INFLUENCE OF MOBILE PHONE'S TECHNOLOGY ON LEARNERS' GRAMMAR: AN EVALUATION OF PUBLIC DAY SECONDARY SCHOOLS IN NAKURU COUNTY, KENYA

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DECLARATION

I declare that this thesis is my original work and has not been presented in any other university or institution for consideration. The research work has been complemented by reference sources duly acknowledged. Where text, data (including spoken words), graphics, pictures or tables have been borrowed from sources other sources including internet, these are specifically accredited and references cited in accordance to anti-plagiarism regulations.

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DEDICATION

I dedicate this thesis to my precious sons; Ian, Bornface and Warren who have been a great source of inspiration during the course and in the production of this thesis.

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My heartfelt appreciation goes to the Almighty God for His enduring mercy that enabled me to complete this work successfully. My profound gratitude goes to my supervisors; A. Bwire and K. Oyiengo for painstakingly reading and correcting my work despite their tight schedule and for their support, understanding and contribution to the success of this thesis.

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ABBREVIATIONS AND ACRONYMS

ABC	Australian Broadcast Corporation
BBC	British Broadcasting Corporation.
CET	Composition Essay Test
FAO	Food and Agricultural Organization
H.O.D	Heads of Departments
KISS	Keep It Simple Stupid
I.M	Instant Messaging
K.N.E.C	Kenya National Examination Council
K.C.S.E	Kenya Certificate of Secondary Education.
M.O.E	Ministry of Education
MOHEST	Ministry of Higher Education Science and Technology
QTEL	Questionnaire for Teachers of English Language
SMS	Short Message Service
SPSS	Statistical Package for Social Sciences
SQ	Students' Questionnaire
U.K	United Kingdom
USA	United States of America

ABSTRACT

The purpose of the study was to establish any influence of mobile phone technology on learners' classroom English grammar in day public secondary schools, in Nakuru North district and Nakuru Municipality. Grammar is essential in any piece of writing for meaning to be realized yet from previous studies, the findings revealed that learners are performing poorly in written English where it is exclusively grammar. Studies done in and outside the country on mobile phones have revealed that the use of short message service (SMS) has contributed to learners' poor performance in grammar. The study was guided by five objectives: to establish how learners interact with mobile phone in writing, establish whether the differences in learners' interaction with the device in Nakuru North district and Nakuru Municipality are significant, examine mobile phone influence on learners' performance, identify features of the gadget that may enhance learners' grammar and finally examine teachers' perception on learners' use of mobile phone in teaching and learning of English language. The study employed a descriptive survey research design and the instruments used in data collection included composition essay test and questionnaires for 194 students while questionnaire and interview schedules administered to 14 teachers of English language. The study used the multistage sampling procedure, where day schools were purposively selected in the two locations. Students were sampled using proportional random sampling to include both boys and girls while teachers of English language were sampled using purposive sampling. Data was analyzed by employing Statistical Package for Social Science (SPSS) programme which produced statistical measures such as frequency, means, percentages and standard deviation. The different means were then subjected to a T-test which determined the level of significance of how different groups used mobile phones. The results revealed that 43% of the students in Nakuru Municipality accessed and utilized mobile phones 11-20 times compared to 66% in Nakuru North who accessed and used them 1-10 times each day; learners' interaction with the mobile phones in both locations varied slightly, with a mean difference of 2.38 with Nakuru Municipality outshining Nakuru North with a mean difference of 1.99 in vocabulary. (86%) of the teachers interviewed acknowledged that mobile phone usage affects learners' grammar both positively and negatively. In conclusion, most learners access mobile phone and use them for a range of purposes; learners' interaction difference with mobile phone between the two locations were statistically significant at $P<0.05$ with a t-value = 4.852 at 192 degrees of freedom; frequent access to the mobile phone correlates positively with learners' performance in English grammar; features that may improve learners' performance in grammar include Google search, SMS, facebook and twitter. Teachers observed that Google search can improve learners' grammar whereas SMS and Facebook can enhance writing skills. The study recommended that curriculum developers should include teaching of SMS language in the syllabus and sites that can improve learners' language skills such as You-Tube, WhatsApp, voice recorder, google search among others can be ventured.

CHAPTER ONE

INTRODUCTION

1.1 Background of study

The invention of mobile phone is a great achievement in the area of communication because of its convenience and accessibility compared to the fixed telephony which is only used in specific areas and at specific time. However, this device has been blamed for learners' poor performance in grammar especially as they use the SMS feature to text. This particular study focused on the influence of mobile phone on the learners' English grammar in day public secondary schools because mobile phone usage is greater here once students are back at home. The chapter is discussed under the following sub-headings: the background of the study, statement of the problem, purpose of the study, objectives of the study, research questions, and significance of the study, scope of the study, limitation of the study, assumption of the study, theoretical framework and conceptual framework**.**

Technology in communication has made life very comfortable for many because of its convenience and comfort (Mphahlele, 2005). Before the device came to use, people relied mostly on fixed telephones for communication; however, this has its major limitation as it can only be used in certain places and at specific time (Ibid). The emergence of the mobile phone in Kenya in early 2000s has created a lot of excitement to almost all age groups with the learners being the most interested group because of its attractive features. According to Ling (2008), mobile phone is appealing to young people

because of its extension nature of social life, its role in the formation of identity, its influence in reshaping the temporal and spatial interaction.

Thurlow (2006) analyzed over 100 media reports, finding that the predominant themes were negative in tone about the effect of texting on Standard English. Typical descriptions, for example, from Sutherland (2002), are ‘‘bleak, bald, sad shorthand’’ and ‘‘linguistically, it’s all pig’s ear’’. Thurlow’s (2003) own work; however, has shown that the naturalistic text messages of older adolescents were generally comprehensible, contained few opaque abbreviations and showed a good sense of what Crystal (2006a) has referred to as lucid use of language, language rich from a playful use of words. Others have also been optimistic about texting (Lee, 2002; Bell, 2003; O’Connor, 2005, Helderman, 2003) in that it ‘‘gets children writing’’ where previously they may have been less likely to do so. In Crystal’s view, text language fulfils the criteria of spoken language as follows: it is spontaneous, loosely structured, socially interactive and, in contrast to IM and speech, not time bound, as the message may remain as long as desired; it is immediately revisable, a feature Reid and Reid (2004) found made it the medium of preference for those with higher levels of social anxiety.

Despite its attractive and vital nature, its effects on learner’ grammar has led to many researches (Lee, 2002; Mpahlele, 2005; crystal, 2003). In Kenya a similar research has been done on syntactic aspect in text messaging (Ongonda,; Matu, and Oloo, , 2011).

English language in Kenya plays a vital role in learners’ lives since most class assignments, tests and national examinations are set and done in English. The secondary school English syllabus postulates that fluency in all aspects of English language will enable students to perform better in all other subjects whose medium of instruction is

English (K.I.E, 2006).The study; therefore, looked at the performance of English language in relation to mobile phone because of the many complaints that mobile phone is impacting negatively on learners class work because of the SMS use.

According to Doring (2002); Ling (2005); Segerstad (2002); however, for SMS language to be used, one has to think clearly on how to best phrase the message in order to put point across with the fewest possible words. Thurlow & Mckay (2003) aptly put it that certainly new communication technologies can empower young people and many do indeed explore and develop imaginative ways of making the technology work best for them. The study will set to establish whether the fears of parents and educators that mobile phone affects negatively on learners' grammar is true or the findings of other researchers that it affects learners positively is viable in the two locations in Nakuru county; that is, Nakuru North district and Nakuru Municipality which represent rural and urban respectively. Research done in Kenya at Makini primary school revealed negative influence of the device as reported in " Business Daily Africa' 2010 that learners did not seem to distinguish when to use and not use SMS language as words like "be4", "sori", "coz", were picked in compositions. English language is quite vital in Kenyan education system and this can be attested by the transformation that has taken place in the sector. The Kenya Institute of Education (KIE) came up with a new syllabus for English language in 1984/1985 as it was realized that the previous syllabus where English language was treated as two different subjects: English language and English literature did not meet Kenyan's expectation and so from 1985, the integrated approach was adopted (K.I.E, 2006). In the approach, both English and literature were to be taught as one subject to bring integration approach in teaching which came with changes on time

allocation to meet the task intended; that is, 6 lessons of 40 minutes each in a week for form (1 and 2) and 8 lessons for form (3 and 4). The reason for the changes was to ensure that learners improved their English language, especially the writing skills (Ibid).

Despite the attempts made to improve English standard, the performance is still dismal. A report released by Kenya National Examination Council (KNEC) in 2009 revealed lack of proficiency in English language which was evident from some sampled compositions; students could hardly write English language correctly. Elementary words such as BALL, FIELD, TODAY, RAINING, were misspelt as "boll", "fild", "tudeyi" "raning" respectively (K.N.E.C, 2009). The purpose of the study was to investigate learners' performance in English grammar in connection with mobile phone usage among learners.

1.2 Statement of the Problem

English language is essential in Kenyan educational system due to its various functions; English language is the language of instruction (LOI) from primary four (4) to university. It is also a key subject in primary and secondary curriculum as well as the language for administering class assignments, tests and examinations. In addition, it is also an international language. Despite its importance, English language has not met the expected standards in the writing skills especially, in English grammar. Grammar entails the punctuation, spelling, sentence construction, vocabulary among others. In a recent report released by Kenya National Examination Council (K.N.E.C), some sampled compositions were scrutinized and the findings were alarming as students could hardly write English language correctly. Elementary words such as BALL, FIELD, TODAY, RAINING, were misspelt as "boll", "fild", "tudeyi" "raning" respectively (K.N.E.C,

2009). The alarm on English poor performance keeps recurring as noted in a report released by KNEC in 2011 that English is a widely used language in Kenyan schools today, yet the performance is still below the expected standard (KNEC, 2011). Ong'onda, Matu & Oketch, (2010a) talks of how mobile texting affects learners' syntacs and define text messaging as a private communication that allows learners to rebel against the standard rules of English language. The study sought to establish whether this kind of rebellion is what is contributing to learners' poor performance in English language.

1.3 Purpose of study

The purpose of the study was to investigate the influence of mobile phone technology on learners' grammar putting more emphasis on SMS language as there are other factors that influence grammar such as mother tongue interference, language spoken at school, home and with peers among others. The study was carried out in day secondary schools with the assumption that learners in day secondary schools access mobile phone once they are out of school since there is a government ban of students carrying mobile phone to schools.

1.4 Objectives of the study

The study was guided by the following objectives:

1. To establish how learners interact with mobile phone in relation to grammar.

2. To compare learners' interaction with mobile phones in Nakuru North District and Nakuru Municipality.

3. To examine the extent to which the learners' performance in English grammar as influenced by mobile phone technology.

4. To identify features of mobile phone that may influence learners' performance in English grammar.

5. To determine teachers' views on mobile phone usage on teaching and learning of English language.

1.5 Research Questions

The study was guided by the following questions:

1. How do learners interact with mobile phones in relation to grammar?

2. Are there significant differences in learners' interaction with mobile phone in Nakuru North district and Nakuru Municipality?

3. Does use of mobile phone technology influence learners' performance in English grammar?

4. Which features of the mobile phone influence learners' performance in English grammar?

5. What views do teachers' hold on the use of mobile phone technology on teaching and learning of English grammar?

1.6 Significance of the Study

The study may contribute to improved performance in English grammar among learners especially when they are well guided by their teachers on the use of SMS language. The study may be a guide to curriculum developers to formulate English language syllabus whereby the teaching of SMS language is included in the syllabus. Teachers of English language may use mobile phone technology to teach writing skills, punctuation, spelling and vocabulary by using various features such as facebook, WhatsApp, Google search, voice recorder among others.

1.7 Scope of the study

The study was carried out in Nakuru Municipality an urban area since Nakuru town is a cosmopolitan city; thus, the use of mobile phone with internet enabled connection is likely; thus, very vital in the study in providing data needed. Similarly students in this region are presumably more exposed to technology than those in rural areas. The study also covered Nakuru North area which is virtually rural; thus giving data on how learners in rural region are likely to interact with the device. The study dealt study concentrated on SMS language with view that there are other factors that may also contribute to learners' poor performance in grammar such as mother tongue interference, the language used at home, school and even with peers. The two locations were chosen for concrete and in-depth information on the study.

The F2 students were sampled to participate in the study since this class is not under much pressure of national examination like F3s who are at this stage are preparing for the national examination to be undertaken in F4 and the F4s will be busy revising for Kenya

Certificate of Secondary Education Examination (KCSE) at the end of the year. F1s were not sampled because they were still trying to adjust to the new environment; thus, unlikely to be active users of the device; 206 F2 students were sampled for the study.20 teachers teaching F2s were also sampled as they were handling the class; consequently had correct information on how learners use mobile phone technology in relation to English grammar.

1.8 Limitation of the study

There are other factors that affect English grammar; as a result, concentration was mainly on the use of SMS language to eliminate other factors.

1.9 Assumption of the Study

The study proceeded on the following assumptions:

1. That learners in day schools access mobile phones and this was true since learners in both study locations had access to the mobile phone.
2. That teachers teaching Form two classes have information on learners' use of mobile phone technology. Indeed, the teachers had information since they provided information that touched on learners' interaction with the mobile phone.
3. That the students would cooperate throughout the study by responding to the questions in the questionnaire without prejudice as to the consequences of giving such information, given that mobile phone use by learners in school is prohibited. Indeed, the learners who participated in the study understood that the study sought to examine their use of the mobile phone at home but not in school thus freely provided the required information.

4. That learners interact differently with mobile phones in the two localities since in the rural electricity power may be a drawback. This was true because rural areas had just a few homes with power and indeed even some schools did not have electricity power.

1.10 Theoretical Framework

In an attempt to understand the influence of mobile phone technology on learners' grammar, "Activity Theory" was employed. The origin of the model is attributed to the founding of the "The school of Russian Cultural History", developed in Russia with Vygotsky (1978) and Leont'ev (1982) in the early twentieth century. This theoretical framework is widely recognized internationally and is extensively applied, in connection with the theme of mobile learning.

The key point in this theoretical corpus of the Activity Theory is agency. The concept was created to indicate the ability of people to act as agent in a transformative way in their environment. This is relevant to study as learners act as agents by using mobile phone to do what they wish; for example, chatting through internet via facebook, sending messages (SMS), searching for information (google search) among other through the various features in the device.

Secondly, the human agency is linked to the tools to achieve the objectives. In the study, learners are linked to mobile phone to text, browse, search for information among others and in the process achieve the objective of learning English language by writing, building vocabulary, spelling and punctuating.

Thirdly, mobile learning enables active forms of agency and allowing the students to be in central position in the learning process. Considering that mobile learning has social-constructivist personality (Hayes et al., 2007). This is relevant as learners are the ones who decide on what they wish to learn at their own time and pace.

In conclusion, this theory supported the study as learners have the opportunity to use mobile phone technology to change learning paths by being in control of learning. The theory also supports independent as well as social learning.

1.11 Conceptual framework

Mobile phone has various features depending on the type of phone. As learners use the device in various ways, it influences their learning of English language. For example, in sending messages by texting, learners learn how to read and write. In searching for information through google search, they build vocabulary, likewise when they get to social sites via facebook or twitter; they learn writing, vocabulary spelling among others from friends. However, there are moderator factors that may affect how they learn.

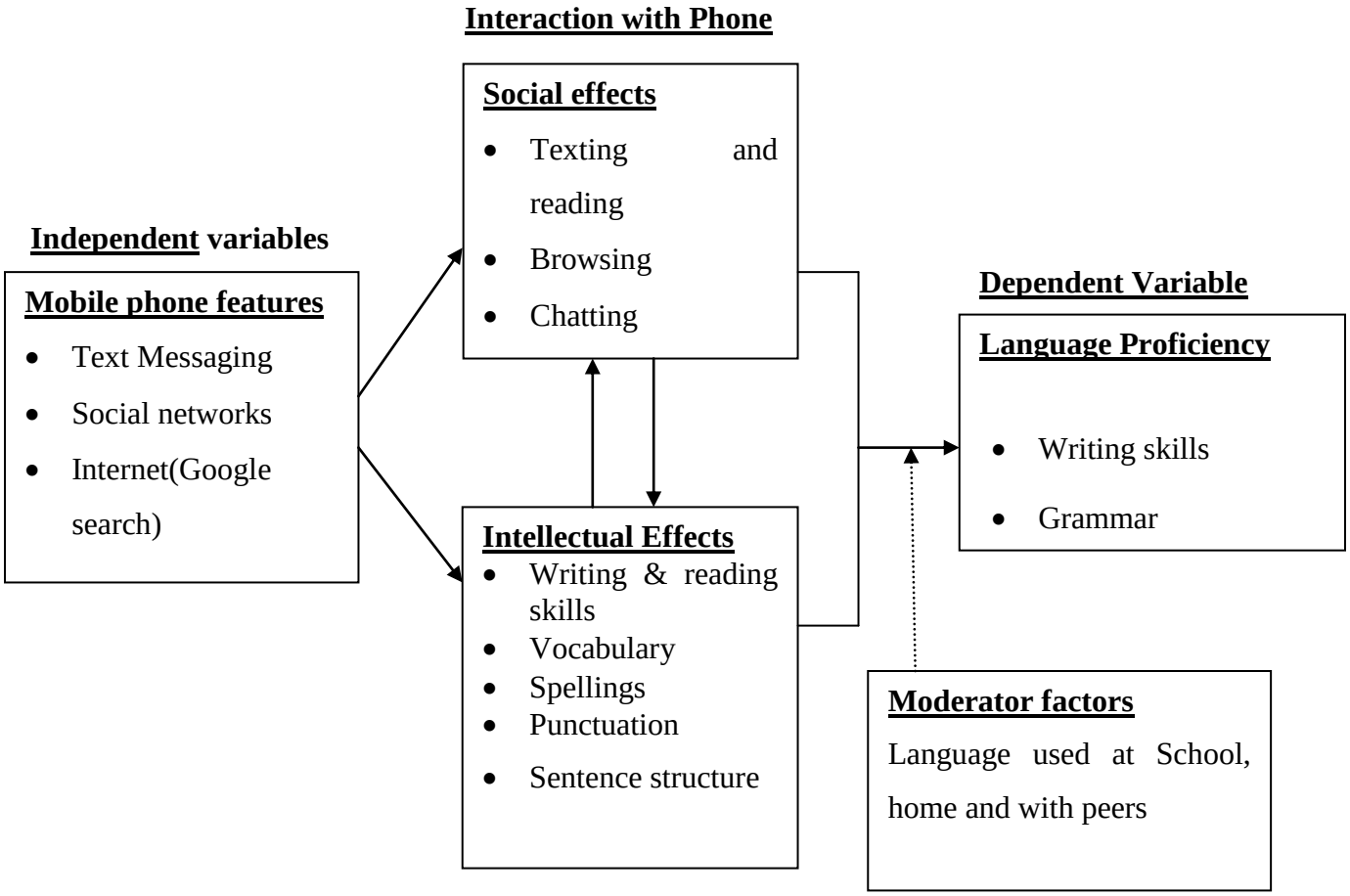

Figure 1.1: Learners' Interaction with mobile phones.

The conceptual framework shows the features of the mobile phone namely text messaging, social networks and internet (independent variables) that may have social and

intellectual effects on learners. The social effects (texting and reading, browsing and chatting) and intellectual effects (writing & reading skills, vocabulary, spellings, punctuation and sentence structure) interact and may influence learners language proficiency (writing skills and grammar). This relationship may be moderated by the language used by the learners both at school, home and with peers. The study acknowledges that other factors other than the mobile phone may influence learners' performance and language proficiency in English. Thus, taking into consideration the possible effects of such factors independently as well as the integrative effect of the mobile phone in the presence of such factors, this study did not attempt to make a cause-effect analysis between mobile phone use and learners' performance in English grammar. Instead, an explanatory correlational approach was adopted where the study explored the extent to which the independent variable (learners' interaction with the mobile phone) co-varied with the dependent variable (learners' performance in English grammar), that is, whether changes in learners' interaction with the mobile phone were reflected in changes performance in English grammar (Creswell, 2008).

1.12 Operational Definition of Terms

E-mail: A site in the internet that can be used to send documents or message from on area to another and from one person to another.

Facebook: A site in the internet, that allows users to chat with friends and some family members.

Features: These are software found in a mobile phone and can be used for various purposes.

Grammar: It is the use of punctuation, spelling, sentence construction and vocabulary.

Graphones: This comes from two words, 'graphic' how words are written and 'phone' how words sound. The word, therefore, means that words are pronounced the way they are spelt.

Influence: How mobile phone use affects learners' grammar either positively or negatively.

Interaction: how learners use mobile phone to relate to their friend or family members through texting and reading.

Learners: These are students in high schools especially, the Form Two students.

Mobile phone technology: This is a machine whose features can be used to perform different tasks as the user wishes.

Mobile phone: it is a device that is used in communication among people at any time and place.

Municipality: The area within and around the town.

Public schools: These are schools that are aided by the government whereby tuition money is paid by the government for every child.

Rural: Areas that are at the outskirts of town or far from town.

SMS Language: This is the use of shortened words, graphones, numerals and simple pronounceable letters in communication.

Text messaging: It is a private communication that allows users to rebel against the standard rules of English language.

Writing skills: Specific abilities which help writers put their thoughts into words in a meaningful form and to mentally interact with the message.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.0 Introduction

This chapter reviews literature pertaining to influence of mobile phone technology on learners' English grammar. The review includes the following sub- headings: the number of learners who use mobile phones, how learners interact with mobile phone, influence of mobile phone on learners' performance, features of mobile phone that may enhance learners' grammar and how teachers of English language handle influence of SMS language on learners' grammar.

2.1 Students' Performance in English Language in Kenya

English performance in national examination both for primary and secondary level has been a concern of educators and parents owing to its vital function in the country; it is the language of instruction (LOI) in schools, a key subject in the curriculum, official language in schools among other functions. Despite its importance, English language has continued to post poor performance in national examination in recent years despite efforts made to ensure better performance (KNEC, 2006). While releasing 2008 KCSE examination results, the then minister of Education professor Ongeri noted that there was a drastic drop in English language as a subject (KNEC, 2009). Kenyan school leavers continue to perform poorly in English language due to poor teaching methods or strategies (Ng'onga, 2002).English language curriculum is examination oriented and ignored practical approach and evaluation and only tested on memorization (Nyanjom, 2007). From the studies, the poor performance is attributed to other factors but little has

been done on relationship to use of mobile phone. The study; therefore, investigated influence of mobile phone technology on learners' grammar.

In a study conducted by "Consumer Insight" 2010 in Mobi Youth Report Q2, 09 on youths aged between 7-24 living in urban and semi-urban areas, the Managing Director Ndirangu wa Maina said, that though cost of handset is still a barrier, it is much less so since only 2 out of 10 youngsters sampled, cited it as a barrier. In the same study, it is reported that Kenyan youth of school going age are the biggest consumers of airtime in the major East African countries spending 3.4 billion per month in airtime alone, which is three times what their counterparts in Tanzania are spending and also double what peer in Uganda consume per month. This study shows that learners are popular with the device whether they own them or not.

Mobile phones are becoming more widely used in learning vocabulary, as is shown in a number of studies (Chen & Chung, 2008; Kennedy & Levy, 2008; Lu, 2008; Pincas, 2004; Stockwell, 2008; Stockwell, 2010; Thornton & Houser, 2005; Yamaguchi, 2005). In one study, Lu (2008) had students learn two sets of English vocabulary words either through mobile phones or by a paper-based format. Students who learned via SMS were found to understand more words than students who were presented with the paper-based tasks. There are aspects of mobile phone that learners find appealing; mobile telephone's accessibility, text messaging, numerous applications that can be downloaded and entertainment possibilities (Katz, 2003; Ling, 2004).

A study done by Anita Gurian in National Public Radio (NPR) News October 2, 2008 at Minnesota, reported that an estimate of 40% to 75% from middle school students own cell phones with even higher rates for high school students. The study focused on how

learners access and interact with mobile phones when communicating with their friends in Nakuru North district and Nakuru district.

2.2 Use of the Mobile Phone among Urban and Rural Learners

The study focused on learners' use of mobile phone in two locations, that is, Nakuru Municipality (urban) area Nakuru North (rural). According to Cpus (2001), rural adolescents have never had same ready same access to means of communication as have their urban counterparts because the arrival and spread of innovations and technology in rural areas has always lagged behind cities (Cairnoross, 1997; kalantaridis, 2006). A study done in Finland entitled "Young People and Mobile Phone" the findings reveal that people metropolitan areas and major cities stand out from thrfrom the rest regarding the use of new mobile services and the mobile internet (Nurmela & ylitalo, 2001; Nurmela, Sirkia, & Mustonen, 2004). Research Institute Association (RIA) Household Survey data suggest a very low ownership of computer with 14.78% and stationary internet at 4.76%. In 2011 39% of urban and 27% of rural users were browsing internet on their mobile phones possibly because users might be getting internet offers cheaper than stationary internet cost.

A study conducted by RIA in 2010 found that 70.6% of urban dwellers aged 16 to older, use mobile phone while only 48.9% of their neighbors engage in such activity. The study also revealed that internet browsing is also expanding in South Africa with 39% of urban dwellers and 27% of rural residents browse internet on their phones. However, internet access is low among rural cellular market due to cost concerns. The study reveals mobile

phone use among urban and rural dweller which reveals there is a difference in how the two groups use the phone.

In a study done by Pew Internet & America Life Project 2010 reveals that impact of mobile phone is being felt less by teachers in rural areas than those teaching in urban areas or suburban schools. 28% of teachers of rural schools report students using phones to look up information in class and 64% say that students are not permitted to have cell phones in class. In contrast, 47% of those in urban schools say their students use cell phones to look up information in class and just 46% say students cannot use cell phones and 45% reports students not being permitted to have cell phones in class. From that study, students in urban location uses the mobile phone more in the classroom to look for information than those in rural areas. The study done in Nakuru North and Nakuru Municipality was to establish how learners in the two locations use mobile phones and how different they use them.

2.3 Learners' Interaction with the Mobile Phone and Performance in English Grammar

In a study conducted by "Consumer Insight" in Mobi Youth Report Q2, 09 on youths aged between 7-24 living in urban and semi-urban areas, the Managing Director Ndirangu wa Maina said, that though cost of handset is still a barrier, it is much less so since only 2 out of 10 youngsters sampled, cited it as a barrier. In the same study, it is reported that Kenyan youth of school going age are the biggest consumers of airtime in the major East African countries spending 3.4 billion per month in airtime alone, which is three times what their counterparts in Tanzania are spending and also double what peer in

Uganda consume per month. This study shows that learners are popular with the device whether they own them or not is immaterial.

A study done by Anita Gurian in National Public Radio (NPR) News 2nd October, 2008 at Minnesota, reported that an estimate of 40% to 75% from middle school students own cell phones with even higher rates for high school students. In a research conducted by Amanda Lenhart senior research specialist, Pew Internet & American Life Project, the following findings were realized: cell phone texting has become preferred channel of basic communication between teens and friends. The mobile Phones have become indispensible tools in learners' communication pattern where 88% of cell phone users send text messages. This is a sharp rise from 51% "texter" in 2006 and more than 54% of learners are daily texter (Amanda, 2008). Teen texters ages 12 to 13 send and receive 20 text messages a day. Those between 14 to 17 years send and receive 60 text messages a day. The study also revealed that girls send and receive 80 text messages a day while boys send and receive 30 texts in a day that is, 86% of girls' text messages to friends several times in a day while 64% of boys do the same. Fully two thirds of teen texters say they are more likely to use their cell phones to text their friends than talk to them by cell phone. The study reveals that learners prefer to use text messages more than they do with voice call. The study focused on how learners access and interact with mobile phones when communicating with their friends in Nakuru North district and Nakuru district.

Learners have been attracted to this device because of its appealing nature especially to adolescents (Ling, 2008). The use of mobile phone has elicited arguments from researchers as regards its performance among learners in English grammar. For example,

some argue that it has made positive contribution in the area of education: improving learners' literacy and numeracy skills thus, recognizing their existing abilities. It encourages both individual and collaborative learning experience. It helps remove some of the formality from learning experience and engages reluctant learners. Besides, it helps learners to remain more focused for longer periods raising their self esteem and self confidence (Attewell, 2004). According to (Bells, 2003) "anytime students are reading or writing it is going to help." According to Crystal (2008), creative potential of texting has been almost ignored. He further says that research shows that texting does not eat into children's ability to read and write. Though there are positive sides of this device, some researchers feel it is spoiling learners' grammar as in Maples' sentence. Since a sentence can be stated in one sentence that may contain only five words and "get the job done" in a text message, students are tending to think that shortened answers will also "get the job done" in the classroom. For many courses and especially English, shortened answers and choppy sentences will certainly not suffice (Maples, 2009). This study investigated how learners interact with the devise and its performance in learners' lives in relation to grammar.

2.4 Features of Mobile Phone and Learners' Performance in English Grammar

Extant literature on mobile phone features reveal mixed findings on the effects of mobile phone technology on learners' performance in English grammar. Whereas the mobile phone has been blamed for written English language problems, others studies have shown that there are other features that can enhance learners' writing. This section presents literature review on what prior studies have reported on mobile phone features namely

text messaging, social networks and internet browsing engines and performance in English language.

2.4.1 Text messaging and Learners' Performance in English Language

There are different views on the effects of text messaging on learners' communication and this has resulted in various schools of thoughts. Crystal (2008) refutes the popular view that SMS language and its profuse abbreviation and slang can impact negatively on students' language and literacy. His claim was based on six main points:

a. In a typical text message less than 10% of words are abbreviated.
b. Abbreviating has been in use for decades and this is not a new language.
c. Children and adults alike use text language, the latter being more likely to do so.
d. Students do not habitually use abbreviation in their homework and examinations.
e. Before people can use text messaging they must first know how to spell it.

Crystal (2006) opines that despite many texters' enjoying flouting linguistic rules, they also realize they should be understood. When messages are longer, containing more information, they use more of standard orthography. According to Doring (2002); Ling (2005); Segerstad (2002) one has to; therefore, think clearly on how to best phrase the message in order to put the point across with the fewest possible words. Thurlow & Mckay (2003) aptly put it that certainly new communication technologies can empower young people and many do indeed explore and develop imaginative ways of making the technology work best for them. According to Thurlow (2007), very few of text messages are systematically 'unrecoverable', even when read out of their original, discursive context and even to outsiders. Thurlow (2011), opines that what texters type in their

messages would note mostly very different from a note scribbled on the fridge door, the dining-room table or next to the telephone-where the same brevity and speed would be required.

However there are those who argue that texting destroys learners' English grammar. Teachers say that papers are being written with shortened words, improper capitalization, punctuation and characters like; &, $ and @. These mistakes are often unintentional as noted on Montana Hodge, a 16 year old high school student in Montclair New Jersey, who was accustomed to Instant messaging abbreviation that she often read past them (Lee, 2002).

A study done by Pew Internet and American Life Project and the National Commission on Writing of ages 12 to 17 were asked if they used shortcuts or symbols often used in text messaging on homework assignment. The findings revealed that 64% of these learners admitted to using shortcuts in schoolwork "Sacramento News," April 14th, 2008. In an attempt to deal with text problem, the Vodacom Company has come up with SMS dictionary provided to clients when they purchase a cell phone (Mphahlele, 2005).

Table 2.1: SMS Dictionary of Vodacom

WORD IN FULL	ABBREVIATIONS (SMS)
As Far As I Remember	AFAIR
Love	LUV
Thanks	THNX
Have A Nice Day	HAND
So What Is Your Problem	SWYP
Tears In My Eyes	TIME
Keep It Simple, Stupid	KISS
Random Act of Kindness	RAK
At	@
See You	C U
Before	B4
Today	2DAY

Source: Mphahlele (2005)

Although there is SMS dictionary, there are still problems since English language and SMS language dictionaries have similar words, for example KISS which in SMS

language means “Keep it simple, stupid” in English language dictionary it means to touch with the lips to show affection or as a greeting. This kind of writing confuses the learners more, especially in their grammatical construction (Mphahlele, 2005).

A study done by “Business Daily” posted, January 27th, 2010 entitled, “Mobile Texting a new threat to teaching languages in schools”, Professor Kithaka wa Mberia a linguist at Nairobi University, says that texting poses a big challenge to language since colloquial language is a new norm. According to professor, many Kenyans cannot even distinguish between British and American English, making it harder for linguists to help purge text language from students work. From the comment, it is evident that text messaging is also an issue of concern to Kenyans as well. The research is to establish the influence of mobile phone on learners’ grammar in the two locations and whether the same findings discussed are applicable in the locations.

2.4.2 Internet Browsing Engines and Learners’ Performance in English Language

Internet browsers are now being built into a growing number of cell phones especially those that use 3rd generation protocol (3G). Accessing internet open doors to other buses such as Google search engine, social network site (facebook, email, blog twitter among others. This study dealt with only two of social media features: facebook and twitter because they are often used and especially by learners.

Having a browser in a cell phone puts a dictionary, thesaurus and encyclopedia into the hands of every student. It gives them instant access to Google and other search engines, turning their cell phones into research tools (Prensky, 2004). Internet is seen as a channel of participation and expression of easy and instantaneous communication readily

accessible to adolescents (Lopez, 2006). According to Pew Report (2001), (74%) of online teens use instant messaging (Lenhart, Ranle and Lewis 2001, p3) and (68%) of teen's instant message users; use Instant messaging (IM) at least several times in a week. This also helps them to send e-mails to their friends as well and they can even attach documents to be read by these friends. According to Thorne, Black and Syke's research, participating in internet interest community has potential to propel language learners beyond the confines of institutional identity.

2.4.3 Social Network Sites and Learners Performance in English Language

Social network is linked to internet and has popularity with the teenagers because it provides a forum for socialization as they chat. There are many forms of social media such as internet, blog, games, facebook among others. Facebook is one of the most popular social networking sites that allow users to post information, chat with others and collaborate (Stelter, 2008). When students use Facebook as a tool for their study by spending time browsing profiles, meeting new people, and exploring relationships using the English language, they have greater opportunities to collaborate with a large number of people worldwide and learn the target language at the same time (Educause Learning Initiative, 2006). When students receive comments and suggestions, they can use the information given to improve their language skills. Apart from this, when students discuss on Facebook, they do not have to use their real names. They can avoid face-to-face interaction thus lowering the level of anxiety (Murphy, 2009). Having been given opportunity to communicate with other people students are likely to benefit from collaborative learning in facebook (Dawson, 2008). According to Thorne, Black and Syke's research, participating in internet interest community has potential to propel

language learners beyond the confines of institutional identity. Social media not only assist learners but teachers as well as brought out by U.S.A. Department of Education which stresses that teachers should not only be connected to resources but should have communities of practice that provide career long personal learning opportunities for educators within and across schools, pre-service preparation and in-service institution and professional organization (Office of Educational Technology, 2010). The study was to establish whether some features of mobile phone can be used among Kenyan learners to improve their English grammar.

2.5 Teachers' Views on the Use of Mobile Phone for Teaching and learning of English Grammar

Mobile phones for many learners are not a device for making calls but rather "lifeline" to the social network and an instrument for coordinating their everyday life. It is therefore advisable that instead of making a blanket ban on the device, schools may better integrate them into their normal routine (Mathews, 2004). A number of studies have been conducted about the use of mobile phone as a tool for learning and other functions such as calculator, creating messages and alarm reminders among learners have been reported (Ison, Hayes, Robinson and Jamieson, 2004). Teachers; however have their views on how the use of mobile phone impacts learners' lives. One of the major goals of a second language educator is to inculcate and enhance the language proficiency of learners.

According to most language researchers, including the Council of Chief State School Officers (CCSSO) (1992), language proficiency consists of the ability to listen, speak, read and write with comprehension, observing grammatical, syntactic as well as semantic rules governing that language.

According to (Maples, 2009), text messaging has given our society a quick means through which to communicate, taking out the need for capitalization, punctuation, the use and knowledge of sentence structure and the details that make good statement great (Maples, 2009). Some educators suggest that this age form of messaging may be hindering today's learners' abilities to apply grammar correctly in the writing and social skills. Thurlow (2011), calls young people's use of their mobile phones as a 'novel, creative' way of improving close relationships and existing social circles and claims that 'popular discourses about the linguistic uniqueness and incomprehensibility of this particular technologically mediated discourse appear greatly exaggerated'. Others, however, take pride in the notion that learners are essentially creating their own language of twenty first century and see no effect on their students' writing skills (Maples, 2009).

Teachers; however, have a duty to perform incase students use the SMS language as observed in this teacher's comment. "When informal language does pop up in papers, I definitely am going to correct it,' she said. 'But it's part of our job as teachers to help students move in and out of formal and informal language."This teacher is very correct; in Alabama as well as other states across the United States, one of the standards for teachers of English Language Arts is to educate students on the difference of and appropriate use of formal and informal language (Hubert, 2008).The study sought to get the opinion of teachers in Nakuru North and Nakuru Municipality on how mobile phone influence learners grammar.

2.6 Chapter Summary

Though a lot of work has been done on text messaging from other nations most of which from America, not much has been done in Kenya as revealed in the literature review. Researchers like Ogonda, Matu and Oloo (2011), have looked at the syntactic aspect of

text messaging on linguistic variations among university students. The findings showed that text messaging is influencing linguistic variation hence leading to language change. They found that Kenyan text messages are compressed through omissions, abbreviations and contractions. However, their recommendation is that a thorough study should determine literacy importance of SMS on language in contemporary society. The proposed study took a different path to investigate on how learners in public day secondary schools use mobile phone in relation to performance in English grammar since such a study has not been done in this location and for the fact that there is a ban on the use of mobile phone in schools; therefore a study can only be done on day scholars who are likely to use phones once they are out of school. The researcher sought to fill the gap by finding out whether some of the findings realised in the literature review are applicable to students in Nakuru North district and Nakuru Municipality. The mobile phone technology especially, the text messaging has widely been blamed for learners' poor performance in grammar (Lee, 2002). Nevertheless, there are some researchers that have come out with findings that texting can improve learners' writing skill (Lee, 2002). The study; therefore, investigated whether the device has any influence on learners' grammar specifically, those from the two locations

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

The chapter describes the methodology used in conducting the study under the following sub-headings: research design, location of the study, population, sample and sampling procedures, instrumentation, pilot study, data collection and data analysis

3.1 Research Design

The purpose of research is to achieve greater control of the study and to improve the validity of the study by examining the research problem (Burns and Grove, 1999). In deciding which design to use, the researcher has to consider a number of factors: the focus of research (orientation of action), the unit of analysis (the person or object of data collection) and the time dimension (Bless and Hiqson-Smith, 1995). This study had both descriptive and predictive purposes. At the descriptive level, the study sought to describe learners' interaction with the mobile phone and teachers views over the same, while in terms of prediction, the study sought to explore the extent to which learners' interaction with the mobile phone co-varied with their performance in English grammar. Therefore, the study utilized both descriptive and explanatory correlational research designs. Correlational research is a type of descriptive non-experimental research that describes and assesses the magnitude and degree of an existing relationship between two or more continuous quantitative variables (Kalaian, 2008). Correlational research involves collecting data from a sample of individuals or objects to determine the degree of the relationships between two or more variables for the possibility to make predictions based

on these relationships. In this type of study researchers collect two scores from each participant as each score represents each variable being studied (Creswell, 2008).

3.2 Study Location

The study was carried out in Nakuru North district and Nakuru Municipality, in Nakuru County, Kenya. These locations were chosen because it gave concrete and in-depth information on the use of mobile phone technology on learners' grammar and from the literature review it shows that a study on mobile phone and its influence on grammar has not been done in these areas. It also provided data on learners in rural and urban areas as represented by Nakuru North and Nakuru Municipality respectively making it possible to compare how learners use mobile phone in rural and urban areas. During an international Conference held in Nairobi by the UN-Habitat in September 2010, it was declared that Nakuru was the fastest growing town in Africa, (UN-Habitat, 2010). Growth of the town's economic output is estimated at 13% "Comparable only to Chinese cities according to Mr Thomas Melin," Habitat senior advisor. This is an indication that some changes are taking place especially human growth as many seek greener pastures in such towns thus increase use of technology such as mobile phones to reach out to friends and relatives.

3.3 Target Population

The target population comprised 5,340 students, 56 teachers and 6,566 students, 70 teachers of English language in public secondary schools in Nakuru North district and Nakuru Municipality respectively, giving a total of 12,032. The Form Two students from both locations were sample because the class does not yet experience the pressure of

examination which is normally conducted at the end of four years in Kenyan high school system that is; the Kenya Certificate of Secondary Education (K.C.S.E). The form two teachers of English language were sampled as they were the ones handling the class; therefore, were in a better position to give reliable information on the learners' use of mobile phone. The study further narrowed down to students in day schools in the named study locations following government ban on the mobile phone usage in both public primary and secondary schools. The assumption was that students in day schools access mobile phones once they are back from school during the week and weekends.

3.4 Sampling techniques and sample size

The study employed multistage sampling technique which involves two or more steps in sampling (Mulwa and Nguluu, 2002). The first step was to sample schools in both locations using purposive sampling method to select only day schools. Nakuru North and Nakuru Municipality had a total of 23 and 21 day public secondary schools respectively.A systematic random sampling was employed since the schools at both locations had same features to get a reasonable representation. In each location, schools were arranged in an ascending order of 1-23 and 1-21 respectively, thereafter, a school was picked at every fourth position. Consequently, 5 schools were sampled from each location totaling to 10 schools a representation which is more than 10%, a figure accepted as a reliable representation by (Borg, Gall & Gall).

The second stage involved sampling of Form two students from both locations through proportionate random sampling to get representatives from each school. Kathuri & Pals (1993) recommend that for descriptive studies, a minimum of 100 subjects are acceptable

as long as none of the sub-samples would be less than 20. Therefore, the study utilized a sample size of 206 students and 18 teachers responsible in teaching English language to form two students. Two English teachers were systematically selected from schools having more than one stream and one English teacher from schools having one stream. The sample size for students was scaled up to 206 to cover for possible non-responses. The 206 students were equally distributed to the two study locations whereby in each location, 103 students were proportionately sampled from each of the 5 schools based on the number of Form two students in every sampled schools. Average of two teachers handling form two students in English language were purposively selected from each of the participating schools. Table 3.1 shows the distribution of the students' sample size per location per school.

Table 3.1: Sample Sizes per Location per School

Location	School	Form II Student Population	Sample size	Percentage of sampled students	Teachers of English Population	No. of sampled teachers of English	Percentage of sampled teachers of English
Nakuru	A	152	25	16.45	5	2	40
Municipality	B	201	34	16.92	6	2	33
	C	153	26	16.99	5	2	40
	D	50	8	16	2	1	50
	E	60	10	16.7	2	1	50
Subtotal		**616**	**103**	**16.72**	**20**	**8**	**40**
Nakuru	V	96	17	17.7	2	2	100
North	W	94	16	17	3	2	67
	X	155	27	17.4	5	2	40
	Y	87	15	17.24	2	2	100
	Z	158	28	17.72	5	2	40
Sub Total		**590**	**103**	**17.46**	**17**	**10**	**58.82**

3.5 Research Instruments/Instrumentation

The main instruments for data collection were the students' questionnaire (SQ) and the Composition Essay Test (CET). Gay (1992), Kothari (2003) and Orodho (2002), all agree that questionnaire are free from bias, are cost effective and give respondents adequate time to give well thought answers. The students' questionnaire had two sections; section

A dealt with biographical details while section B contained items related to the study objectives. Section B had both closed-ended questions which reduced wide variation in the responses thus ensuring that there was consistency in the answers which ensured easy comparison and open-ended questions which enabled the respondents to give their opinions and as a result, the information gathered would otherwise not have been realized. The questionnaires bring out the values, opinions and attitude of learners concerning the use of mobile phones.

The second instrument was the composition essay test (CET) which was helpful in analyzing the influence of various mobile phone features on learners' English grammar in their written work. The CET was administered to the pilot group from two locations similar to those in the actual study. The CET was administered during class lesson session to avoid feeling that they are being examined. The test was to test the spelling, punctuation, sentence construction and vocabulary to examine whether there was any influence of mobile phone usage. Split-Half reliability was used to aid in determining how much error in a score was due to poor test construction (Borg, Gall & Gall, 1996).CET being dichotomous in nature rather than having multiple choice sections, the Kuder- Richardson formula 20 (KR-20) was the statistic used. The essays were arranged in an ascending order; 1-194 which was then Split- Half using Odd- Even method.

The third and final instrument was the questionnaire for teachers of English language (QTEL) which had both closed and open-ended questions to get the opinion, values and attitudes of teachers of English language in relation to learners' use of mobile phone. The instrument was to establish whether the device has any influence on learners' performance in writing, especially spellings, punctuation, sentence construction and

vocabulary and whether there were features of the device that can enhance learners' grammar.

3.6 Pilot Study

A pilot study was conducted in two, day mixed secondary schools in rural and urban areas; these schools had similar characteristics with the actual sampled schools for study. The two schools were not part of the actual sample of study. The pilot study had sample size of 15 students from each location giving a total of 30 students and 4 teachers; two from each location. The findings from the pilot study were used to validate the research instruments and also tested their reliability.

3.6.1 Validity

Validity is a measure of how well a test measures what it is supposed to measure (Kombo and Tromp, 2006). The content and construct validity of the instruments were strengthened by seeking expert advice from the supervisors, the lecturers in the department of Educational Communication and Technology and experienced teachers of English language from the department of English language. Face validity of the questionnaires for both students and teachers were ensured by dividing them into two sections: sections A dealt with personal details while section B dealt with both open and closed-ended questions. The reason for closed ended questions was to get the exact information needed while open ended questions sought to reveal information which would otherwise not have been realized. It also brought out the opinions, feelings and the attitudes of the respondents.

The validity of composition essay test (CET) was realized by administering an essay test that was short and interesting during class session for students not to have tension associated with examination.

3.6.2 Reliability

The reliability of the questionnaires was determined by scoring each question: 0-1 for those numbers with two possible answers and the multi-point formatted questions or scales 1-5 especially Likert scales. Data from pilot study was then coded and entered in the computer and reliability analysis conducted with the aid of the Statistical Package for Social Science program (SPSS version 17). The reliability was checked using Cronbach Alpha Coefficient (CAC) test which produced a reliability index of 0.77 indicating that the level of reliability was within the acceptable threshold as the recommended reliability is coefficient of $\alpha = 0.70$ (Bryman & Crammer, 1997; Fraenkel & Wallen, 2000).

The reliability of composition essay test (CET) was realized at face value and internal reliability through Split-Half test technique. The CET was administered to the pilot group of 30 students which was then split in equal halves of 15 each. Split-Half Reliability is a common statistical method used to determine the reliability of a typical test especially for essay questions which require to be evenly distributed in terms of content and point value. Split-Half Reliability aids in determining how much error in a test score is due to poor test construction(Borg, Gall & Gall, 1996). With the CET being dichotomous in nature rather than having a multiple choice sections, the Kuder-Richardson formula 20 (KR-20) was the statistic used. The composition essay test was administered to 15 students from each location giving a total of 30 students and then scored based on several

key areas namely spelling, punctuation, sentence construction, vocabulary among others. These areas were then objectively marked using a laid down criteria to give a score for each individual student. The scores were then divided into two. Split-Half Reliability assumes that, if a test is reliable, a student should score equally as well or poorly on two randomly selected halves of the test (Fraenkel & Wallen, 2000). Each student who took the test therefore had two sets of scores for the CET. The scores were then recorded in appropriate cells of the Excel spreadsheet that allowed for the computation of the reliability coefficient that yielded an r value of 0.743. This reliability was considered to be high.

3.7 Data Collection

The District Education Officer (D.E.O) in- charge of the study areas were informed of the intended study and permission was granted to collect the data from the sampled schools. Later permission was sought from the principals of the sampled schools. The schools which participated were visited two times; first visit was for introduction purposes. The second visit was for the administration and collection of the questionnaires, interview schedule and student essay assessment test. The researcher collected the data from the respondents in their natural environment (their usual areas of operations) which helped the respondents to be themselves when responding to the instruments. The composition essay test was administered to the whole class during a normal class lesson of 40 minutes through the subject teacher to avoid the feeling of being pressurized in the presence of a stranger. It also made them to be themselves as they wrote rather than feeling that they were taking an examination.

Questionnaires were administered to learners at a time that was deemed fit by their teachers explaining to learners the purpose of the questionnaire, thereafter; learners were issued with the questionnaire and given ten minutes to fill them in to ensure that no one filled in for the other. The teachers' questionnaires were issued to them at their convenient time and administered personally by the researcher to ensure that they were completed by the sampled respondents.

3.8 Data Analysis

Before the actual data analysis, the filled in students' questionnaires were checked and the relevance of their responses confirmed. The responses were organized into main objective areas of study. A coding strategy was developed and the data gathered from the field were coded after validating. The Statistical Package for Social Science (SPSS) program was employed to assist in the data analysis. The statistical tools used for descriptive analysis included frequencies, percentages, mean and standard deviations as realized from the questionnaires, that were used to describe learners interaction with the mobile phone. Significant differences in the means were compared by use of inferential statistics (t-test) while the relationships between mobile phone use and learners' performance in English grammar were analyzed using the Pearson's Product Moment Correlations.

The composition essays test was collected from the field marked and the results were coded and computed. The SPSS program was employed to assist in data analysis where statistical descriptive tools used included means and standard deviation to describe learners' performance in the two locations. The significant differences in the means were

compared using the inferential statistics (t-test) while the relationships between the learners' interaction with mobile phone and performance in CET and mobile phone features and learners' performance in English grammar were analyzed using Pearson's product moment correlations.

Qualitative data obtained from open-ended students' questionnaire and from in-depth questionnaire of teachers of English was extracted, transcribed and infused into the study qualitatively by way of discussing the same under relevant thematic areas of the study. Discourse analysis was used to analyze written and spoken information.

3.9 Ethical considerations:

Ethical conditions are principles which researchers should abide by when conducting research so that respondents' rights are not violated. These measures included:

Permission to carry out the research was sought from the Ministry of Higher Education science and Technology (MOHEST), through the graduate school, Kenyatta University. The researcher obtained a written, informed consent from the respondents and assured them of confidentiality before the actual interview. The participants were adequately informed of their voluntary participation in the study as well as their freedom to withdraw from the study at any time without suffering any consequences. The researcher did not try to be dishonest by using research for any other interest rather than what research was intended for.

CHAPTER FOUR

DATA PRESENTATION ANALYSIS AND DISCUSSION

4.0 Introduction

The study investigated the influence of mobile phone technology on learners' English grammar in public day secondary schools in Nakuru North District and Nakuru Municipality. After carrying out a pilot study of the research, the researcher collected the actual data from students and teachers using students' and teachers' questionnaires respectively. This chapter therefore, presents the findings of the research study from a descriptive analysis of data collected, interpretation and discussion of the findings. The chapter is presented under sub-filters of: response rate; distribution of the respondents by sex; learners 'interaction with the mobile phones; performance of learners in English grammar; mobile phones use and learners' performance in English grammar and predictors of learners' performance in English grammar.

4.1 Response rate

One hundred and ninety four (194) students' questionnaires and fourteen (14) teachers' questionnaires from the 206 students' and 20 teachers' questionnaires that were administered were returned; representing a 97% and 70% return rates for student and teacher respondents respectively. These ensured that the sample sizes remained as closely possible to the originally designed sizes as expected and thus representativeness of the target population.

4.2 Distribution of the Respondents by Sex

The student respondents were asked to indicate their sex. The distribution of the respondents by sex was such that 103 (53%) of the respondents were female while 91 (47%) were male students. The near equal representation of sex implied that there was a balance of information from the entire students' population thus generating findings that were largely representative of the target population.

4.3 Learners' Interaction with the Mobile Phones

The study sought to investigate how learners interacted with mobile phones. This section therefore, presents findings on the learners' access to mobile phones and the frequency of usage, the popular mobile phone features and the frequency of use among students.

4.3.1 Learners' Access to Mobile Phones and Frequency of Usage

The students were asked to indicate whether they had ever used mobile phones and, using a given frequency range with a class size of 9; indicate the frequency with which they used the phone on a daily basis (in making/receiving a call, messaging or both). The frequency of daily usage per location of school was as shown in Table 4.1.

Table 4.1 Frequency of Mobile Phone Usage per School and Location

Frequency of phone usage in day	School Location		Total
	Nakuru Municipality	Nakuru North	
Not at all	3.1%	11.5%	7.2%
1-10 times	36.7%	65.6%	51.0%
11-20 times	42.9%	14.6%	28.9%
21-30 times	13.3%	6.3%	9.8%
More than 30 times	4.1%	2.1%	3.1%
Total	**100.0%**	**100.0%**	**100.0%**

The findings in Table 4.1 show that highest percentage (43%) of the students in Nakuru Municipality accessed and utilized mobile phones 11-20 times compared to a majority of 66% of students in Nakuru North who accessed and used them 1-10 times each day. In Nakuru Municipality, another significant 37% of the students used the mobile phone 1-10 times. On average, 51% of the students used mobile phones 1-10 times compared to 7% who never used mobile phones.

Comparatively, more students in Nakuru Municipality used mobile phones more frequently than their counterparts in Nakuru North. In Nakuru Municipality, being an urban area, learners' access mobile phones more easily from various sources including friends, parents and relatives, with a good number of them equally being in possession of their own hand sets. Learners in Nakuru North District which is basically rural, have limited access to the phones given that very few are likely to be in ownership of hand

sets. Those who access from parents and relatives only do so under restrictions and more conservative nature of rural parents compared to the liberal urban parents.

Further analysis involved determining gender differences in learners' frequency of use of mobile phones. The study established that in both study locations, boys used the mobile phone more frequently than girls. For instance, in Nakuru Municipality, about 12% of the boys used the mobile phone more than 21 times in a day compared to only 6% of girls who reported similar frequency of mobile phone use. Cumulatively, 26% of the girls either did not use the mobile phone at all or used it 10 times and below compared with 14% of the boys with a similar frequency of use. In Nakuru North, a cumulative 6% of the boys used the mobile phone more than 21 times on a daily basis compared to 2% of girls with the same frequency of use while in the lower mobile phone usage categories, whereas a cumulative 44% of the girls used the devices 10 times or less in a day, 34% of the boys used the devices at the same frequency. Figure 4.1 shows the distribution of learners' frequency of mobile phone use by gender and location.

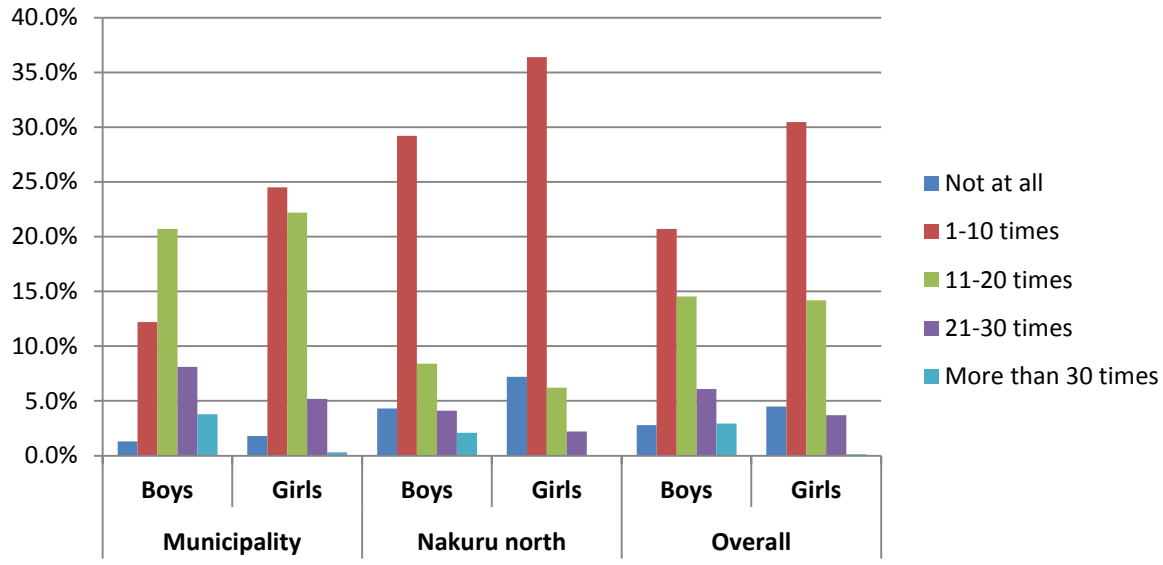

Figure 4.1: Distribution of Learners' Frequency of Mobile Phone Use by Gender and Location.

Overall, the findings revealed that boys used the mobile phone more frequently than girls as shown by the overall comparison across gender in Figure 4.1. The high frequency of mobile phone usage among boys compared to girls may be attributed to the gendered freedom of movement in the society which allows boys to freely move and thus gives them opportunities to access the mobile phone variously compared to girls whose gender roles restrict their movements.

4.3.2 Popular mobile phone features among learners

The learners were asked to indicate the features of the mobile phone they enjoyed using and the frequency with which they used the features. Ninety percent 90% of the students indicated that they enjoyed using the short message service (SMS); 77% facebook; 69% Google search while 39% enjoyed using twitter. The findings on the frequency of use of these features on a daily basis were as shown in Figure 4.2.

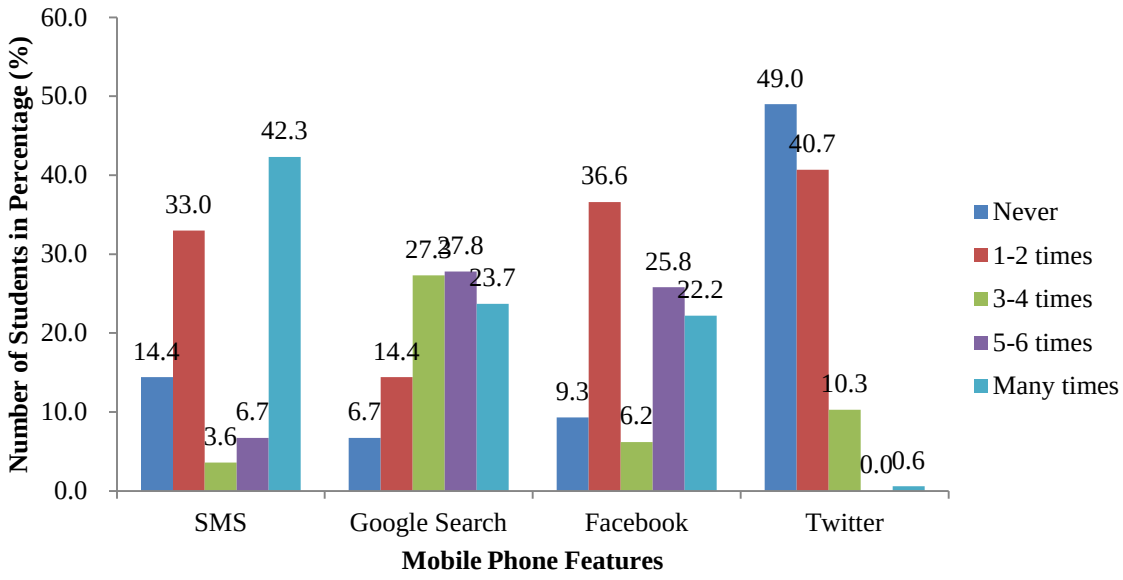

Figure 4.2: Frequency of using mobile phone features by learners

The findings indicate that the most frequently used feature by learners was the SMS with 42.3% of the respondents indicating that they used the feature many times while Twitter was the hardly used feature among the students. Usage of Google search was almost normally distributed across all the usage levels ranging from many times to never, though the highest percentage of 28% used it either 3-4 or 4-6 times a day. On the other hand, 37% of the students used facebook 1-2 times, with another significant 26% using it 5-6 times.

The SMS emerged as the most frequently used mobile phone feature probably due to its comparatively lower costs, which were associated with numerous short message service offers on the rates across the various mobile service providers. Most learners indicated that with as low as ten Kenya shillings, they could access unlimited short message service, making it more popular among the learners. On the other hand, Google search emerged as the second most frequently used as most learners indicated that it was the

reference point for all the other internet related services, that it was easier to assess other web pages including facebook through Google search engines. In addition, Google search was said to be a good source of academic information such as online dictionaries that saved learners' time as opposed to looking up for the required information from other printed materials such as the dictionary.

Facebook's popularity was linked to its ease of use and instant exchange of information as well as the fun derived from its usage compared to the SMS. The respondents also indicated that it was easier to post photographic materials which they would not only store safely but also share with friends on the network. Making friends was also another reason for preference for the facebook feature. Twitter was less popular, perhaps due to the nature of information exchanged through the service which is more of passage of important news than social issues that are common and popular among the learners.

From studies conducted, the findings show that learners use text messages through the SMS and social networking sites as well as use Google search machine to access the dictionary in the web over a network. In a research conducted by Amanda Lenhart senior research specialist, Pew Internet & American Life Project, the following findings were realized: cell phone texting has become preferred channel of basic communication between teens and friends. The mobile Phones have become indispensible tools in learners' communication pattern where 88% of cell phone users send text messages. This is a sharp rise from 51% "texter" in 2006 and more than 54% of learners are daily texter (Amanda, 2008).

Among all learners, their frequency of use of texting has now overtaken the frequency of every other communication form of interaction with their friends. Fully two thirds of teen texters say they are more likely to use their cell phones to text their friends than talk to them by cell phone. Teen texters ages 12 to 13 send and receive 20 text messages a day. Those between 14 to 17 years send and receive 60 text messages a day (Amanda, 2006). The findings of the current study thus agree with the prior research findings that SMS is the most preferred feature in the mobile phone.

4.4 Differences in Learners' Interaction with the Mobile Phone in Nakuru North District and Nakuru Municipality

The second objective of the study was to establish whether there were any significant differences in the learners' interaction with the mobile phones between Nakuru North District and Nakuru Municipality. Scores were assigned to the different frequencies of daily mobile phone usage, where a score of 0 was adopted for "not at all"; 1 – "1-10 times"; 2 – "11-20 times"; 3 – "21-30 times" and 4 – "more than 30 times". For the frequency of using the various features of the mobile phones, the scores were 0 - "not at all"; 1 – "1-2 times"; 2 – "3-4 times"; 3 – "5-6 times" and 4 – "many times". The mean scores for the learners' interaction levels with the mobile phones in Nakuru North District and Nakuru Municipality were computed by adding the respondents' scores in frequency of daily mobile usage to the frequency of each mobile phone feature used on a daily basis and compared to determine whether there were significant differences in the mean scores. Table 4.2 shows the comparison of means and standard deviations of learners' scores in the interaction with the mobile phone in Nakuru Municipality and Nakuru North District.

Table 4.2: Comparison of Means of learners' interaction with the mobile phone in Nakuru Municipality and Nakuru North District

School Location	Sample size	Mean	Std. Deviation
Nakuru Municipality	98	11.2143	2.97844
Nakuru North	96	8.8333	3.81318

The results received from the returned questionnaires indicate that the means and standard deviations (S.D) of learners' interaction with the mobile phones in Nakuru Municipality and Nakuru North District varied slightly, with a mean difference of 2.381. The use of the mobile phone in Nakuru Municipality was higher than that of Nakuru North district probably because of its urban location where electrical power is more available compared to Nakuru North district. A t-test was done to determine whether the differences in the means of learners' interaction with the mobile phone between Nakuru Municipality and Nakuru North District were statistically significant or not at 0.05 level of significance. The results were as shown in Table 4.3 below.

Table 4.3: T-test of the Means of Learners' Interaction with the Mobile Phone

School Location	Sample Size	Mean	S.D	t-Value	Df	p-Value
Nakuru Municipality	98	11.2143	2.97844	4.852	192	.000
Nakuru North	96	8.8333	3.81318			

The results indicated that the differences in learners' scores in interaction with the mobile phones between Nakuru Municipality and Nakuru North District were statistically significant since the p-value was less than 0.05 ($P<0.05$) with a t-value = 4.852 at 192

degrees of freedom thus 99.9% level of confidence. This implied that the learners in the two locations interacted with mobile phones differently, with those from Nakuru Municipality interacting with the phones more frequently than their counterparts in Nakuru North District. As earlier discussed, in Nakuru Municipality, being an urban area, learners' access mobile phones more frequently and easily since they have multiple sources including friends, parents and relatives. It is possible that a good number of the learners might be in possession of their own hand sets. On the other hand, learners in Nakuru North District which is basically rural, have limited access to the phones given that very few are likely to be in ownership of handsets hence their lower frequency of interaction with the mobile phones.

4.5 Influence of Mobile Phone on Learners Performance in English Grammar

The third objective of the study was to determine influence of the mobile phone on learners' performance in English Grammar. The students were given a Composition Essay Test (CET) which tested their skills in five areas of English grammar: sentence construction; spelling; punctuation; vocabulary use and layout of the write up. Composition Essay Test was an investigative test to gauge the influence of mobile phone on learners' five English grammar areas. The test was administered to the sampled learners from the two study locations with an aim to establish whether there were any differences in the learners' performance across the two locations. The CET was marked out of 20 points distributed as follows: 5 points each for good spelling, good use of punctuation and sentence construction; 3 points for vocabulary and expressions, 2 points for general layout of the essay. The scoring criteria were as follows:

(i) Every error made in spelling, punctuation and sentence construction resulted in a deduction of 1/2 point each per sentence at an average of 10 sentences.

(ii) For each use of vocabulary and expression, ½ a point was awarded thus use of six vocabulary or expressions.

(iii) For the use of a good handwriting, good paragraphing, good introduction and conclusion, ½ a point for each skill was earned by the student.

This section, therefore, presents the findings on the score range, means of the learners' scores in CET, analyzes and describes the possible influence of the mobile phone on the learners' performance in the test. The score range of learners in the CET from the two locations is presented on table 4.4.

Table 4.4: The Score Range of Learners in CET

Score Range	**Frequency**	
Marks	**Nakuru Municipality**	**Nakuru North**
1-5	29	32
6-10	57	58
11-15	10	5
16-20	2	1
TOTAL	**98**	**96**

The learners' score range in the CET shows that most learners' performance was below average in both locations; however the performance of learners in municipality was better

in quality grades which may be associated with their frequent interaction with the mobile phone.

Further analysis to determine gender differences in learners' performance in CET was conducted. The results from the comparison of means scores and standard deviations of girls and boys in CET were as shown in Table 4.5.

Table 4.5: Comparison of Means for Boys' and Girls' Performance in CET

	Gender	**Sample size**	**Mean**	**Std. Deviation**
Learners	Boys	91	7.7166	3.3846
performance in CET	Girls	103	7.5325	3.6515
Overall		**194**	**7.6246**	**3.5732**

The results indicated that the girls attained mean score of 7.72 with a standard deviation of 3.38 while boys attained a mean score of 3.65 at a standard deviation of 3.65. Girls performed better than boys in CET with a mean difference of 0.18. When these results are compared with the findings on the gendered frequency of mobile phone use, it could well be argued that on a general scale, use of the mobile phone negatively affected learners' performance in CET since the boys' mean score in CET fell below that of girls yet boys used the mobile phone more frequently that girls. However, this can only be verified if other variables that account for gender differences in performance are considered which was not within the scope of this study.

4.5.1 The Means of Learners' Performance in CET

The mean scores for the learners' results in CET were computed to establish whether there were any differences in learners' performance between Nakuru Municipality and Nakuru North. Table 4.6 shows the comparison of means of students' overall scores in CET.

Table 4.6: Comparison of Means of Learners' Performance in CET

	School Location	Sample size	Mean	Std. Deviation
Learners	Nakuru Municipality	98	9.0408	3.58668
performance in CET	Nakuru North	96	6.2083	3.23115

The findings in Table 4.6 show that generally, learner performance in CET was below average in relation to the total of 20 points in CET. The findings revealed that the means and standard deviations of learners' performance in CET varied considerably in the two study locations, with Nakuru Municipality leading with a mean of 9.04 while Nakuru North had a mean of 6.21, representing a mean difference of 2.83. A t-test was done to establish whether the differences in the means of learner performance in CET between the two study locations were statistically significant or not at 0.05 level of significance. The findings were as shown in Table 4.7.

Table 4.7: T-test of the Means of Learners' Performance in CET

School Location	Mean	S.D	Mean Diff	t-Value	Df	p-Value
Nakuru Municipality	9.0408	3.58668	2.83	5.775	192	.000
Nakuru North	6.2083	3.23115				

The findings indicated that the differences in learners' performance in CET between Nakuru Municipality and Nakuru North District were statistically significant with a t-value of 5.775, p = 0.000 at 192 degrees of freedom thus 99.9% confidence level.

4.5.2 The Means of Learners' Performance in Key Skill Areas of Grammar in CET

The means for each of the key skill areas of grammar in CET were computed and compared to determine whether there were differences in the scores of learners in the two study locations. Table 4.8 below shows the findings

Table 4.8: Means of Learners' Performance in Grammar skills

Key Grammar Skill Area	School Location	Sample Size	Mean	Std. Deviation
Sentence construction	Nakuru Municipality	98	1.90	.793
	Nakuru North	96	1.35	1.095
Spelling	Nakuru Municipality	98	2.12	1.695
	Nakuru North	96	2.29	1.436
Vocabulary	Nakuru Municipality	98	2.20	.405
	Nakuru North	96	0.21	.501
Punctuation	Nakuru Municipality	98	2.61	.83641
	Nakuru North	96	3.08	1.0406
Layout	Nakuru Municipality	98	1.08	.275
	Nakuru North	96	1.08	.278

The results indicate that the means and standard deviations (S.D) of learners' performance in four of the five key skill areas in grammar varied slightly in the two study locations. Generally, learners' performance in all skill areas was below average. While learners in Nakuru Municipality outperformed their counterparts in Nakuru North in sentence construction (mean of 1.9 against 1.35) and vocabulary (mean of 2.20 against 0.20), the later led in spelling (2.29 against 2.12) and punctuation (3.08 against 1.61). The two study locations tied at a mean of 1.08 in layout of the CET. Remarkable difference in means between the two locations was noted in vocabulary where Nakuru Municipality outshone Nakuru North with a mean difference of 1.99 which may be associated to frequent use of mobile phone through texting to friends whom they intend to impress with their prowess use of language. An independent samples t-test was done to determine whether the differences in the means of learners' performance in four of the five skill areas of English grammar in the two study locations were statistically significant. The findings were as shown in 4.9.

Table 4.9: T-test of the Means of Learners' Performance in Grammar Skills

Grammar Skill	School Location	Mean	Std. D	Mean Diff	t-Value	p-Value
Sentence construction	Nakuru Municipality	1.90	.79	0.54	3.967	.000
	Nakuru North	1.35	1.10			
Spelling	Nakuru Municipality	2.12	1.70	0.17	-.750	.454
	Nakuru North	2.29	1.44			
Vocabulary	Nakuru Municipality	2.20	.41	1.99	30.544	.000
	Nakuru North	0.21	.50			
Punctuation	Nakuru Municipality	2.61	.84	0.46	-3.180	.002
	Nakuru North	3.08	1.04			

The results indicated that the differences in learners' performance in sentence construction, vocabulary and punctuation between Nakuru Municipality and Nakuru North District were statistically significant since the corresponding p-values were less than 0.05 ($P<0.05$). On the other hand, the differences in learners' performance in spelling between the two study locations were not statistically significant with a p-value being greater than 0.05.

From Table 4.9, it can be deduced that in Nakuru Municipality where earlier sections of this study revealed a higher frequency of interaction with the mobile phone, the poor performance in spelling and punctuation may be attributed to the frequent interaction with the mobile phone, more so the frequent use of SMS service and facebook, which are associated with shortening of English words and dropping of punctuation marks. Below are examples of sentences with spelling mistakes as observed in learners' work:

1. "*We made alot of noise becoz we couldn't contain our happiness & excitement".* The correct version would have been: "We made a lot of noise because we couldn't contain our happiness and excitement. This is an influence of learners tend to write words as they pronounce them thus *a lot* and *becoz.*

2. *"*Faces *were ful of joy and happyness"* – the correct forms would be:"Faces were full of joy and happiness"or"Faces were full of joy and happy expressions". In this sentence the learner is in a hurry to write such that he/she has no time to check on spelling errors thus use of *ful* and *happiness.*

3. *"As the bus started moving we made alot of noise becoz we couldn't contain our happiness & excitement."* The sentence should read: "As the bus started moving, we

made a lot of noise because we could not contain our happiness and excitement. In the above sentence, the learner seems to be in a hurry to write the statement such that there is use of contracted form- *"couldn't"*, writing the words the way they are pronounced – *"a lot"* and using character "&" to save time. This kind of writing is a characteristic of SMS language.

4. *"I thot it couldn't hurt to touch it cause it was asleep or so I thot. On stretching my hand to touch it rose imedietly and bit it."* The correct version: "I thought it could not hurt to touch because it was asleep or so I thought. On stretching my hand to touch, it rose immediately and bit it." The sentence has omission of punctuation marks as shown in corrected version and it also has spelling mistakes as indicated above. The spelling problem might have been that the learner spelt the words in the way he/she pronounced them. This is typical of SMS writing as also noted in punctuation problems.

Sentences with punctuation mistakes were:

5. "*The trip we had to Masaai Mara was such a fabulous event that i could remember as if it were yesterday*". The correct form would be: "The trip we had to Masaai Mara was such a fabulous event that I could remember it as if it were yesterday." This sentence has a problem with capitalization where "i" is used instead of I.

6. *"On our way back we heard some weird noises from the bush."* The correct version should be: "On our way up the mountain, we heard some noises from the bush." The sentence has omission of comma after WAY.

7. *In a blink of an eye we had already arrived and were welcomed by a friendly guard.*

The correct version is: “In a blink of an eye, we had already arrived and were welcomed by a friendly guard.” The sentence has omission of a comma after EYE. Sentence 4, 5 and 6 have issues with punctuation marks which is typical of SMS language as the learners are always in a hurry to send as many messages as they can in the shortest time possible and to many friends as well.

Sentences that had punctuation and construction mistakes were:

8. “*We reached Lake Bogoria at 5:30 am on arrival at the gate we were told to buy eggs so that we could try and boil them using the hot springs*”. The corrected version should be: “We reached Lake Bogoria at 5:30 am and on arrival at the gate, we were told to buy eggs which we were to boil at the hot springs”. The sentence has a problem with punctuation mark a comma should have been placed just immediately after GATE. It also has a problem with sentence construction where conjunction AND should be placed between “a.m” and “on”.

9. *“On the day we were coming back i felt not to come back.”* The correct version is: “On the day we were to come back, I felt like I would not be back.” In this sentence, there is omission of punctuation after the word BACK and “i” instead of capital I. There is also has a problem with sentence construction as corrected above.

10. *“By the way it was a good trip because i saw lake Victoria and i was carried by the boat.”* The sentence should read: “By the way, the trip was good because I saw Lake Victoria and took a boat ride.” The sentence has a problem with punctuation as a comma should have been placed immediately after the word WAY. There is a problem with

capitalization as “l” in LAKE should be capital as Lake Victoria is a proper noun. The word *“carried”* may have been as a result of limited vocabulary.

In sentences 7, 8 and 9, the learners seem to be in a hurry to pass the message rather than punctuating the sentences correctly. Poor sentence construction might have been as a result of mother tongue interference.

In Nakuru North District, most of the grammatical mistakes were related to sentence constructions andsome spelling problemswhere sentence construction mistakes could be attributed to mother tongue influence but spelling mistakes, might have been as a result of SMS language. Sentences that have spelling mistakes:

1. *“When I was in harry without looking at where I was heading”*- the correct sentence would be: “When I was in a hurry, I didn’t even bother to check where I was going.” In this sentence the word hurry is misspelt probably because the learner was writing the word as pronounced a feature of SMS language.

2.“We had no brekfast that moning and so i left to join my frends.” The correct version should be: “We had no breakfast that morning and so I left to join my friends.” The sentence has spelling mistakes such as – *“brekfast”*, instead of BREAKFAST, “*moning”* instead of MORNING and “frends” instead of FRIENDS.

3. *“Laiter that evning my father took as 4 a treat in a nearby camping site.”* The sentence should read: “Later that evening, my father took us for a treat in a nearby camping site.” The sentence has a problem with punctuation as a comma is omitted after evening and there is also spelling problems such as – “laiter”, “evening” instead of LATER and

EVENING respectively. In the three sentences above, the learners seem to write the words the way they are pronounced; a characteristic of SMS language.

4. Sentence with punctuation and sentence construction problems was: *"A memorable trip I made was a trip to Nakuru town where we set 2 visits my aunt"*- The correct sentence is: "We made a memorable trip to Nakuru town where we had set off to visit my aunt." The use of numeral number 2 is normal a trait in SMS language as the learner is in a hurry to write as fast as possible.

6. "*Within the next 2 minutes we ready 4 the journey and the car engine roared living a cloud of dast behind."* The sentence should be: "Within the next two minutes, we were ready for the journey and the car engine roared leaving a cloud of dust behind." In this sentence the learner used SMS language by the use of numerals such as "2" and "4" as well as using wrong spelling such as "dast" instead of DUST. The wrong spelling might be that the learner was writing the words as pronounced.

7.*"After the check up I went to the bus stop 2 wait for the bus which was to take us 4 a trip."* There were problems with the spelling, punctuation and construction, hence the corrected sentence should be: "After the checkup, I went to wait for the bus which we were to use for the trip." The learner uses numerals, a feature which is frequently used in SMS language as well as omission of punctuation marks thus the influence of mobile phone usage.

8. *I took my breakfast and I weared my uniform then I took my bag and ran becoz I was late."* The sentence should have been: "I took my breakfast, wore my uniform and took my bag rushed out because I was already late." The sentence has a problem with spelling

and punctuation. The learner has a problem with punctuation as commas would have been used instead of conjunction AND but replace "*then"*with AND as illustrated above. The word *"weared"* might be limited knowledge on how irregular verbs change their tenses. The word "becoz" may have been the influence of SMS language.

9. "*At night my grandmother told us stories told during her age and as I retired to bed I looked forward to learning new things".* This sentence had problems with punctuation and vocabulary, thus poor construction. The correct sentence would be: "At night, my grandmother told us stories told to her during her childhood and as I retired to bed, I looked forward to learning new things." The vocabulary problem must have been the effect of mother tongue problem; however the omission of punctuation mark may have been the influence of mobile phone use.

From the analysis, it can be deduced that there is influence of mobile phone on learners' grammar in both rural and urban schools. However, some spelling and sentence construction problems noted from both locations might have been as a result of other factors such as mother tongue interference, limited vocabulary among others other than mobile phone influence.

A Pearson's Product Moment Correlation was calculated and used to determine whether there was a relationship between learners' total scores in learners' interaction with the mobile phones and the overall performance in CET. The findings were as shown in Table 4.10 below.

Table 4.10: Learners' Interaction with the Mobile Phones and Performance in CET

		Interaction with mobile phone	Learners Performance in CET
Interaction with mobile phone	Pearson (r)	1	.277**
	p-Value		.000
	Sample size	194	194
Learners Performance in CET	Pearson (r)	.277**	1
	p-Value	.000	
	Sample size	194	194

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

Overall, there was a significant positive relationship between learners' interaction with the mobile phones and their performance in CET (r=0.28, n=194, p=0.000). This implied that higher performance by Nakuru Municipality in CET was associated with frequent use of the mobile phones by the learners. However, a number of prior studies indicated that students who use text messaging on a frequent basis often use bad grammar, poor punctuation and improper abbreviation in academic writing. Teachers report that papers are being written with shortened words, improper capitalization, punctuation and characters like; &, $ and @. These mistakes are often unintentional as noted on Montana Hodge, a 16 year old high school student in Montclair New Jersey, who was accustomed to Instant messaging abbreviation that she often read past them. She said her ability to separate formal and informal English declined the more she used SMS (Lee, 2002).

4.6 Mobile Phone Features and Learners' Performance in English Grammar

The fourth objective of the study was to identify features of the mobile phone that may influence learners' performance in English grammar. The learners' scores in the frequency of use of the SMS, facebook, Google search and twitter were correlated with their corresponding scores in sentence construction, spelling, vocabulary, punctuation and layout of the CET using the Pearson's Product Moment Correlation (PPMC) analysis. The findings were as shown in Table 4.11.

The findings revealed that there were significant negative relationships between SMS use and learners performance in spelling (r= -0.325, p=0.000) and punctuation (r= -0.147, p=0.037), but significant positive relationships with vocabulary (r=0.336, p=0.000) and layout of the write up (r=0.179, p=0.013). There was a significant positive relationship between use of Google search and learners' scores in vocabulary (r=0.447, p=0.000), but the relationships between this mobile phone feature and learners' performance in the other skill areas of English grammar remained insignificant. On the other hand, use of facebook exhibited significant positive relationship with learners' scores in sentence construction (r=0.465, p=0.000), vocabulary (r=0.517, p=0.000) and layout (r=0.431, p=0.000) but a significant negative relationship with punctuation (r= -0.462, p=0.000).

Table 4.11: Mobile Phone Features and Learners' Performance in the Key Skill Areas of English Grammar

		Sentence construction	Spelling	Vocabulary	Punctuation	Layout
SMS	Pearson's (r)	.069	-.325**	.336**	-.147*	.179*
	p-Value	.341	.000	.000	.037	.013
	Sample size	194	194	194	194	194
Google Search	Pearson's (r)	.040	.058	.447**	-.036	.101
	p-Value	.579	.420	.000	.641	.161
	Sample size	194	194	194	194	194
Facebook	Pearson's (r)	.465**	.085	.517**	-.462**	.431**
	p-Value	.000	.497	.000	.000	.000
	Sample size	194	194	194	194	194
Twitter	Pearson's (r)	.142*	-.052	.263**	-.369**	.174*
	p-Value	.048	.471	.000	.000	.015
	Sample size	194	194	194	194	194

Correlation is significant at the 0.05 level (2-tailed).

The relationship between facebook use and learners' spelling scores was largely insignificant. Lastly, there were significant positive relationships between use of twitter and learners' performance in sentence construction (r=0.142, p=0.048), vocabulary (r=0.263, p=0.000) and layout (r=0.174, p=0.015). The relationship between use of twitter and learners' scores in punctuation was significant but negative, while that with spelling scores was insignificant. The findings imply that learners' skill in sentence

construction was positively associated with frequent use of facebook. Learners get to benefit from their friends' English grammar skills during conversations on social sites such as facebook. This encourages them to sharpen their skills as they borrow from their friends, reinforced by the need to also show their prowess in English grammar if they are to be respected by their peers.

Milrad and Spikol (2007) reveal that students indirectly increase their language arts skills by compressing information not by simply using typical text messaging, but by revising and editing sentences to express ideas more effectively, providing support that the use of cell phone technology can have a positive influence on student performance. Perhaps teachers of English could exploit this opportunity to encourage learners to constructively use such sites to better their writing. From the findings got from teachers, many confessed that each time they found use of SMS language in students work they corrected it and that if this could be accompanied with teaching SMS language in class, learners could use SMS language without any worry of it ruining learners' English grammar.

Use of SMS, facebook and twitter built learners' vocabulary hence their good scores in vocabulary. Cobb *et al.*, (2010) studied the use of texting during class lecture to allow students to pose questions and become part of the class discussions. Their findings revealed that 71% of the participants would like to see the use of text messaging again and that the results highlight the huge potential of the system. The authors suggest how this alternate form of classroom communication allows for empowerment of the student who would otherwise be feeling anxiety in the face of verbal communication within the classroom. Franklin (2011) points out mobile devices do increase the opportunity for student interaction through the use of text messages, Skype calls and constant email.

The significant negative relationships between use of SMS, facebook and twitter with learners' performance scores in punctuation implied that frequent use of these mobile phone features made learners to develop poor punctuation skills. Constant use of the SMS makes learners to perfect the habit of shortening their sentences which subsequently brings about spelling problems in English grammar as evidenced by the negative relationship between frequent use of the SMS and learners' scores in spelling. Although there were significant positive relationships between learners' scores in layout and use of SMS, facebook and twitter suggesting possible associations, these features have less to do with the learners' layout of CET write ups. Besides, learners' mean scores in layout in the two study locations were tied at 1.08 indicating that the learners followed the general guidelines as taught in class by the teachers of English language.

Further correlation analysis was done to determine the overall correlations between learners' performance in CET and the four features of the mobile phone. The correlations between the learners' performance in CET and the features of the mobile phone were as shown in Table 4.12.

Table 4.12: Correlation between Mobile Phone Features and Learners' Performance in CET

		SMS	**Google Search**	**Facebook**	**Twitter**
Learners	Pearson's (r)	.144*	.215**	.415**	.223**
performance	p-Value	.045	.003	.001	.002
in CET	Sample size	194	194	194	194

Correlation is significant at the 0.05 level (2-tailed).

The relationship between learners' performance in CET and features of the mobile phone is clearly discernible. The table shows that learners' performance in CET was positively correlated with usage of the SMS, Google search, facebook and twitter. This shows that frequent use of any of these features would lead to higher performance in the CET. The correlations were significant at $p<0.05$. The manner in which new information and communications technologies are being used suggests that children today are creating understandings and knowledge in new and different ways (Spires *et al.*, 2008). This new way of thinking and using information and communications technology is reflective of constructivism (Sandberg *et al.*, 2011). In a study of Japanese students, Gromik (2011) used the video feature of the cell phone as a tool for Japanese students learning English. The study revealed that students were able to improve their word output and be cognizant of time limits. Gromik concludes that this study does lend evidence to the use of the cell phone and its audio/video features as possible tools for use in the language development classroom. The use of such features in innovative ways such as this enables the student to develop a more thorough understanding of outcomes.

4.7 Teachers' Views on Mobile Phone Use among Students

The last objective is the teachers' opinion on the learners' use of mobile phone in relation to their performance in English grammar. The sampled teachers of English language were asked whether they believed that students' use of mobile phones influenced learners' grammar. Eighty six percent (86%) of the teachers interviewed acknowledged that the use of mobile phones affect learners' performance in English grammar both positively and negatively. 14% of them were not sure whether there is any such effect while none of the teachers interviewed refuted the effect of mobile phones on students'

performance. Those who argued for the positive influence commented that there are features of mobile phones that may enhance learners' grammar citing Google search that students can use to access web dictionary to improve learners' vocabulary. Some of them stated that although the use of SMS and facebook may influence the learners' grammar negatively because of the SMS language, the same (SMS and Facebook) can improve their writing skills if well guided. For teachers who argued that mobile phone influences learners' grammar negatively commented that most students have issues with punctuation marks and capitalization which are as a result of their frequent use of mobile phones. Further observation revealed that the following words are often found in learners work: *"pple""i", "thru", "bcoz"* and characters like *'@", "&",* among others. These findings, to a large extent concur with the findings of an unscientific poll conducted by Edutopia.org, where, out of 1028 respondents, 50% were of the view that texting was harming students' writing and grammar. 20% thought that text messaging could have some effect on students' writing; but did not consider it a major problem; while 27% felt it did not have any negative influence (Russell, 2010).

On a positive front, David Crystal, honorary professor of linguistics at the University of Wales, believes that sending frequent texts can actually help children to read and write because of the abbreviations used. People use them in new, playful and imaginative ways that benefit literacy (Leake, 2008). According to Crystal (2008), the brevity of the text style, and the 160 character constraint of an SMS, requires the author to write economically, inventively and playfully - doing this is good practice when learning to read and write. Wood, Plester and Bowyer (2008) concur that when texting, the children have the freedom to 'play' with the construction of language that they are learning about

at school, and are creative in their use of it. They also have regular engagement with it. Plester, Wood and Joshi (2009) believe that any engagement with the written word (as opposed to the spoken word) – including reading and writing textisms in digital form on mobile phones – is beneficial for children. Wood *et al.,* (2008) states that "children's use of this technology appears to have a positive impact on their developing literacy, as it provides children with an additional resource for learning about and experimenting with letter-sound correspondences and language, and for reading and 'decoding' text." They conclude that "If our children are showing difficulties with reading and spelling attainment, it would seem that this is in spite of the contribution of textism use, not because of it."

The findings got from the teachers revealed the teachers' attitude towards learners using mobile phones. They feel that the use of this device can improve learners' vocabulary as they access Google search. They also observed that features like SMS and Facebook which are their favorite sites can improve writing skills if well guided. However they observed that SMS and facebook can be blamed for the spelling and punctuation problems noted in learners' work.

4.7.1 Teachers' view on the Governments Ban on Mobile Phone Use

Mobile phone usage has been a concern of educator in Kenya in Kenya. In July 23rd 2008, Professor Sam Ongeri ordered a ban of mobile phones in Kenyan schools to curb unrests in schools following a wave of riots that hit schools across the country as reported by "People Daily", 23rd July; 2008.The ban was extended to national examinations as one of the Kenya National Council Examination rule. Mobile phones are, therefore not

allowed in public schools. The study was to establish through questionnaire to English language teachers whether they feel the ban is justified in connection with English grammar learning. The findings revealed that 64% were opposed to the ban asserting that mobile phone can be helpful to learners if monitored in vocabulary building through Google search and even facebook as they learn through friends during chats.29% were for it citing that learners grammar has been ruined through texting by use of SMS language; areas of concern were spelling and punctuation which they blamed on SMS 160 characters for each message while 7% were not sure because they probably felt it was a case beyond a debate as it was already a policy. The teachers' responses are as illustrated in Figure 4.3.

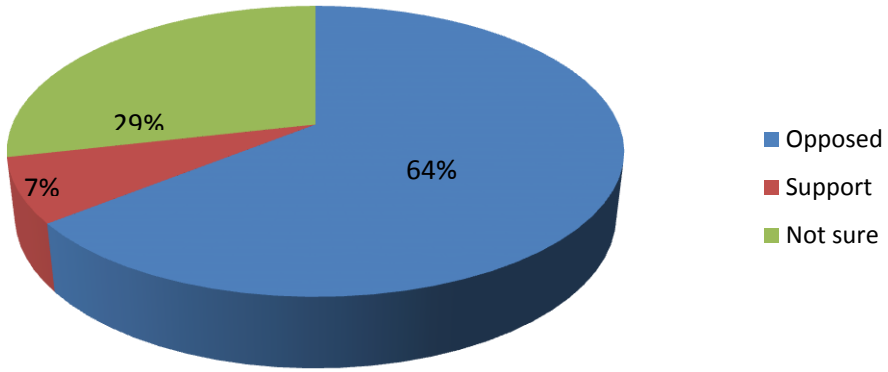

Figure 4.3: Teachers' Views on Learners, use of Mobile Phone

4.8 Chapter Summary

Under this chapter, the findings of the research study were presented. The chapter was introduced by describing the response rate and the characteristics of the student respondents who participated in the study with respect to their gender. The chapter was

preceded by presenting the main findings based on the five objective areas of the study, discussing the findings and linking the study's findings to the literature reviewed in Chapter two of the study. The objective areas under which the findings were organized included: determination of learners' interaction with the mobile phone, learners' performance in English grammar, influence of learners' use of the mobile phone on performance in English grammar and teachers' views on usage on teaching and learning of English language.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This is the last chapter of the paper in which the researcher has summarized all the main parts of the study with special emphasis on the research's main findings. In so doing, the major aspects of the research such as the research findings as per objectives, research methods, and the analysis of the collected data are revisited in order to make a comprehensive conclusion of the entire research process. This chapter ends with the researcher's recommendations that will serve in advancing the field of knowledge studied.

5.2 Summary of Findings

Objective one of the study was to establish how students interacted with mobile phones. The findings revealed that 43% of the students in Nakuru Municipality accessed and utilized mobile phones 11-20 times compared to a majority of 66% of students in Nakuru North who accessed and used them 1-10 times each day. A significant 37% of the students in Nakuru Municipality used the mobile phone 1-10 times. On average, 51% of the students used mobile phones 1-10 times compared to 7% who never used mobile phones. Comparatively, more students in Nakuru Municipality used mobile phones more frequently than their counterparts in Nakuru North. The most frequently used mobile phone feature was the SMS with (42.3%), while twitter was the hardly used feature among the students. Usage of Google search was almost normally distributed across all the usage levels ranging from many times to never, though the highest percentage of 28%

used it either 3-4 or 4-6 times a day. On the other hand, 37% of the students used facebook 1-2 times, with another significant 26% using it 5-6 times. On the gendered use of the mobile phone, the study established that boys used the mobile phone more frequently than girls. Consequently boys had a lower mean score in CET compared to girls, a performance that may proclaim its attribution to a higher interaction with the mobile phone among boys compared to girls but only if the influence of other variables that account for gender differences in performance in English are verified.

The second objective sought to determine whether there were significant differences in learners' interaction with mobile phones in Nakuru North and Nakuru Municipality. The study established that learners' interaction with the mobile phones in Nakuru North District and Nakuru Municipality varied slightly, with a mean difference of 2.381. The use of the mobile phone in Nakuru Municipality was higher than that of Nakuru North district. The differences in learners' interaction with the mobile phones between the two locations were statistically significant at $P<0.05$ with a t-value = 4.852 at 192 degrees of freedom thus 99.9 level of confidence, showing that learners in urban settings interact with the mobile phone frequently than those in rural settings.

The third objective was to examine the extent to which learners' performance is influenced by mobile phone usage. The study established that performance in CET was below average. Nakuru Municipality led in CET performance with a mean of 9.04 while Nakuru North had a mean of 6.21, representing a mean difference of 2.83. The differences in learners' performance in CET between the two districts were statistically significant with a t-value value of 5.775, $p = 0.000$ at 192 degrees of freedom thus 99.9 level of confidence. Learners in Nakuru Municipality outperformed their counterparts in

Nakuru North in sentence construction and vocabulary while the later led in spelling and punctuation. The biggest difference in means between the two locations was noted in vocabulary where Nakuru Municipality outshone Nakuru North's with a mean difference of 1.99. The differences in learners' performance in sentence construction, vocabulary and punctuation between Nakuru Municipality and Nakuru North District were statistically significant $P<0.05$. However, the differences in learners' performance in spelling between the two study locations were not statistically significant. Learners in Nakuru Municipality exhibited more problems in spelling and punctuation while in Nakuru North; most of the grammatical mistakes were related to sentence construction and some spelling mistakes. It may thus be argued that frequent usage of mobile phone enhances sentence construction but breeds more problems in spelling and punctuation among learners.

The fourth objective was to establish whether there are mobile phone features that may influence learners' performance in English grammar and the study established that the use of SMS negatively influenced learners' performance in spelling and punctuation but influenced vocabulary and layout positively. Use of Google search improved learners performance in vocabulary but had no significant influence on the other areas of grammar. On the other hand, use of facebook positively influenced learners' scores in sentence construction, vocabulary and layout but negatively affected punctuation. More so, use of facebook had no significant influence on learners' spelling scores. Lastly, use of twitter improved learners' scores in sentence construction, vocabulary and layout but had a negative relationship on learners' scores in punctuation.

The fifth objective set to examine teachers' perception on mobile phone usage in teaching and learning of English language. Eighty six percent (86%) of the teachers interviewed acknowledged that the use of mobile phones affect learners' performance in English grammar both positively and negatively. 14% of them were not sure whether there is any such effects while none of the teachers interviewed refuted the effect of mobile phones on students' performance. Those who argued for the positive influence commented that Google search can enhance learners, vocabulary by accessing web dictionary and that SMS and Facebook can be used to improve learners' writing skills because of their frequent exchange of SMS messages. Teachers who argued on its negative influences on learners' grammar, commented that most students have issues with spelling, punctuation marks and capitalization such that the following words are often found in learners work: *"pple""i", "thru", "bcoz"* and characters like *'@", "&",* among others.

5.3 Conclusions

Based on the findings of the study, the following conclusions can be made.

(i) Majority of learners have access to mobile phone and use them for a range of purposes. The most frequently used mobile phone feature was the SMS followed by facebook, while the least used feature by learners was twitter. Frequency of use of Google search was more or less normally distributed within the learners' population.

(ii) Learners from Nakuru Municipality access and use mobile phones more often than their counterparts at Nakuru North. The differences in learners' interaction with the mobile phones between the two locations were statistically significant at $P<0.05$ with a t-value = 4.852 at 192 degrees of freedom thus 99.9 level of confidence. Features

of the mobile phone that were used most by the learners were the SMS, Google search and facebook while Twitter was the least used.

(iii) The use of the various mobile phone features influence learners' performance in English grammar both positively and negatively. Generally, frequent access to the mobile phone correlates positively with learner performance in English grammar, as noted from the differences in learners' performance in CET which were statistically significant with a t-value of 5.775, p=0.000 at 192 degrees of freedom thus 99.9 level of confidence. Learners in Nakuru Municipality outperformed counterparts in Nakuru North as they frequently used mobile phones. Frequent access to mobile phone improves learners' sentence construction and vocabulary, while the seldom access to mobile phone was associated with the fewer mistakes in spelling and punctuation.

(iv) All the mobile phone features influence learners' performance in English vocabulary positively. Features that may improve learners' performance in sentence construction and layout are facebook and twitter. However, these same features (facebook and twitter) together with SMS affect learners' spelling and punctuation negatively if learners are not well guided. On the other hand, Google search only influences learners' vocabulary positively but has no significant influence on the other components of English grammar.

(v) Teachers observed that features such as Google search can be used to improve learners' grammar whereas SMS and Facebook can be used to enhance writing skill.

However, the teachers observed that SMS and Facebook if not well monitored, can result in poor punctuation and spelling as noted in learners' work.

5.4 Recommendations

The following recommendations were made based on the findings of the study:

1. The study has shown that most learners have access to mobile phone and use mobile phone features for a range of purposes. While such access and usage has its advantages, it is incumbent upon the stakeholders in the education sector especially school administrators and teachers of English to judiciously strike a balance between the positive and detrimental effects of such use and deliberately collaborate with parents to control the use of the mobile phone by learners to ensure that the standards of English language communication are not adversely affected.

2. The study has also shown that learners in urban areas interact with mobile phones more frequently than those in rural areas. Whereas one may be quick to conclude that the mobile phone influences performance in English grammar positively based on the findings of this study that showed learners in Nakuru Municipality (urban) outperforming those in Nakuru North (rural) in CET, it is important to consider performance in totality and direct all efforts towards discouraging this skewed conclusion, more so, discourage the use of the mobile phone among learners based on such an argument.

3. The findings revealed that there were significant negative relationships between SMS use and learners performance in spelling ($r= -0.325$, $p=0.000$) and punctuation ($r= -0.147$, $p=0.037$), but significant positive relationships with vocabulary ($r=0.336$,

p=0.000) and layout of the write up (r=0.179, p=0.013). There was a significant positive relationship between use of Google search and learners' scores in vocabulary (r=0.447, p=0.000), but the relationships between this mobile phone feature and learners' performance in the other skill areas of English grammar remained insignificant. On the other hand, use of facebook exhibited significant positive relationship with learners' scores in sentence construction (r=0.465, p=0.000), vocabulary (r=0.517, p=0.000) and layout (r=0.431, p=0.000) but a significant negative relationship with punctuation (r= -0.462, p=0.000).

4. Further, it is recommended that caution must be exercised in encouraging learners to use the mobile phone features that have shown significant positive effects on certain elements of English grammar. This is because of the varied effects where the mobile phone features affect some elements of English grammar positively while affecting other elements negatively. If use of these features is not checked, learners are likely to get used to them so that they may no longer realize the need for Standard English constructions even in their formal communication phenomena.
5. Teachers should educate students on the negative and positive effects of mobile phone use in respect to their academic performance. This educational venture will help learners to avoid the features with detrimental effects on their performance and instead concentrate on those that have potentials to boost their performance, whenever they get an opportunity to interact with mobile phones.
6. The curriculum developers should include topics on the SMS language in the curriculum to keep check on students' spellings, considering that most of the learners

from the municipality who had problems with spelling and punctuation had a relation to SMS usage.

7. Sites like You-Tube, WhatsApp among others should be ventured by teachers to aid in teaching speaking, reading, listening and writing by listening and making downloads of different songs and video clips.

5.5 Suggestions for Further Research

(i) The next study should try to categorize learners of different abilities, that is, higher, average and low achievers to investigate whether the level of achievement affects how learners use mobile phones.

(ii) The study was done in the two locations but further study can be done in other areas to investigate whether the same results will be realized or not.

(iii) An experimental research can also be carried out in the same area of study with a control and experimental group, where the former is taught in the traditional regular way, the latter using mobile phone technology.

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APPENDICES

Appendix I: Students' Introductory Letter

BOX 1027

NAKURU

Dear student,

I am a student at Kenyatta University pursuing Master in Education (Language Education). I intend to carry out a study on: "The influence of mobile phone technology on learners' English grammar in public day secondary schools."

Your help in filling in the questionnaire will be highly appreciated. All information will be treated with strict confidentiality, as the purpose of this study will be purely academic. You have the liberty to participate or not to since no negative action will be taken against you.

If you are ready to participate in the study, please confirm it by signing in the space provided.

Signature

Thank you in advance.

Yours faithfully,

Pamellah A. Okoth

Appendix II: Students' Questionnaire

The objectives of the study are to provide the researcher with information for purely academic

Purposes. The study is to establish the influence of mobile phone technology on learners' grammar in public secondary schools. I would like to ask for your honest response. All information provided by you will be kept strictly confidential.

Please do not put any name or any other form of identification. Thank you for your support.

Answer all questions as indicated either by ticking (√) or filling in the blank spaces.

SECTION A

Biographical Details

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

2. How old are you?

13-14 [ ] 15-16 [ ] 17-18 [ ] Above 18 [ ]

3. Is your school in urban [ ] or rural area [ ]

SECTION B

4. (i) What language do you use at home?

(a) English [ ] (b) Kiswahili [ ] (c) Mother Tongue [ ] (d) mixture (specify) [ ]

(ii) Which language do you use with your friends at school?

(a) English [ ] (b) Kiswahili [ ] (c) sheng [ ] (c) Mother Tongue

5. (i) Have you ever used mobile phone?

(a) No [ ] (b) Yes [ ]

(ii) If yes, through which means do you access a mobile phone?

(a) Parent's [ ] (b) friend's [ ] (c) personal [ ] (d) siblings' [ ]

(e) Others (specify) ----------

6. (i) How frequently do you use the phone on a daily basis?

Not at all [ ] (b) 1-10 times [ ] (c) 11-20 [ ] (d) 21-30 [ ] (e) others----------

----------specify.

(ii) When do you use the mobile phone most?

(a) Everyday [ ] (b) Weekends [ ] (c) Holiday [ ] (d) Not at all [ ]

7. (i) Which features in the mobile phone do you enjoy using?

Internet [ ]

Short message service (SMS) [ ]

Voice call [ ]

Social networks [ ]

Others ----------

(ii) Why do you enjoy the feature/s mentioned in (i) above?

(iii) How frequently do you use these features daily?

(a) The SMS: (a) 1-2 times (b) 3-4 (c) 5-6 (d) many times [ ]

(b) The Internet: (a) 1-2 [ ] (b) 3-4 [ ] (c) 5-6 [ ] (d) many times [ ]

(c) Facebook (a) 1-2 [ ] (b) 3-4 [ ] (c) 5-6 [ ] (d) many times [ ]

(d) The social network (twitter) (a) 1-2 [ ] (b) 3-4 [ ] (c) 5-6 [ ] (d) many times [ ]

(e) Are their features that you affect your English grammar?

Yes [ ] No [ ] Not Sure [ ]

8. (i) Are there features that have helped you with your English language?

(a) Yes [ ] (b) No [ ] (c) Not sure

(ii) If the answer is positive in (i) above show the features and area it has been of benefit

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Appendix III Teachers' Introductory Letter

BOX 1027

NAKURU

Dear teacher,

I am a student at Kenyatta University pursuing Master in Education (Language Education). I intend to carry out a study on: "The influence of mobile phone technology on learners' English grammar in public day secondary schools."

Your help in filling in the questionnaire will be highly appreciated. All information will be treated with strict confidentiality for the purpose of this study will be purely academic. Your participation is voluntary and should you feel like backing out, you are free to do so.

To confirm your participation please sign in the space provided

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Signature

Thank you in advance.

Yours faithfully,

Pamellah A. Okoth

Appendix IV: Teachers' Questionnaire

The objectives of the study are to provide the researcher with information on the influence of mobile phone technology on learners' spellings and grammar in public secondary schools. I would like to ask for your honest response. All information provided by you will be kept strictly confidential.

Please do not put any name or identification for this strictly for academic purposes. Thank you for your support.

Answer all the questions as indicated either by ticking (√) or filling in the blank spaces.

SECTION A

Biographical Details

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

2. How old are you? (a) 25-30 [ ] (b) 31-39 [ ] (c) 40-49 [ ] (~~d~~) 50-60 [ ]

3. Where is your school located?

SECTION B

5. (i) Do your students have mobile phones?

Yes [ ]

No [ ]

Not sure [ ]

(ii) Give details for your answer above.----------

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6. (i) Would you recommend learners to have mobile phone?

(a) Yes [ ] (b) No [ ] (c) Not sure [ ]

(ii) Give reasons for your answer in 6 (i) above.

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8. (i) Does the use of mobile phone technology affect learners' grammar?

(a) Yes (b) No (c) Not sure

(ii) Give reasons for your answer in (i) above

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9. (i) Which feature(s) of mobile phone can learners use to enhance their grammar?

SMS [ ]

Facebook [ ]

Google search [ ]

Twitter [ ]

Others [ ] specify ----------

(ii) Are there any of these feature(s) that can improve learners' grammar?

(Give brief description).

---

10. (i) Have you noticed any negative effects of mobile phone technology on learners' written work?

(a) Yes [ ] (b) No [ ] (c) Not sure [ ]

(ii) If yes, give details of the negative affects you have noted.

Appendix V: Students' Composition Essay Test

Write an essay of about 150 - 200 words.

Question

Describe a memorable trip you made to a friend.

Appendix VI: Composition Essay Test Marking Scheme

Scoring: 20mks

1. The test should consist of at least ten sentences whereby 1/2mk will be awarded per sentence for spelling, punctuation and sentence construction totaling to 5mks each.

2. For every vocabulary used, a score of 1/2mk will be awarded for a maximum of 6 vocabularies giving a total of 3mks.

3. Layout of the essay and neatness will score a total of 2mks whereby good paragraphing scores 1/2mk good paragraphing, 1/2mk tidiness, 1/2mk good introduction and 1/2mk good conclusion.

Bellow is how marks will be awarded per item;

5 marks for good spelling

5 marks for good use of punctuation

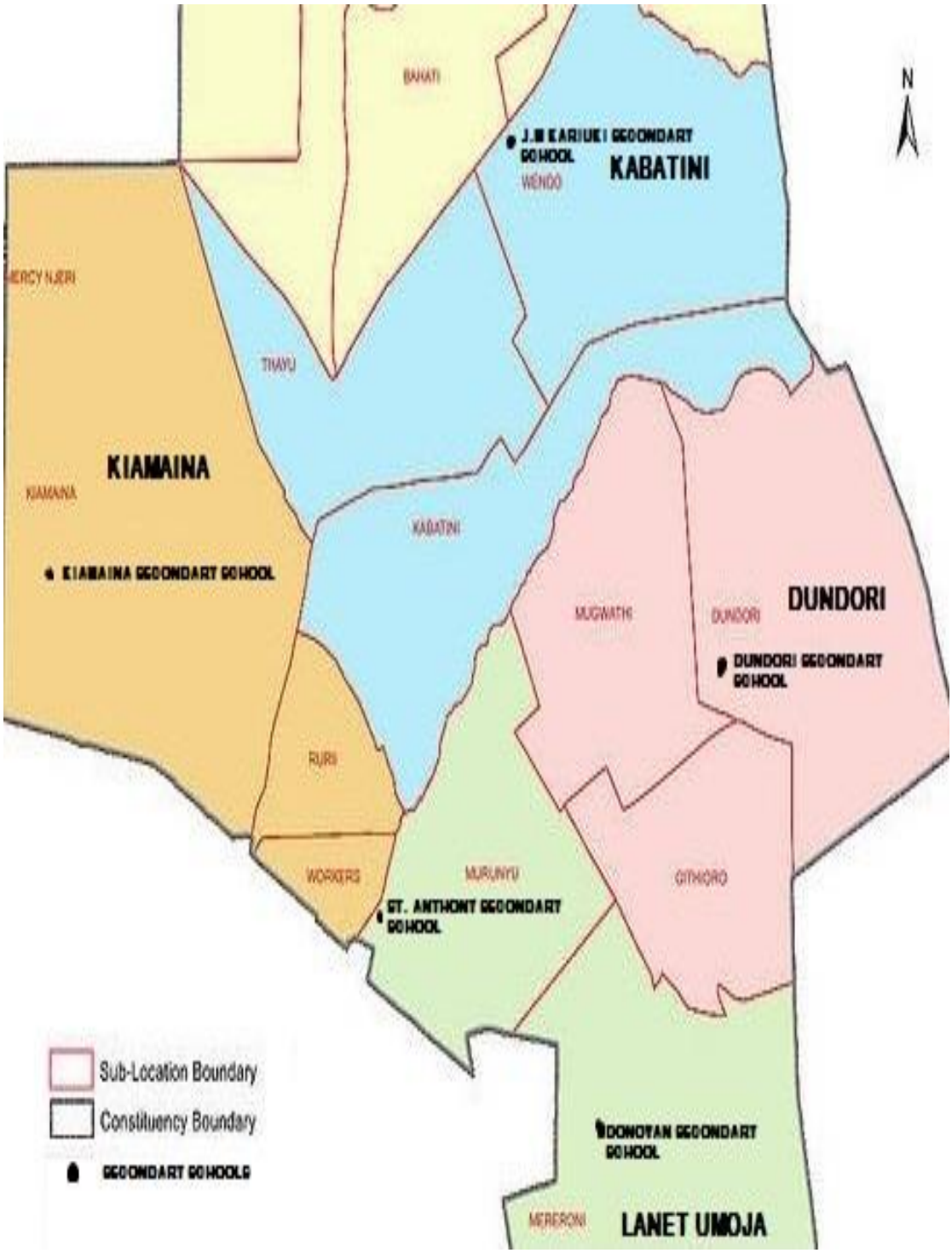
5 marks for sentence construction

3 vocabulary and expressions

2 Marks for general layout of the essay.

Total marks: 20 marks.

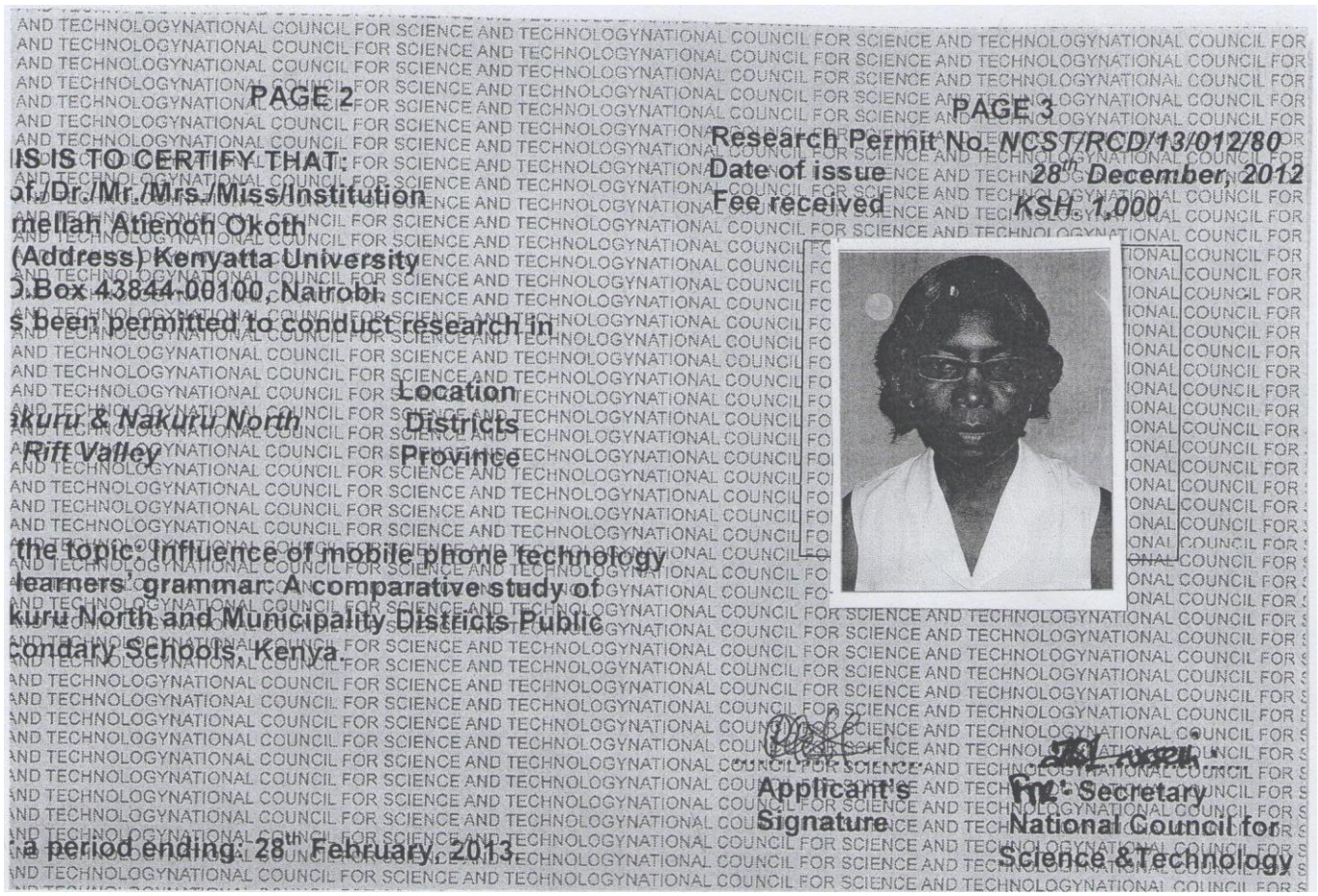
Appendix VII: Map of Nakuru North District



Appendix VIII: Nakuru Municipality

GOOGLE SATELLITE MAPS

Appendix IX: Permit for Research from NCST



PAGE 2

IS IS TO CERTIFY THAT:

of./Dr./Mr./Mrs./Miss/Institution

mellah Atienoh Okoth

(Address) Kenyatta University

O.Box 43844-00100, Nairobi

s been permitted to conduct research in

Location

kuru & Nakuru North

Districts

Rift Valley

Province

the topic: Influence of mobile phone technology

learners' grammar: A comparative study of

kuru North and Municipality Districts Public

condary Schools, Kenya.

a period ending: 28th February, 2013

PAGE 3

Research Permit No. NCST/RCD/13/012/80

Date of issue 28th December, 2012

Fee received KSH 1,000

Applicant's Signature

Secretary

National Council for Science &Technology