

**AN AUTOMATED INTERFACE DESIGN FOR STUDENT-PARENT
INTERACTION IN SECONDARY BOARDING SCHOOLS: A STUDY OF
SCHOOLS IN RACHUONYO SOUTH SUB-COUNTY, KENYA.**

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DECLARATION

Declaration by the candidate

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DEDICATION

This thesis is dedicated to my parents and my children Bruce and Candy.

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The process of researching and coming up with this system from the design and analysis phase to the implementation was tedious and time consuming but this was proven easy by the help of informative people and a considerable amount of effort from me. Foremost, I would like to thank God for my mental ability of comprehending issues and for the ample supplication of resources that enabled me to succeed in the system. Secondly, I would like to thank my project supervisor for the support and guidance he gave me during the project period. Thirdly, I would like to thank Rongo University for their support and role played in educating me in this field thereby making this dream a reality. Fourthly, my acknowledgements are stretched out to my classmates with whom we have always helped one another in one way or another. Finally, my gratitude also extends to my family for their support. They accorded me all the assistance necessary during the design phase of this project. To all those who helped me in the production of the system, I stretch out my gratitude to you all and may God bless you.

ABSTRACT

Ministry of Education banned the use of mobile phones by students in boarding schools without replacing it with a suitable interaction interface. This situation infringes on children's right to information, as delineated in the Convention on the Right of the Child which include the right to be heard and to be taken seriously, to free speech and information, and to maintain privacy. The situation has thus led to sneaking and illegal use of phones making students to incline towards accessing destructive pieces of information. There is need to find a suitable replacement to letter writing, and mobile phones in secondary boarding schools. The study aims at assessing student-parent interaction needs to come up with requirements interaction that would enable the development of a suitable interaction platform. The study objectives were: to examine existing students-parents interaction platform used in secondary boarding schools, to establish requirement for an automated interface design for student-parent interaction while in secondary boarding school, to design an automated interface for student-parent interaction while in secondary boarding school. The study was confined to public boarding secondary schools in Rachuonyo South Sub-County, in Kenya. A survey methodology and stratified sampling technique with sample size of 330 students, 178 parents and 8 teaching staff were used to come up with appropriate data for research. Cochran equation formula was used to determine the sample size. The data collected were descriptively and inferentially analyzed using SPSS and ms-excel applications. The findings from the data analysis and interpretation showed that bigger percentage of students use mobile phones to interact with their parents despite the ministry's ban. The administrators preferred an interaction interface that would filter destructive information while the students preferred a speedy and reliable interaction interface. Guided by research findings and studies on other successful student-parent interaction interfaces in other parts of the world, the researcher designed an interface in which each student had an account and logged in using log in credentials. Students' problems were categorized into three as per the research findings. The categories were social, academic and financial problems. Each category had a list of problems designed as a dropdown menu. The students select their problems from the menu which is sent to their parents' phone numbers as short messages. The interface administrator has to login to be able to register new students and deregister absent students by updating the students' and parents' Database. The administrators also update the problem menus to suite the student's need especially in addressing emerging issues. Based on these findings, the ministry of education and the school head teachers should allocate funds for provision of a special room in schools equipped with adequate computers. Each computer to be installed with interaction interface and the number should be enough to enable each student get an opportunity to interact with their parents. A teacher on duty should be charged with additional responsibility of guarding the room and supervising student-parent interaction process.

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LIST OF ABBREVIATIONS

ANSI	American National Standard Institute
API	Application Programming Interface
CCI	Common Interactions Interface
CRC	Convention on the Right of the Child
CSCW	Computer Supported Cooperative Work
CWE	Collaborative Working Environment
DB	Database
DBMS	Database Management System
EARCE	Educational Assessment and Resource Centres
EFA	Education for All
ERD	Entity Relationship Model
HCI	Human Computer Interaction
HIV	Human Immunodeficiency Virus
HL7	Health Level Seven
ICTSS	Interactions Technologies in Schools Survey
IPO	Input Process Output
ISO	International Organization for Standardization

ISPs	Internet Service Provider
ITSS	Interactions Technologies in Schools Survey
IWB	Interactive Whiteboard
NACOSTI	National Council of Science Technology and Innovations
OOAD	Object Oriented Analysis and Design
PACMAD	People at the Centre of Interaction interface Development
PDA	Personal Digital Assistants
R.O.K	Republic of Kenya
RDBMS	Relational Database Management System
SQL	Structured Query Language
SSL	Secure Socket Layer
STI	Sexually Transmitted Infections
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
URL	Uniform Resource Locator
UX	User Experience
VBSC	Visual Based Software Construction
WHO	World Health Organisation

CHAPTER ONE

INTRODUCTION

1.1 Overview

Effective interaction is important for development of any learning institution. It is the process by which meanings are understood and perceived. Parents and teachers tend to consider the importance of big talks, about significant topics with children but the ability to connect when it really matters is often based on the ability to connect when it doesn't. The way a parent or a teacher relates to a teenager in day to day life will make it easier or harder to sort out the key issues. Effective interaction bridges the gap between children in secondary boarding schools and their parents, giving parents easy time to address their children's problems' both when they are in schools and at home (Kidi, 2017).

Over the years, government of Kenya has purposely expanded the number of boarding schools in the country. This has enabled access to quality and relevant system of education and training. It has also offered opportunity to nearly all Kenyan children therefore ensuring equity. However the boarding schools have posed many challenges to the schools' administrators, parents and the schools' stakeholders. In 2018 the Kenyan private school association national secretary Mr Ochome urged the ministry of education to allow boards of management, parents, and teachers to discuss the underlying issues to be able to avert tension and unrest that was being experienced in many secondary boarding institutions in Kenya (Kejitan, 2017). According to Nyaundi (2018) most arson cases occurred in boarding schools followed by mixed boarding and

day schools. In 2018, the students unrest hit 32 counties in which 63 schools experienced riot and arsons targeting school dormitories and administration blocks.

The ministry of education has tried to address the challenges faced by secondary boarding schools by defining the problem and determining the cause with aim to offer a solution. On July 23rd 2008, the Kenyan government banned the use of cell phones by primary and secondary schools' children as a string of riots hit schools across the country, (Ouma, 2018). Kenya National Examinations Council Act (2012) also prohibited candidates from using mobile phones during examination period; this policy has only been partially implemented as it would completely cut off interaction between parents and their children in boarding school. Other options like letter writing are not very convenient especially in this error where people hardly visit post offices to check for letters. There is however no doubt that parents play a major role in supporting their children's learning. There should be a clear policy on student-parent interaction in boarding schools (Davies, 2011). Research was carried out to establish automated student-parent interactions requirements.

1.2 Background of the Study

Researcher employed information communication technology in designing an alternative suitable student-parent interaction interface to address the challenges faced by children in secondary boarding schools whenever they wanted to contact their parents. Information communication technology has become part of our everyday life. A study suggests that ICT is one of the fastest growing sectors on the African continent and has improved drastically over the past five years (Sylvain, 2013). In Kenya, information technology use, especially the cell phone use has seen a rapid diffusion, quadrupling between 1998 and 2001 from 0.42 cell phone subscribers per 100 Kenyans

to 1.73% (Meso et al., 2005). It's obvious, digital technology is inevitable it is ubiquitous feature for most people in this century.

Child protection act-Thailand (2003), UNCRC (1989) and Kenyan children act (2001) all declared to be committed to change the world to be a better place for children so that all young ones get the best possible start in life. The family, being the basic unit of society, should have the primary responsibility for the children and the children should have the right to freedom of association and peaceful assembly. In view of the foregoing discussion, this study defines a parent as one who natures and raises the child, and a child as every human being below the age of eighteen (UN, 1991).

Most guidance for services for children, like safeguarding and health care emphasize how important it is to listen to the wishes of the child. That is why, though it is illegal, schools' administrators still allow students to interact with their parents through cell phones. Currently the cell phones are the only available efficient means of student-parent interaction and teachers facilitate the interaction process because they are not in a position to solve all the students' problems. Some schools in Spain and Singapore use interaction interface systems like E-book system and classroom webpage in student-parent interaction (Lois, 2007).

The study was carried out in Rachuonyo South Sub-County, the county was purposely chosen because of recent spates of student unrest cases in the Sub-County. In the year 2016 Dudi girls' secondary school were on rampage protesting against the tight rules imposed on them by school administration and in 2017 Siany mixed secondary school also protested against the strict administration. Attempts to curb the unrest by education

stakeholders, the community and the government have not yielded much fruits (Nyanjagah, 2013).

Cases of examination irregularities are also reported each year in Rachuonyo South. In the year 2007 a school had the KCSE result of all its candidates cancelled because of exam irregularities, while in the year 2012 a school had been banned from being an examination centre because of continued cases of examination irregularities (Nyanjagah, 2013). The researcher examined the Kenya National Examinations Council act 2012. The act prohibits candidates from being in possession of a cell phone in the examination room or centre without lawful authority. Such offence is punishable by disqualifying the candidate from taking the entire examination and if the candidate had already taken a paper at the examination, the paper is cancelled. The secondary public boarding schools therefore need a suitable alternative to cell phones, thus there was a need for the researcher to design and develop a suitable automated student-parent interaction interface which offers reliable, timely and accurate interaction between parents and students while in secondary boarding schools.

Suitability of an interface is its ability to meet the user's need. If a product fails suitability test, then it does not offer the features and functions required by the user. The suitability of a product becomes superfluous as it enables the users achieve their goals (Nielsen, 2013). Likewise, the International Organization for Standardization (ISO) defines interface suitability as the extent to which an interface can be used to achieve specified goals with satisfaction, efficiency effectiveness, and in a specified context of use. A suitable student-parent interaction interface should promote a safe environment at school and help students make good decisions.

1.3 Statement of Problem

Poor performance of students in boarding schools is attributed to inability by parents to supervise them. This has also led to indiscipline cases witnessed in schools in Rachuonyo South (Ayal, 2017). In the year 2016 Dudi girls' secondary school were on rampage protesting against the tight rules imposed on them by school administration and in 2017 Siany mixed secondary school also protested against the strict administration. WHO (2009) suggests that depressed children, are more likely to engage in indiscipline cases, the study showed that youth reporting higher levels of impaired interaction and lower levels of parental monitoring were more likely to anticipate future risk behaviour. When young people feel unconnected to home, they may be involved in activities that put their health at risk. However, when parents affirm the value of their children, the youths more often develop positive and healthy attitudes about themselves this help them make healthy decisions in life (Lawrence, 2004).

Parents are not able to supervise their children in secondary boarding schools because there seems to be lack of a suitable student-parent interaction platform, the current interaction interfaces like E-home book system, classroom webpage and mobile phones used in secondary boarding schools are only suitable for teacher-parent interaction. The mobile phones may be suitable for student-parent interaction but they expose the children to destructive information as it is very hard to monitor whom the children are interacting with and the kind of information exchanged between the two. The mobile phones also have limited control feature such that one student may use it too frequently and for a longer period denying other children the chance to use it. E-mail and letters are not efficient because the feedback is not immediate.

1.4 General Objectives

The study aims at surveying student-parents interaction needs to come up with requirements for interaction that would enable the design of a suitable student-parent interaction platform.

1.5 Specific Objectives

The study was guided by the following objectives:

- i. To examine existing students-parents interaction platform used in secondary boarding schools,
- ii. To establish requirement for an automated interface design for student-parent interaction while in secondary boarding school.
- iii. To design an automated interface for student-parent interaction while in secondary boarding school.

1.6 Research Questions

This study was guided by the following research questions:

- i. Which are some of the student-parent interaction platform used in public secondary boarding schools?
- ii. Which are some of the requirements for a suitable student-parent interaction platform in secondary boarding schools?
- iii. What interaction interface design model would best address the needs of the Secondary boarding students?

1.7 Assumptions

The study was guided by assumptions that any message with irrelevant pieces of information is destructive and should be barred from reaching the intended destination; both the student and the parent may send irrelevant pieces of information. It was further assumed that one way communication would be effective as it would enable the students to give factual information, manipulate and gain their parent's cooperation.

1.8 Delimitation of the Study

This study was confined to public boarding schools in Rachuonyo South Sub-County, Kenya. The sample sizes consisted of 200 students and 8 teachers selected from various schools. The researcher examined the problems that the students faced as they used available student-parent interaction methods and made appropriate recommendation that would help in designing a suitable student-parent interaction interface. The study was limited to designing a suitable automated student-parent interaction interface for public boarding secondary schools in Kenya. The study data was collected on user requirement for a suitable student-parent interaction interface. The collection was based on the study objective and a sample size of 330 students, 178 parents and 8 teachers.

1.9 Operational Definitions of Key Terms

Application software: it is a program that is designed to perform a group of co-ordinated functions, tasks or activities for the benefit of the student.

Automated: The interface completes a number of different tasks requested by the students and automatically posts the result.

Boarding school: It is a school where pupils live and study together during the school year supervised by their teachers.

Child: Every human being below the age of eighteen.

Destructors: These are counter-productive and self-defeating habits which deny student happiness but can instead cause pain.

Error free: Message without irrelevant information.

Errors: Any information deemed irrelevant to the students and parents.

Interaction: It is a mutual or reciprocal deed. It means engaging in any kind of action that involves the parent and student.

Interface: An interface is a program that enables a student communicate with a computer

Minimalist design: An interface design that has functions that best serve interaction between students and their parents.

Parent: This refers to a father or mother who raises a child. He could be a guardian or a relative who plays the role of a parent to a student in a boarding school.

Peaceful assembly: the right to hold public meetings and associations without interference by the government.

Public school: a free tax supported school controlled by a local governmental authority

Radicalization: is a process by which a boarding school student comes to adopt increasingly extreme political, social, or religious ideals and aspirations that reject or undermine the status quo of contemporary ideas and expressions of freedom of choice.

Secondary school: it is a school intermediate between elementary school and college and usually offers general technical, vocational, or college preparatory courses.

Software optimization: it is the process of modifying a web application software system to make student- parent interaction process more reliable, accurate and timely.

Student: this is a person formally engaged in learning, one enrolled in secondary boarding school.

Stranger: a person who is neither a family member nor a guardian to the student.

User interface: it is a device or a program enabling a student to interact with the computer.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The researcher assessed the current state of research on student-parent interaction in secondary boarding schools by studying the previous research on this area of study. This chapter is divided into three major parts, the Theoretical Framework, Literature Review and Conceptual framework. The Theoretical Framework explains the theory on which the study was based. In the Literature Review, the researcher looked at previous studies related to or different from the themes of current study as derived from the objectives and research questions. The study examined literature on the existing students-parents interaction interfaces used in secondary boarding schools, how they are used, and why they are necessary. The study also reviews literature on the suitable functional requirements for automated students-parent interaction interfaces used in secondary boarding schools, their benefit and shortcoming.

According to Venners (2006), an interface is a point of interaction between entities. An operating system always interfaces with different pieces of computer hardware. Applications programs may interact with operating system via streams. Object oriented programs allow objects within an application program to interact via many methods. The researcher ensured that the interface design prohibits automatic access to all computer resources by default but allowed access only through well-defined entry point, the student-parent interaction interface. The student-parent interaction Interface software enabled access to computer resources such as storage, memory, and Central Processing Unit as there would be major ramifications due to direct access to such

resources by software, sometimes even very disastrous for functionality and stability of the computer resources.

2.1.1 Characteristics of Successful User Interfaces

Clarity is a useful aspect of successful user interface though it should not be overdone. Any addition of definitions and explanations result to mass growth of the interface. Too many explanations may make the students spend too much time reading through the interface. The instructions on the interaction interface should be clear and concise (Fadeyev, 2009).

According to Tylor (2000), familiarity is something which resembles something else one has encountered before. The researcher identified terms and styles which are familiar to secondary boarding school students. Many students have used windows therefore they are familiar with a drop down menu designed on the interface's top bar, they also understand terms like "OK", "EXIT". These and others were integrated into student-parent interaction interface to enhance its friendliness.

A successful user interface must be responsive; it should provide some form of feedback. The interface should constantly interact with the student informing them about what is happening. For example, the send button in the students-parents interaction interface if pressed should display that the message has been sent (Jarrett et al., 2003).

Aesthetics should be applied in the interface design but should be used in moderation to reinforce function. The researcher added some colour with a few font styles and ensured that graphics, colours and fonts were in harmony with each other. In reference to Google homepage, the researcher avoided loading the student-parent interaction

interface with superfluous eye-candy but focused on function over form. The Google spent time polishing the Chrome user interface elements like buttons and icons to make them look just as right as evidenced by the subtle gradients and pixel thin highlight (Czaja, 2004).

According to Matt (2009) the interface should be forgiving. Nobody is perfect, and the students are likely to make mistakes during interaction with the interface. The interaction interface should be able to identify an error and alert the student and even give suggestions on how the error can be corrected. A forgiving interface may save the students from costly mistakes.

2.2 Existing Student-Parent Interaction Platforms in other Parts of the World

From the Study carried out to establish the existing student-parent interaction platforms in other parts of the world, The researcher discovered the following platforms; classroom web page, collaborative Apps, BuzzMob, The Teacher App & Grade Book, Collaborize Classroom and Reminder 101.

2.2.1 Classroom Web Page

The study borrows from the classroom webpage which has been a success in Spain and Singapore. According to Candler (2010), using a classroom webpage can allow the learning process to take place anytime and anywhere. Students can access class notes and curricular resources even when they are at home. Parents and students can see what is being taught during the year. This can help the parents monitor their children's progress and find out in case there is a problem. Figure 2.1 shows a sample of the classroom web page application.

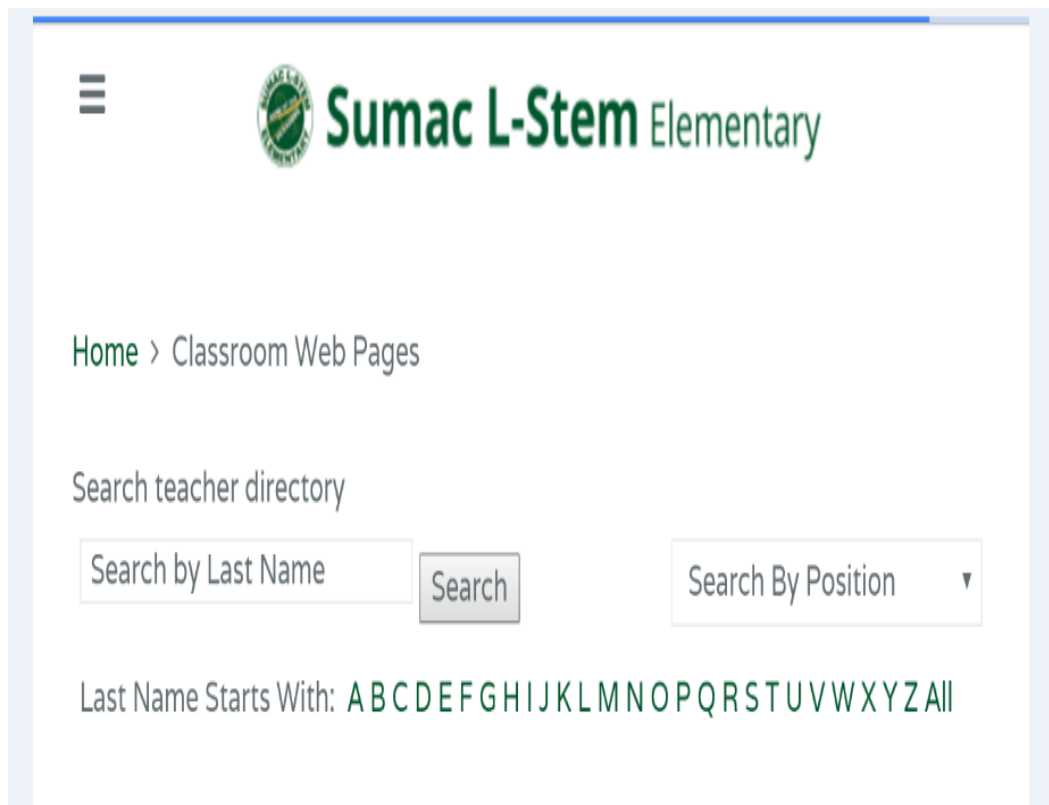


Figure 2.1 sample of classroom webpage

(Source: Adopted from Candler, 2010)

Students and parents search for information posted by the classroom teacher by typing the teacher's name in the search box then clicking search button. The information is mainly on student's academic progress. The classroom webpage could be a suitable student-parent interaction method because the interaction strictly involves the students, teachers and parents and being a public media, members only post constructive pieces of information. The major shortcoming is that the discussion is limited to student's academic progress only and one cannot discuss their private issues in the platform as it will be made public.

2.2.2 Collaborative Apps

Collaborative software or groupware is application software designed to help people involved in a common task to achieve their goals. One of the earliest definitions of collaborative software is intentional group processes plus software to support them. Collaborative software is a broad concept that overlaps considerably with computer-supported cooperative work (CSCW). According to Carstensen and Schmidt (2016), groupware is part of CSCW. The authors claim that CSCW and thereby groupware, addresses how collaborative activities and their coordination can be supported by means of computer systems. Software products such as e-mail, calendaring, text chat, wiki, book marking and whatsApp belong to this category whenever used for group work whereas the more general term social software, applies to systems used outside the workplace. Such as example, online dating services and social networking sites like Twitter and book. The use of collaborative software in the work space creates a collaborative working environment (CWE).

Collaborative software relates to the notion of collaborative work systems, which are conceived as any form of human organization that emerges any time that collaboration takes place, whether it is formal or informal; intentional or unintentional. Whereas the groupware or collaborative software pertains to the technological elements of computer-supported cooperative work: collaborative work systems become a useful analytical tool to understand the behavioural and organizational variables that are associated to the broader concept of CSCW. The collaborative software limits interaction to teachers and parents only and cannot help much in case the student wants to interact with the parent.

According to Vose (2015), some schools use the free location-based social media application as a parental collaboration tool. Parents download the application to their

phones. A number of teachers use the free online and mobile applications to interact with the busy parents who always want to know their children's progress. Collaborative application took off some of the burden from the instructor who would, otherwise, have to create one-way communication channels like e-mail or paper-based newsletters.

2.2.3 BuzzMob

BuzzMob is a cross-platform communication tool that connects and engages classroom and school communities. It offers educators the simplest, most effective way to send vital updates and semi-personal messages to parents and students. BuzzMob allows teachers and school administrators to create updates and messages in one simple place and parent and students can choose to receive communication via web, mobile application, e-mail, or short messages. BuzzMob saves teachers time and energy and provides parents and students with a simple, secure, experience that keeps them updated and engaged. This application enables parents and teachers to connect on a private network that requires authorization before a user can see updates. Ease of use is an advantage of the new collaboration method, where student performance is displayed in the phones correctly. BuzzMob allows parents have updates on school issues; it informs parents on their children performance plus school functions like closing and opening (Boaz, 2015). This application may not suitable for students in secondary schools in Kenya as it will require them to have mobile phones.

2.2.4 The Teacher App & Grade Book.

The Teacher App and Grade Book tool helps enhance collaboration between teachers, parents, students, and schools using parent messaging, an interactive calendar, event notification and course grade notifications. Parents can check grades, review attendance records, submit absentee letters, and stay on top of upcoming events with the app's

calendar. The goal of the teacher app and grade book is to increase parental involvement in the classroom. Research has proven that increased parental involvement in matters related to student education, increases students' motivation, test scores and individual school performance. Teacher app and grade book offer individual user interfaces for teachers, parents and students. Each user interface has its own unique features including grade book, school messenger system, student, parent messaging interactive class calendar events, course grades, assignment grades and notes sent assignment attendance records and absentee notices (Mackin, 2015). The application however does not offer private platform for the student- parent interaction, this is a set back as the students are not able to discuss their personal issues.

2.2.5 Collaborize Classroom.

According to Naditz (2015), the increasing use of the web in schools is allowing teachers and students go beyond the boundaries of the physical classroom instead it involve online collaborative learning engagement. Collaborize classroom is one such online collaborative platform that focuses on collaborative elements such as structured online discussions between students, online brain storming, peer feedback and online surveys. It also assists the teacher in monitoring and encouraging students in terms of their participation. At Bella Vista High School in Fair Oaks, California in United States of America, teachers use this education focused app to set up a closed network where a parent can discuss topics, trends, and student progress. The structured online discussion platform lets one extend the classroom discussion outside the normal school hours and engage with parents who want to be kept in informed on how their children are faring on in class. Teachers post links to articles and videos, upload links, set up discussion threads, and field questions in a closed, safe environment that is only accessible to

registered members. This application may not be suitable for student in secondary boarding schools in Kenya as it would require them to acquire mobile phones. It does not offer private platform but only engage members on academic issues

2.2.6 Remind 101.

According to Edward (2018), Remind 101 is a private mobile messaging platform that enables teachers, parents, students and administrators in schools to communicate with each. The platform has more than 20 million monthly active users across the United States of America as of September, 2016. Remind 101 is used in more than 50% of the public schools in the USA. The app lets teachers create an account that parents can join by sending a text message. Because they can message their entire classes and or parents quickly from their mobile phones, teachers are able to stay in contact on the fly and collaborate with parents without having to pick up the phone or send out an e-mail. Because it accommodates more than a million active members, the platform may not be safe for the secondary boarding schools students in Kenya; it may expose them to drug traffickers, arsonists and destructive relationships.

2.3 Existing Student-Parent Interaction Platforms in Kenya

According to Omwami (2013), most boarding schools in Kenya, provide a cell phone for the students to call their parents. There is stipulated time for the mobile phone use and the personnel in charge of it. Unfortunately, some of the schools still have no clear policy on student – parent interaction, in some of them, students beg for phones from anybody found within the school compound. The situation is worsened in some schools, where student-parent communication is restricted until that time that they break for home at the end of the term. According to the study, some students in some of these

boarding schools still use letters to interact with their parents; the letters are given to strangers some of which are matatu conductors for delivery.

2.4 A Suitable Student-Parent Interaction Interface

The researcher tried to establish the necessary requirement for a suitable student-parent interaction interface by looking into the following areas; Database Design, type of data to be stored in the student-parent database, Data Relationship, Logically structuring Data, Entity relationship, Normalization, Schema Refinement, and physical Design.

2.4.1 Database Design

The suitability of Database design is paramount in any interaction process. A Database design is a blue print or a model of a Database. The students' Database should be organised by collecting structured and related data items and storing them in a computer or electronic device whose accessibility is controlled. The data model should bear all the necessary physical and logical design and physical storage needed to create a Database (Gehan, 2006).

Database design is a logical design of Database structures for storing data. Various Database models were studied and the design settled on relational Database. The Database model provides the students with simple operations to manipulate data in the Database and retrieve it. It establishes defined relationships between tables thus giving the students a complete picture of the data store. The model also provides an excellent students' data security. In this model, Database structures are tables and views and Database design involves the construction of queries based on data structures and forms used as part of the overall Database application within the Database management system. The researcher looked at the relationships between the different data elements

to determine the data to be stored in the Database, and also superimpose a logical structure upon the data on the basis of these relationships (Hernandez, 2013).

2.4.1.1 Type of Data Stored in a Database

According to Hernandez (2013), the data to be stored in the Database must be consistent and in line with the research findings. A Database is a collection of data stored in a computer system in an organised manner for easy retrieval of the data items. The Database designer should be equipped with a skill which can enable them elicit the needed information from those with the domain knowledge. Data gathering process should be guided by requirement specification. Usually, the data should be sourced from people with the necessary domain knowledge, though sometimes such people may not express clearly what their requirements for the Database are as they are unaccustomed to thinking in terms of the discrete data elements which must be stored, the designer should be able to compare the requirement analysis with design process to be able to design a Database which is easily processed and which can generate a useful report.

2.4.1.2 Data Relationships

Researcher should create a meaningful relationship between the data in different tables. Once a Database designer is aware of the data which is to be stored within the Database, they must then determine which dependency is within the data so as to be able to establish a relationship. A relationship is an association between two or more tables of Database records. The designer should be able to identify the candidate keys. Primary key is a type of candidate key that is usually in the first column in a table. The foreign key is another candidate key used to link a record to data in another table (Light, 2007).

2.4.1.3 Logically Structuring Data

According to Gehan (2006), after successful formation of relationship and among tables, data should be arranged into a logical structure which can then be mapped into the storage objects supported by the Database management system. In the case of relational Databases the Database is designed with minimum redundancy and maximum flexibility of data access. Storage objects are tables which store data in rows and columns. Object oriented Database is a complete program built to hold properties and behaviour. Each object does its own work, processes its own data and defines its properties. The storage objects correspond directly to the objects used by the Object-oriented programming language used to write the applications that will manage and access the data. The relationships may be defined as attributes of the object classes involved or as methods that operate on the object classes. According to Hernandez (2013), each set of related data which depends upon a single object, should be placed in a table. Relationships between the dependent objects should then be stored as links between the various objects. Each table should be designed to represent an implementation of either a logical object or relationships between tables which should be stored as links connecting child's tables with parent's table.

2.4.2 Entity-Relationship Model

Database is absolutely an integral part of software system. An ER diagram provides a means for communication and it helps to design Databases in an efficient way. Entities are rendered as points, polygons, circles, or ovals. Relationships are portrayed as a type of structural diagram for use in Database design. Entity refers to business objects like people and their role, students and their role, among others. ER model is a valuable tool

that helps in concept visualization, design, optimization, and debugging of Database programs (Nadeau, 2005). Figure 2.2 is a typical Entity Relation design

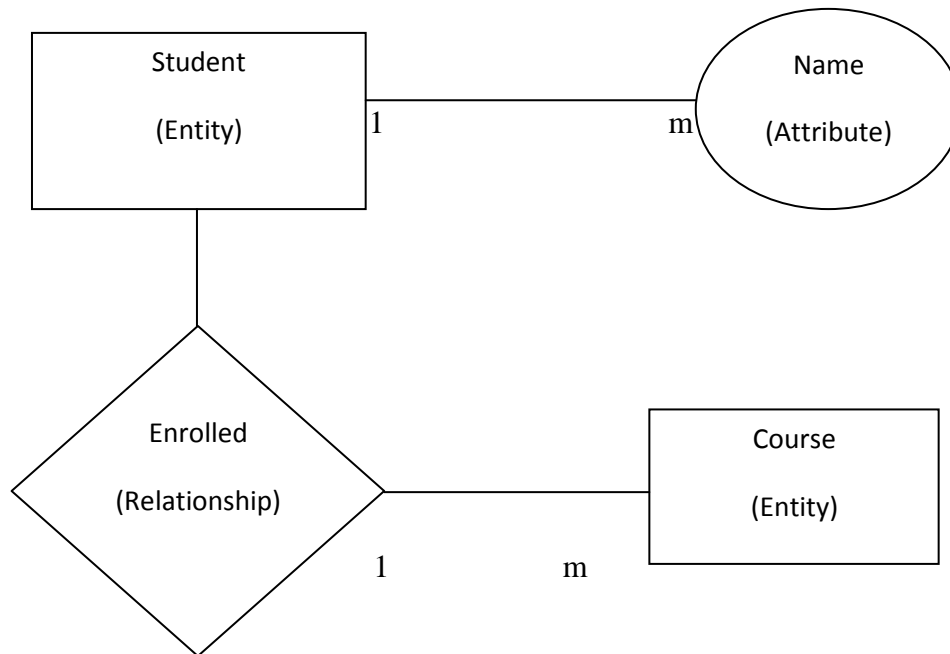


Figure 2.2 Entity Relation diagram

(Source: Adopted from Nadeau, 2005)

In a student database, entities are objects such as course and student. An entity is defined by means of its characteristics or properties, called attributes such as name in the figure above. Relationships are the equivalent of verbs or associations and it signifies that entities are associated to each other, for example, a student may enrol for a course which means that the student is related to the course. A relationship is defined according to the number of entities associated with it which is known as the degree

2.4.2.1 Normalization

According to Dete (1999), normalization is a systematic design which organizes tables in a manner that reduces redundancy and dependency. The students' database structure should be suitable for general-purpose querying and free of certain undesirable

characteristics insertion, update, and deletion anomalies that could lead to loss of data integrity. The students' database should have a fully normalized design by dividing larger tables into smaller ones in a manner that reduces redundancy and dependency of data and eliminating anomalies like insertion update and deletion.

2.4.2.2 Schema Refinement

According to Kent (2000) schema refinement entails normalization to reduce data conflicts and insufficiency. The researcher studied ANSI Architecture which outlines three schema approaches: the internal schema, external schema and conceptual schema. Internal schema is the view of data and involves data management technology. The external schema should reflect an individual student's view of the data, and conceptual schema is the integration of a set of external schemas. Internal schema has two distinct parts: the logical schema and physical schema. Logical schemas should describe the student's data in terms of relational tables and columns, object-oriented classes, and XML tags (Artima, 2011).

A conceptual schema is a map of concepts and their relationships used for databases. Conceptual schema should describe the semantics of an interaction process and represents a series of assertions about its nature. It normally describes the significant issues in an organization which include the attributes and their relationships.

2.4.2.3 Physical Design

Physical schema is a kind of system design representing external and internal entities of the system with to and from data flow. The physical design of the database represents the physical configuration of the database on the storage device. In the case of student's database, this means that there should be detailed specification of data types, indexing

options, data elements, and other parameters residing in the DBMS data dictionary (Berstein, 2008).

According to Vlissides (1995), a physical data model is a representation of a data design as intended to be implemented, In a system, it is typically derived from a logical data model, it may also be reverse-engineered from a given database implementation. A complete students physical data design should include all the database artefacts required to create relationships between tables to achieve performance goals such as linking tables, indexes, constraint definitions, clusters or partitioned tables

According to Ashdown (2012), there are seven main database management systems that dominate the commercial marketplace. They include Oracle, Informix, Postures, Sybase SQL Server, MySQL and DB2. The researcher studied them and chose MySQL as the right DBMS. SQL Server runs only on Microsoft Windows operating-systems, this means that the security requirements, disk requirements, and other aspects of a physical data model are influenced by the RDBMS that the researchers choose to use.

2.4.3 Good User Interface Design

According to Norman (2002), a good user interface design focuses on finishing the design task without drawing unnecessary attention to it. The researcher applied Graphic design and typography to help in influencing how the students interact with the interface. Graphic design also improves the aesthetic appeal of the student-parent interaction design. The researcher ensured that the design process balance visual elements and technical functionality to create an interface that is usable, operational, and adaptable to changing needs of the students. Object oriented design was preferred to structured design because of its suitability for sustaining huge software; its sheer nature

gives the researcher easy time when developing programs as the component of programs which are in the form of objects would just be plugged into the other parts of the program wherever they were needed. The researcher divided the process into stages, starting from abstract descriptions of the problem to designs then to coding and testing and finally to deployment as shown in figure 2.3

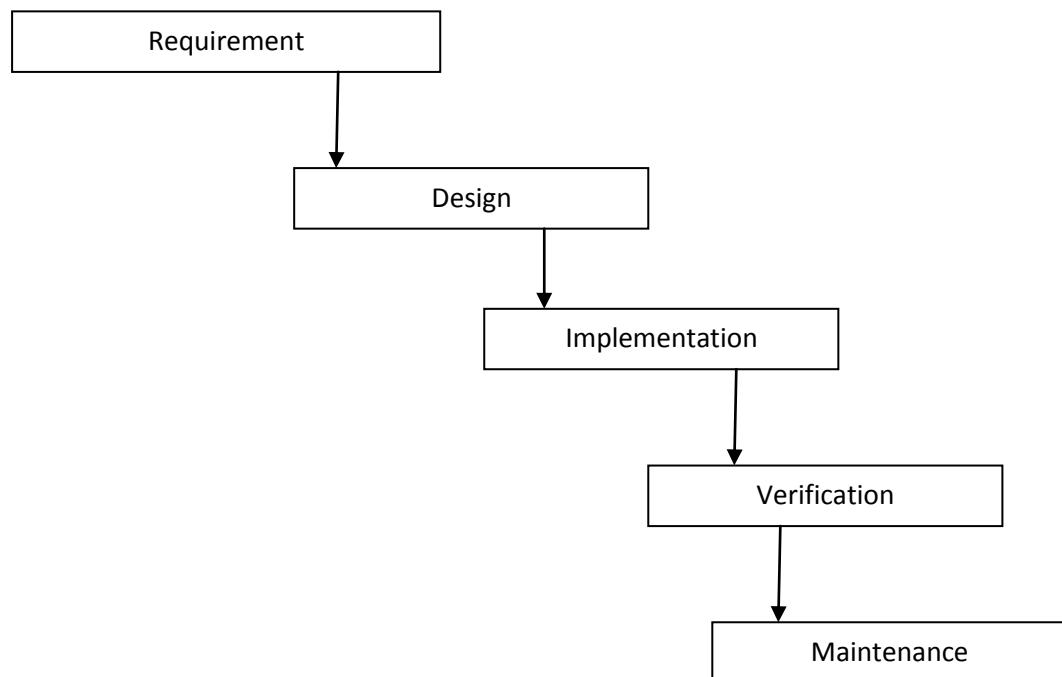


Figure 2.3 Interface Development Process

(Source: Adopted from Boehm, 1999)

Boehm (1999) defines object oriented analysis and design as a computer programming process in which the objects are used to form additional objects and are arranged into hierarchies and in which a single object member such as a variable or function may be used in several different but related way.

2.5 Theoretical Framework

2.5.1 Gestalt theory for User experience Design: Principle of Proximity

Along with Kohler and Koffka, Max Wertheimer was one of the principal proponents of Gestalt theory in 1912 which was later revised by Johan Wagemans in 2012. An experiment was done where a white strip was placed on a dark background in each slit, where the rotation speed of the tachistoscope wheel was adjusted to vary the time required for the light to pass from one slit to the next. Above a specific threshold value, observers saw two lines in succession. With much faster rotation, the two lines flashed simultaneously. At the optimal stage, they were able to observe a distinct motion that could not be distinguished from real motion. When the time interval was decreased slightly, after repeated exposures, observers saw motion without a moving object.

The characteristic phenomena appeared in every case unequivocally, spontaneously, and compellingly. After confirming observation that apparent motion produces negative after images in the same way as real motion, Wertheimer proposed a physiological model based on some kind of physiological short circuit, and a flooding back of the current flow, creating a unitary continuous whole-process. He then extended this to the psychology of pure simultaneity and of pure succession. This extension was the emergence of the Gestalt theory.

Gestalt Theory User experience design is the process of enhancing user satisfaction with a product by improving the usability, accessibility and pleasure provided in the interaction with the product. Human brain is an amazing data processor whose broad capacity still has not been explored at full. Knowledge of cognitive abilities and mechanisms is highly helpful in creating a user friendly product. The researcher borrowed ideas like, when people perceive the complex objects consisting of many

elements; they apply conscious or subconscious methods of arranging the parts into a whole organised system instead of just the set of simple objects. One of the principles in this theory is the principle of proximity for UX design.

This principle is based on the cognitive tendency to perceive the objects close to each other as related especially in comparison with those which are placed farther. The researcher borrowed this idea and organized the interaction interface such that the related objects were close to each other as the students would group them this way automatically.

Research established that proximity was more powerful than other distinctive features such as colour or shape. People tend to see elements as related if they are close to each other in comparison to other objects even if other features differ, decide what will appear or function as a whole and as parts.

2.5.2 Principles of User Interface Design

According to Rand (2012), design is much more than simply to order, to assemble, or even to edit. It is to add meaning and value, to modify, to illuminate, to simplify, to dignify, to clarify, to dramatize, to persuade, and perhaps even to amuse. The attributes of a good user design include: Clarity which is fundamental in interface design. Students must be able to recognize what the interface is all about, have the urge to use, and understand that the interface is helping them interact with their parents, and even predict what will happen when they use it, and then successfully interact with it. There can be room for mystery and delayed gratification in interfaces, but not for confusion. Clarity inspires confidence of the students which may lead to further use. One thousand clear screens are preferable to a single congested one.

Interfaces should enable easy interaction by clarifying, illuminating, and showing relationships. It should bring students and parents together, manage their expectations, and give them access to services. Interfaces should do a good job as their effectiveness can be measured. The best interfaces can inspire, mystify, evoke, and intensify relationship with the world.

Attention is precious and to conserve it, the designer should not litter the applications with distractible material. The interface should keep users in control. Uncontrollable software takes away the comfort of the students by exposing them into confusing pathways, unplanned interactions and surprising outcomes. The students should be kept in control by regularly giving insight into what to expect at every step. Direct manipulation is always recommended. Ideally, the interface is so slight that the user has a feeling of direct manipulation with the object of their focus. Every screen should be designed to support a single action as this makes it easier to use, easier to learn, and easier to modify. A screen becomes confusing when it supports many actions. The designer should provide natural next step by anticipating what the next interaction should be and develop a design that supports it. Appearance follows behaviour. Humans create a good relationship with things that behave the way they expect. The designed elements should look like how they behave. This means that a student should be able to predict how an interface element will behave by just looking at it.

Inconsistency matters - only same screen elements should behave consistently with each other and should appear consistent. On the other hand, screen elements which are different should behave differently from each other. It is as important for unlike elements to appear unlike just as it is for like elements to appear consistent. Consistency is achieved when there is a clear viewing order of the visual elements on a screen. Smart

organization of screen elements can make the many elements appear as though few (Okello, 2000).

2.5.3 Usability Heuristics for User Interface design theory

The study was based on Usability Heuristics for User Interface design. This theory was proposed by Nielsen (2013). He proposed the ten general principles for interaction design. Heuristics theory does not have specific or accurate interaction interface design principles but it is an easily applied standard based on practical experience. According to Siba (2016), an interaction interface should be interactive to enable the students understand what is going on. It should adapt the language which is familiar to the student so that pieces of information appear in a natural and logical order. The interface should encourage student control and freedom because they may choose an interface's functions by mistake and may need a clearly marked emergency state without having to go through an extended dialogue.

According to Wambogo (2014), the designer should save the students from cramming by making objects, actions, and options visible. The interface Instructions should be easily retrievable whenever appropriate. Liability and efficiency of use should always be observed. This is because accelerators may quicken the interaction for the expert student so that the interface caters for both inexperienced and experienced students.

The interface should always express an error message in plain language, precisely indicating the problem, and whenever possible suggesting a solution. The interaction interface should not have any irrelevant information. The extra pieces of information in a dialogue contend emulously with the relevant pieces of information and lessen their relative visibility (Siba, 2016). According to Nielsen (2003) a careful design is better

than good error message as it prevents a problem from occurring during the use of the interface by excluding error-prone conditions and checking for the errors and presenting them before they commit to the action. The design borrows two major ideas from Nielsen to help design a timely, reliable and accurate student-parent interaction interface, error prevention and minimalist design.

2.5.3.1 Error Prevention

An error is a situation where the interactions interface fails to perform its specified duty or where it produces unexpected result. An error can also occur as a result of student's mistake committed when using the interaction interface (Brocode, 2004). According to Promila (2007), there are two classifications of user errors. These are slips and mistakes. The students may slip when they perform wrong actions. This error should be eliminated by employing an object's signifier which indicates how it is used. For example, students may be familiar with clickable button which may show that they have a small amount of shadow on the outside. This causes the button to look like it is moving upwards out of the page. Conversely, form fields should also be made of a rectangle, with small amount of shadow inside indicating that they're empty and can be filled in.

Students may make mistakes when they have mental model of the interface different from the real one and forms a goal that does not suit the situation. Such mistakes are minimised by use of conventions which students are familiar with. For security purposes, all pieces of information deemed irrelevant to the students and parents are treated as error such that error prevention is also geared towards filtering any irrelevant information from either side not to reach the intended destination. For such error prevention method, research was carried out on use of attribute selection drop down menu.

According to Matt (2009), drop-down menu is a woggle menu that enables the students to select an item from a list. It displays a single value when it is inactive, and a list of values from which the user may select one when activated. Control reverts to its inactive state, displaying the selected value whenever the user selects a new value. The drop-down menu is common in the graphical user interface design. Drop-down menus help one to cut down on data entry errors (Mark and Nielsen, 2015).

The students' database should be protected to maintain its integrity hence eliminating errors. Wrong records in the database may result to confusion as a student's message may be delivered to a wrong person or it may fail to be delivered altogether. There are many threats to data security and several opportunities along the path of directory information delivery for an illegal access to data. Intruders can modify or tamper with the database (Sun, 2009). A database is rendered useless if the information can no longer be trusted by clients, or if the database itself cannot trust the modifications and queries it receives from clients. If a database cannot detect interference, an attacker could interfere with a client's request to the server by cancelling the request, or changing the server's response to the client. The Secure Socket Layer (SSL) protocol and other related technologies can solve this problem by signing information at either ends of the connection (Perry, 2012).

The following access control practices by Kayarkar (2012) were incorporated into the database design to ensure security and data integrity: The usage of administrator and other powerful accounts are limited. There is enforced strict access criteria through user accounts, auditing of the interface and user events and actions, reports are reviewed periodically and audit logs protected.

2.5.3.2 Minimalism Design

Minimalism aims at achieving objectivity and simplicity. It should reduce works to the fundamental by stripping away the ornamental layers that might have been placed on top. Minimalist designs offer better typography, less colour and grid layouts. Minimalism is about designing smarter, and is viewed as “Less is more”. The student-parent interaction interface must be very fast and accurate, in order to serve effectively the large number of students in boarding schools. Minimalist design seeks to simplify interfaces by removing unnecessary elements or content that does not support user tasks to enhance its speed (Mies et al., 2016).

According to Randy et al., (2014), users are most attracted to interaction sites that have a neat design; complexity has effects on user’s perception of the site within 50 milliseconds of exposure. Moreover, people are increasingly becoming sensitive to site’s usability. Modern users tend to favour designs that limit their focus to necessary features and avoid distracting components. Minimalist design offers better usability, higher user engagement, and appeals which are more aesthetic.

Some web designers mistakenly neglect the fact that the fundamental goals of minimalism are economy and usability which is the ability to do more in the interaction interface but with fewer components. The underlying ideas of minimalism have been around for much longer. Some of the areas that employ minimalism include interior design, Japanese architecture, and graphic design. The emphasis is on simple design choices that promote sense of calmness and functionality (Van, 2000).

According to Snijders (1990), minimalism was initiated in the 20th century. This came as result of introduction of modern materials, like steel and glass and other new building

technologies. Architects began to employ minimalist designs in their buildings. The phrase “less is more” is associated with Van der Rohe, making him an icon in the minimalist design that shaped much of the modern era. The less is more attitudes gradually progressed arts, interior industries, painting and music. The idea was to eliminate any element that did not significantly contribute to the deeper function.

Minimalism was first applied to interface design in the early 2000s and has recently seen a flurry of interest. The embracement of interface designs is manifested in the success of such sites as Square Space and the demand for minimalist-inspired Word Press themes. Even Google, the most popular website in the world, demonstrates minimalist principles (Wisely, 2014).

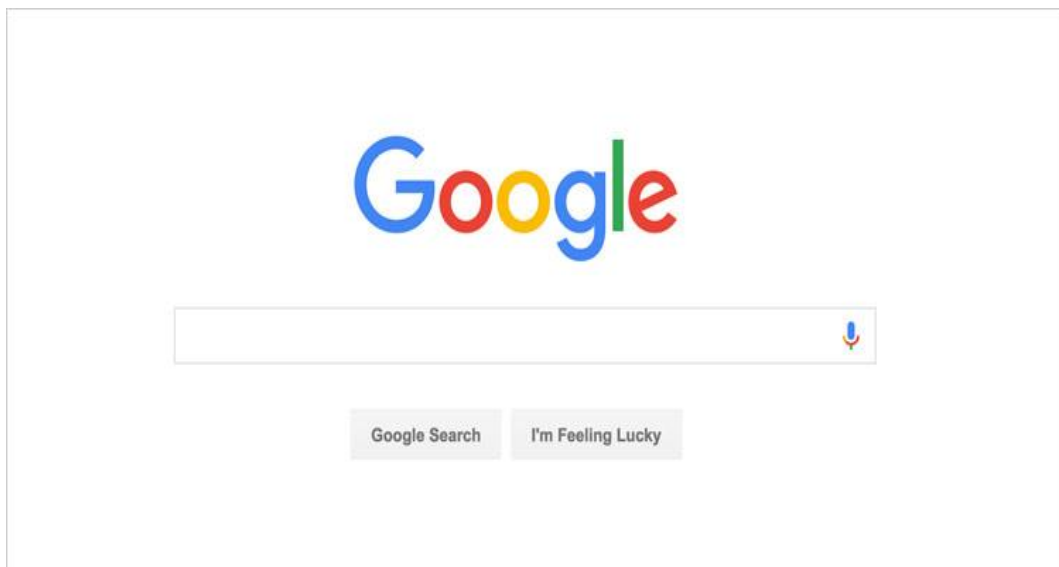


Figure 2.4 Google homepage

(Source: Adopted from Google homepage)

The Google homepage is designed exclusively around its central search function. Anything unnecessary to the function, other than branding, was eliminated. Branding is even more prominent. Not only is it one of the few visual elements on the page, but it is

also makes the page to remain uncluttered; it's not distracting. Google's minimalist philosophy is a great one to follow to improve user experience and promote engagement.

Use of Negative Spaces is an important application of minimalist interface design which maximizes the effectiveness of an interface. In this context, negative is a positive. The empty space is the negative space; it is the space between designed elements. More emphasis exists on the designed elements when the space is more. In the above example of the Google homepage, it is not possible for students to experience difficulties in operating the interface. Negative space is created by removing anything that is not necessary to the page's goal. Interaction interface design should ensure that student have a less stressful and more engaging experience. The challenging aspect of designing a negative space is in not removing so much that students have to search unnecessarily for the features they need because that would defeat the purpose of minimalist design. Negative space is also called white space though it does not necessarily have to be white. Some sites use different colours on the backgrounds to energize empty space (Usability geek, 2016).

Contrast is an important aspect of interface design. A simple high-contrast palette enhances the appearance of the interface. Fewer elements on interface page make the palette have a greater impact. High contrast makes a site more readable and directs users to potential actions or important information. High contrast suits many sites as the goal of minimalist design is efficiency and ease of use (Garbade, 2018).

Hartmut (2009) explains that simplicity is about the user's overall experience when interacting with the interaction interface site. One aspect of simplicity is the ability to accomplish tasks easily without distraction. Simple designs neither confuse nor distract

students. They would enable students to easily accomplish their goals. They usually blend into the user's experience, so that the user can focus.

Simplicity can also be achieved by cutting unnecessary decorations like flash animations. Flash tends to create problems on an interaction interface page and does not add value in the functionality. The principle of minimalist design discourages flash animations and advocates for an appropriate execution of negative space, the interaction interface designers should be careful not to eliminate necessary features while trying to simplify the interaction site. In the case of the hamburger menu, central navigation is collapsed under a single menu icon. The menu is viewed as only appropriate for the students by engaging especially the students with interest in learning it.

2.6 Strength of Usability Heuristic for User Interface Theory

The proposal is sufficient for the achievement of immediate goals; Nielsen (2003) stresses so much on an interaction interface which is error free and suggests ways of preventing the errors, by either eliminating error-prone conditions or checking for the errors and presenting them before they commit to the action. He recommends minimalist design strategy which simplifies interfaces by removing unnecessary elements or content that does not support user tasks. In order to reduce an interface to only its most necessary elements hence enhancing its speed and efficiency.

2.7 Weaknesses of the Theory

This theoretical approach to problem solving is not guaranteed as optimal or perfect. Working on achieving some of these characteristics may actually clash with working on others. For example, by trying to make an interface clear, you may be adding too many descriptions and explanations, which end up making the whole thing big and bulky. Cutting stuff out in an effort to make things concise may have the opposite effect of making things ambiguous. Achieving a perfect balance takes skill and time, and each solution will depend on a case by case basis.

2.8 Student-Parent Interaction

Parents play a major role in supporting their children's learning and fostering positive early learning experiences for their children. The school administrators should therefore facilitate effective interaction between parents and their children. Interaction is the sending of pieces of information from one person to another. It can be verbal, or non-verbal (Davies, 2011).

High School children are a very different breed of humanity. They undergo various mental and physical changes because of their adolescence stage. The hormonal changes make them very emotional and the physical growth leaves them even more confused about whose body they suddenly possess, these combined with the changes in their brains push them into action before they think. It is therefore important for parents to interact effectively and openly with their children as this will not only benefit the child but also the entire community. Relationships between parents and their children are greatly improved when interaction between them is effective (UNESCO, 2012). Parents are their children's first role model; Children learn a lot of things by watching their

parents. If parents interact effectively with their children, chances are that their children will take after them and the good interaction skills will benefit them in their entire lives. Children begin to form ideas and beliefs about themselves based on how their parents interact with them.

Warnock (1978) explains that when parents respect their children they feel important and their self-esteem is boosted, such children know what to expect from their parents and are more likely to live up to these expectations. They feel secure in their position in the family, and are thus more likely to be cooperative (Ruebian, 2011).

Adolescents who feel connected to their parents are more likely to delay initiating sexual intercourse than other teens. The children whose families were warm and caring also reported less marijuana use and less emotional distress than their peers. Ineffective parent-child interaction negatively affects child's behaviours and attitudes. Children who lack parental warmth, care or love were more likely to report lower self-esteem, emotional distress, drug use, school problems, and sexual risk behaviours (Vottz, 2006).

The youths whose parents openly, responsively, comfortably, and confidently discuss sex and related issues participate less often in sexual risk behaviour, suggesting that the quality of interaction influences the message adolescents receive about any issue that affects them (Wambogo, 2014). An automated student-parent interaction is therefore necessary due to the distance, time and place barriers that exist during the children's stay in the public secondary boarding schools. The issues discussed during student-parent interactions are categorised as academic, social and financial.

2.9 Knowledge Gap

From the literature review the researcher discovered that student-parent interaction platforms existing in Kenyan secondary boarding schools include cell phones, letters and e-mail. The platforms in their current state are not suitable for use by secondary school students because they lack feature for filtering information and may expose students to any type of information including destructive ones. The platforms also lack features for proper control of use. In a school environment the platform should be able to serve the large number of students but some students may use the cell phone too frequently and may take too long on the phone hence denying their colleagues chance to access the platform.

The literature further revealed that interaction interfaces used by schools in other parts of the world like, Classroom Webpage (CWII), Collaborize classroom, Buzz mob, teacher apps and grade book, Reminder 101 are only suitable for teacher-parent interaction. None of these interfaces addresses the requirements for student-parent interaction.

2.10 Conceptual Framework

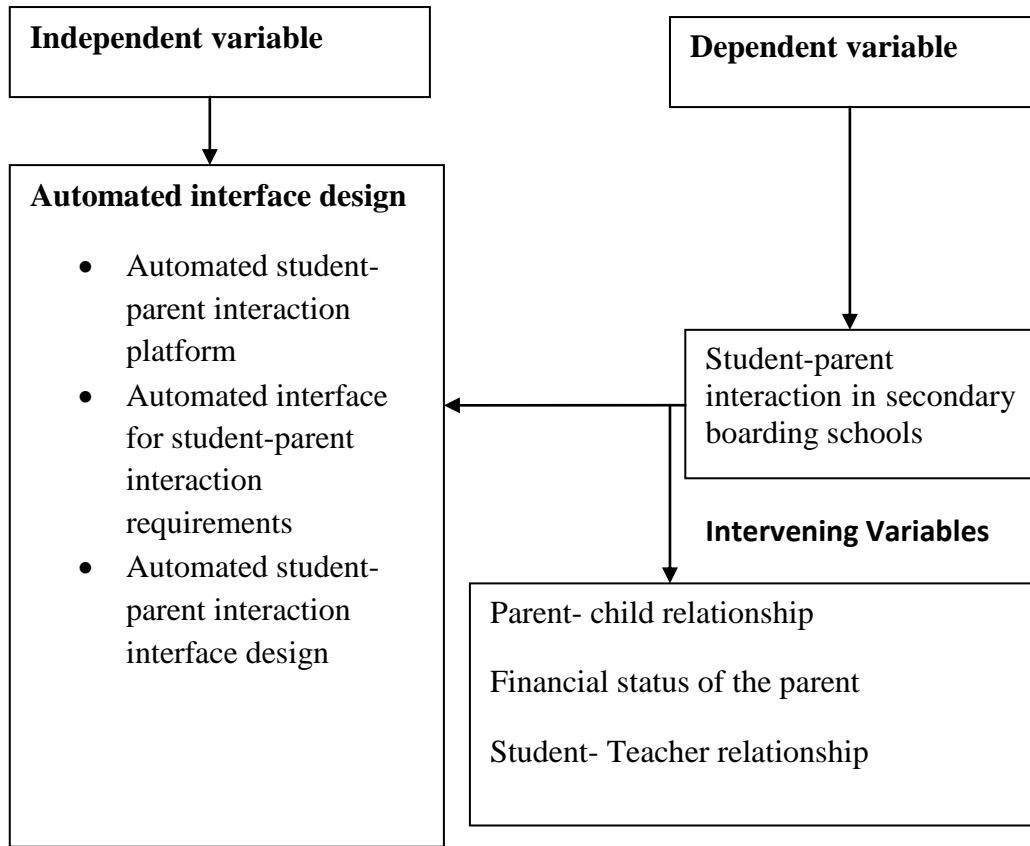


Figure 2.5: Conceptual framework

Source: Researcher (2018)

Figure 2.5 highlights the variables in the study. The dependent variable is the Student-parent interaction in secondary boarding schools. It is dependent on an automated interface design. The study recorded three major challenges faced by students in secondary boarding schools: Social issues, academic issues and financial issues. Findings from the study revealed that the solution to these issues is dependent on the automated interface design. The interface should reliably facilitate student-parent interaction in secondary boarding schools, it should be readily available, should have a feature to facilitate the interaction process control, and should be able to filter information, promote privacy and be cost effective. The intervening variables include

issues like, Parent-child relationship, parents' financial status and student-teacher relationship. A parent will act swiftly if called upon to help their disciplined child and to whom they enjoy cordial relationship than when called upon to help an indisciplined child. For a parent to offer financial support, they must have the finances required at that particular moment. The student's financial problem is only solved if the parent has the finances. Solving student's challenges is also dependent on the student-teacher relationship. A student will understand a teacher in class when they enjoy cordial relationship and would go to them for consultations on subject areas not understood thereby reducing some of the academic challenges students face in school. The suitability of the automated interaction interface was arrived at by looking at two major design principles: error prevention and minimalist design. The relationship between the independent variable and the dependent variable was determined by using descriptive statistics like percentages and frequencies.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter was divided into two categories: Research Design and Methodology. It specifically focused on research design, research site, the target population, sample and sampling procedures, data collection instruments, data collection procedures, validity, data analysis procedures, and reliability of the research instruments, and finally ethical considerations in the study.

3.2 Research Design

To gain an in-depth understanding of the study, the researcher adopted mixed method design by concurrently collecting both quantitative and qualitative data in the same phase of the research process, weighed the methods equally, analysed the two components independently then interpreted the results together.

Phenomenological research design was used to collect qualitative data. This research method attempts to set aside biases and preconceived assumptions about human experience, feelings and responses to a particular situation (Creswell, 2007). The research was conducted through observation and use of in-depth interviews of head teachers and their deputies. Through phenomenological research design, the researcher was able to understand some of the challenges faced by secondary boarding schools and their causes.

Quantitative data was collected using experimental research design. These methods were adopted in order to enable the researcher understand the attitude, opinions,

behaviours and characteristics of the secondary school children and their parents on issues pertaining to student-parent interaction in secondary schools in Rachuonyo South Sub County. Experimental research was appropriate in this case because it enabled researcher draw accurate conclusions, regarding student's attitude on an automated student-parent interaction interface. The researcher was able to establish whether or not interacting with the interface caused a change in the outcome.

3.3. Study Area

The study was conducted in Rachuonyo South Sub-County of Homabay County, Kenya. The map of Rachuonyo South Sub County is in Appendix v. Rachuonyo South Sub County borders Rachuonyo North Sub-county to the North, Kisii Central Sub-County to the North East, Marani Sub-County to the East, Belgut Sub-County to the South East and Nyakach Sub-County to the West. Rachuonyo South Sub County is an Administrative District in Homabay County. Its capital town is Kosele. The Sub County has a population of 307,126 (1999 census) and an area of 945 Km². The district has two divisions: Kasipul and Kabondo divisions, which have been part of Homabay County since 2010 (Rachunyo South cluster ESIA study report, August 2013).

Rachuonyo South Sub-County has a total of 44 secondary schools. 4 girls' schools, 4 boys' schools and 36 mixed schools. The cases of interest were boarding secondary schools in Rachuonyo South Sub-County.

3.4 Target Population

According to Stauner (2014), the target population refers to the entire group of individuals to which the researcher is interested in generalizing the conclusion for the study. Rachuonyo South Sub County only has 4 pure secondary boarding schools, the rest fall under category of mixed day and boarding schools and day schools. The target

population for this study was 4 secondary boarding schools in Rachuonyo South Sub County. The four schools had a population of 2320 students (Rachuonyo South Sub-County Educational office, 2016). There were total of 127 teachers in these schools and they were all targeted. Derived from students' sample size a total of 330 parents were targeted. The Sub-County was purposely chosen because of recent spates of student unrest in the secondary boarding schools in Rachuonyo South Sub-County.

3.5 Sample Size

Cochran equation formula was used to determine the sample size. (Amugune, 2014) suggests that sample size should be small to allow in depth exploration and understanding of phenomena under investigation. The researcher determined the desired confidence level, the margin error as well as the number of students that make up the target population and arrived at a sample size of 330 students. The desired confidence level was 95%, this is because a higher confidence level is likely to produce a broader confidence interval.

The researcher's intention was to collect data from the total number of parents whose children had been selected to participate in the survey, therefore 330 parents were targeted. Using Cochran equation formula, the sample size was arrived at as 178 parents. Two teachers were purposely chosen from the four schools resulting into a sample size of 8. The following Cochran equation formula was used to determine the sample size for parents and students.

$$n_0 = \frac{Z^2 pq}{e^2}$$

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

Where n is the sample size,

Z^2 is the abscissa of the normal curve that cuts off an area α at the tail;

$(1 - \alpha)$ equals the desired confidence level, e.g., 95%);

e is the desired level of precision,

p is the estimated proportion of an attribute that is present in the population, and q is $1 - p$.

The value for Z is found in statistical tables which contain the area under the normal curve. e.g. $Z = 1.96$ for 95 % level of confidence.

N is the target population size.

Table 3.1 Sample size

The sample size for students, teachers and parents are tabulated in the table 3.1.

Population cluster	Target population	Sample size
Schools	8	4
Students	2320	330
Parent	330	178
Head Teachers	62	8
Deputy Head Teachers	62	8

Source: Rachuonyo South Sub-County Education Office October 2015

3.6 Sampling Procedures.

The study used both probability sampling and non-probability sampling techniques by adopting stratified sampling and purposive sampling methods. There were 44 secondary schools in Rachuonyo South Sub-County. 4 were pure girls boarding schools, 4 were pure boys' boarding schools and 36 were mixed secondary school. The sample sizes were 4 boarding secondary schools in Rachuonyo South Sub-County. The 4 schools

were arrived at using stratified random sampling because the researcher wanted to highlight gender and categories of the schools. The schools were grouped according to Strata of Extra County schools and County schools, then according to girls' schools and boys' schools. The 4 schools were then randomly sampled from the strata.

According to Republic of Kenya (2016), Rachuonyo South Sub-County education report 2016, the total population in the four schools were 2320. Researcher used stratified random sampling to group the students into strata according to their form level. There were form one, form two, form three and form four strata. 20 or 21 students were randomly sampled from each form using the form registers provided by the schools. Thus, the researcher ended up with total of (330) students.

The head teachers and deputy head teachers were purposely chosen to participate in this study as they had vital information about the challenges they face in their school and this would help the researcher to gain more knowledge on student-parent interaction in secondary boarding schools.

Researcher used stratified random sampling to group the parents according to their regions. The regions were further grouped according to geographical location of the sampled schools such that a total of 44 or 45 parents were interviewed from a given area. The researcher interviewed 178 parents.

3.7 Data Collection Instruments

A data collection instrument refers to the methodologies used to identify information sources and collect information during an evaluation. They are devices used to collect data. The data collection instruments used in this study were; questionnaires, structured interview guides, document/content analysis guides (Canals, 2014).

Questionnaires were administered to all the 330 students, they filled them and were all returned. For experimental survey, half of the students were exposed to the proposed student-parent interaction interface design before filling the questionnaire. It had a total of 15 questions and was divided into three sections. Section one was on demographic information. It required the students to provide the researcher with information on gender, age and academic level. Section two was about the existing student-parent interaction methods in their schools: How and when they access the interaction media and who avails the interaction media and how frequent. Section three sought to find out the requirement for suitable automated interface for student-parent interaction. Students were required to list down some of the challenges they face in school, their causes and possible suggested solutions. They were also asked if it was in order to get their parents involved in their issues while in school and which best method to use when interacting with parents. This information helped the researcher gain knowledge about the current situation on student-parent interaction in secondary boarding schools.

Structured interview guides data collection instrument was used to collect data from both head teachers and deputy head teachers and parents. It was designed to cover three sectional areas. Section one was on demographic information about gender, age and years of teaching experience. The second section was on existing interaction methods and this was majorly done to confirm if the information given by the students was true. The major areas looked into were the interaction methods available, which categories of students use them, how frequent and some of the problems they discuss with their parents when they interact with them.

In the last section the researcher sought the opinion of the school heads and their deputies on how best the students would interact with their parents in order to address their issues. They were required to mention some of the problems faced by students in

school, and if they needed the intervention of the parents in these challenges. They were asked how best the parents would be involved and in which issues. They were also required to mention qualities of a good interaction interface. These interviews helped so much in designing a suitable automated interface design for student-parent interaction in secondary boarding schools.

Document analysis guide is a form of qualitative research in which documents are interpreted by the researcher to give voice and meaning around an assessment topic. There are three primary types of documents, public records, personal documents and physical evidence (Bowen 2009). The researcher used public records like discipline cases record books that resides in the deputy's head teacher's office to get information about the students' problems in school and how they are handled.

3.8 Data Collection Procedures

Permission was sought from the National Council of Science, technology and Innovations (NACOSTI), through Rongo University. The research permit is annexed in the appendices page, appendix 4. The researcher then visited the Rachuonyo South Sub-County director of education's office to explain the purpose of the research. Appointments were then arranged with schools through the head teachers.

The researcher then visited each of the schools to personally administer the questionnaires for students. Half of the sampled students were exposed to the proposed student parent interaction interface and another half was the control group. Both groups filled and returned the questionnaires. The head teachers and deputy head teachers were visited into their offices and were interviewed guided by structured interview guides. Parents were also interviewed by interview guide, areas around the sampled schools

were visited especially on market days and averagely, a total of 178 parents were participated in this exercise.

3.9 Data Analysis

Data was collected coded and analysed using SPSS Version 25. This section was split into two phases in phase one data was analysed by adopting descriptive statistics comparison. In the second phase the researcher developed a prototype to illustrate Student - parent Interaction Interface.

3.10 Ethical Consideration

During data collection process, the purpose of the study was clearly conveyed to the participants. In the course of data collection the participants and the sites of the research were respected. Besides the participants were expected to sign the informer consent forms before they engage in the research and they were at liberty to withdraw from the study at any time without repercussions. Agreement of individual in authority like the gate keepers at the school were sought before gaining access to the research sites.

Confidentiality was achieved by not asking the participants to write their names on the questionnaire. The respondents to this study were not exposed to any harm. The information that the researcher sought from the respondents was not biased or sensitive about their status. The researcher reached an agreement with the participant about the use of the data, and how its findings were to be reported and disseminated.

The privacy of the participants was protected and the same conveyed to them. The anonymity of the participants was protected during data analysis and interpretations and an account of the information collected was provided by debriefing and numbers

checking. All references and sources where materials were collected for the study were dully acknowledged in order to prevent plagiarism.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

4.1 Introduction

In this chapter, the researcher analysed the result of collected data. The purpose of this analysis was to determine existing student–parent interaction platform, to establish if there was need for a suitable replacement to the current student-parent interaction platform in secondary boarding schools in Kenya and to deduce the best approach in student-parent interaction interface development. Data gathered from the sample group in relation to the research objectives was analysed and interpreted. The questionnaires were responded to by the 330selected participants. Before the initiation of the research questionnaire, the significance, rationale and purpose of the study were provided to the respondents. The respondents were given the assurance that all the data provided were used only for the purpose of the research and their identities would be concealed.

4.2 Return Rate of the Data Collecting Instrument

The data collection instruments in this study were students’ questionnaires, interview guide for head teacher and their deputies and document analysis guide. This section looked at the number of data collection instruments which were returned for the purpose of analysis.

Table 4.1 Return Rate of the documents

Target Population	Expected Sample	Actual Sample	Percentage Rate
Students	330	330	100%
Parents	178	178	100%
Head Teachers	4	4	100%
Deputy Head Teachers	4	4	100%
Total	516	516	100%

Source: Researcher (2018)

Table 4.1 shows the return rate for the research documents. The research was carried out in four boarding schools in Rachuonyo South Sub-County with a sample size of 330 students. The four schools received 83 questionnaires each which were distributed equally among the four classes. Fortunately they were all filled and returned. The research had all the interview guide documents used to interview head teachers, deputy head teachers and parents.

4.3 Demographic Information of the Respondent

The demographic information sought for were gender, class level, school category, professional qualification and teaching experience.

4.3.1 The Students

The researcher sought demographic information from the students, demographic information was important because it refers to a particular characteristic of a population. The information provide data regarding research participants which is necessary for the determination of whether the individuals in a particular study are a representative sample of the target population for generalization purposes (Salkind, 2010).

The researcher ensured that gender of the students' population was fairly represented to accurately capture challenges faced by both boys and girls in the secondary boarding schools. Boys experienced bullying in their boarding schools but this was not mentioned by girls. Girls on the other hand faced health related problems such as unwanted pregnancy and painful menstrual circle.

Table 4.2 Demographic Information

Demographic information	Frequency	Percentage (%)
Gender		
Boys	165	50%
Girls	165	50%
Boarding School		
Girls Boarding Schools	2	25%
Boys School Schools	2	25%
Classes		
Form one	82	25%
Form two	82	25%
Form three	82	25%
Form four	82	25%
Age		
16years and below	220	67%
Over 17 years	110	33%

Source: Researcher (2018)

In table 4.2, respondents were drawn from four out of eight secondary boarding schools in Rachuonyo South Sub-County. The girls' schools had a 25% representation and the

boys' schools also had a 25% representation. Equal number of form one, form two, form three and form four were presented in the study. Form one were 25%, form two were 25%, form three were 25% and form four respondents were also 25%. There was equal number representation of gender as number of boys participants were 165 and number of girls participants were 165. This means that girls had 50% representation, and boys also had 50% representation. Most respondents were 16 years and below (67%) especially those drawn from form one, form two and three. Some from form three and form four were over 17 (33%).

4.3.2 Teachers

To capture teachers' demographic information, the researcher gathered information on the following characteristics; teachers' gender, school, designation, and their teaching experience. The information provide data regarding research participants which is necessary for the determination of whether the individuals in a particular study are a representative sample of the target population for generalization purposes. Data on teachers' demographic information are presented in table 4.3

Table 4.3 Teachers' demographic information

Demographic information	Frequency	Percentage (%)
Gender		
Male	4	50%
Female	4	50%
School		
Boys	2	25%
Girls	2	25%
Designation		
Head Teacher	4	50%
Deputy Head Teacher	4	50%
Teaching Experience		
Less than 10 years	1	12.5%
Over 10 years	7	87.5%

Source: Researcher (2018)

The demographic data obtained on gender of teachers revealed that 50% were male and 50% were female. This may be due to the educational policy where girls schools are required to be headed by female teachers and boys schools be headed by male teachers. The two male head teachers were from the boys' boarding secondary schools and the two female teachers were from the girls' boarding secondary schools. Same scenario

occurred in the case of deputy head teachers where the two male deputy head teachers were from boys' schools and the two female deputy head teachers were from girls' schools.

The teachers who participated were deputy head teachers (50%) and the remaining 50% were head teachers. The head teachers and deputy head teachers were purposely chosen because the researcher realised that though the buck stops with the head teacher, the deputy head teacher in any school is usually the chair of disciplinary committee. The two were therefore better placed in revealing information on the students' challenges and how best they should be handled.

Most head teachers and deputy head teachers had a teaching experience of over 10 years. 87.5% of the teachers' respondents had over 10 years teaching experience and only 12.5% had less than 10 year experience. This is attributed to Teachers' Service Commission policy where the teaching years' experience is very important in acquiring administration jobs. It is assumed that the experienced teachers handle the students' challenges with a lot of wisdom as they have a lot of ideas on how to solve the various problems faced by students. The researcher exploited this experience and the teachers' ideas on problem solving were captured to help come up with a suitable automated design interface for student-parent interaction in secondary boarding schools.

Table 4.4: Parents demographic information

Demographic information	Frequency	Percentage (%)
Gender		
Male	89	50%
Female	89	50%
Occupation		
Formal sector	71	40%
Informal sector	107	60%
Number of children in secondary boarding school		
One	92	51.7%
Two and above	86	48.3%
Age		
Less than 40 years	79	44.3%
Over 40 years	99	55.6%

Source: Researcher (2018)

Demographic information about parents shows that equal number of male (50%) parents and female (50%) were interviewed during fact finding. Parents (40%) said that they work in the formal sector and 60% work in informal sectors such as business men and

farmers. Parents who confirmed that they had children in secondary boarding schools were asked to state the total number of their children in boarding secondary school. Good number of parents (51.7%) only had one child in boarding schools each. The remaining parents (48.3%) had two and above. Most parents (55.6%) were above 40 years of age, the rest were 40 years and below.

4.4 Existing Student-Parent Interaction Platforms in boarding Schools

In this section, the research was carried out on the existing student-parent interaction methods in the secondary boarding schools, and the reasons as to why they are necessary. The students, deputy head teachers and head teachers mentioned some of student – parent interaction methods used in their school. This information was important to researcher as she was able to analyse each method to see their suitability. The methods mentioned were mobile phones, e-mail and letters. One of the head teachers said this:

“The students here mainly use mobile phone to interact with their parents. The school provide one mobile phone which is usually with the matron. Students are allowed to use it at speculated times to be able to interact with their parents”.

Current student parent interaction methods are outlined in Table 4.5

Table 4.5: Student – parent interaction methods

Interaction methods	number of users	percentage
(%)		
Mobile phones	315	95.5
Letters	9	2.7
Electronic mail	6	1.8

Source: Researcher (2018)

As mentioned by (Omwami, 2013), table 4.5 shows that most students (95.5%) in public secondary boarding schools use mobile phone interface to interact with their parents. Other interfaces used are electronic mail at (2.7%) and letters at 1.8%. Mobile phone is still the most popular student-parent interaction method among the students in secondary boarding schools despite the ban by the Ministry of Education. This is an important discovery to the researcher because it points out that the boarding secondary schools prefer an interface which is timely, reliable and efficient like mobile phones. Mobile phones have some distinctive features which make them popular even with the ban. Mobile phone interaction method is timely: the receiver receives the message immediately and the sender is able to receive immediate feedback. It is also efficient meaning it is not time consuming and not much energy is needed in delivery of message compared to letter writing where one has to walk to the post office or to the receiver's

home to deliver the letter but still may not have a guaranteed delivery. Mobile phones are reliable, they guarantee instant message delivery.

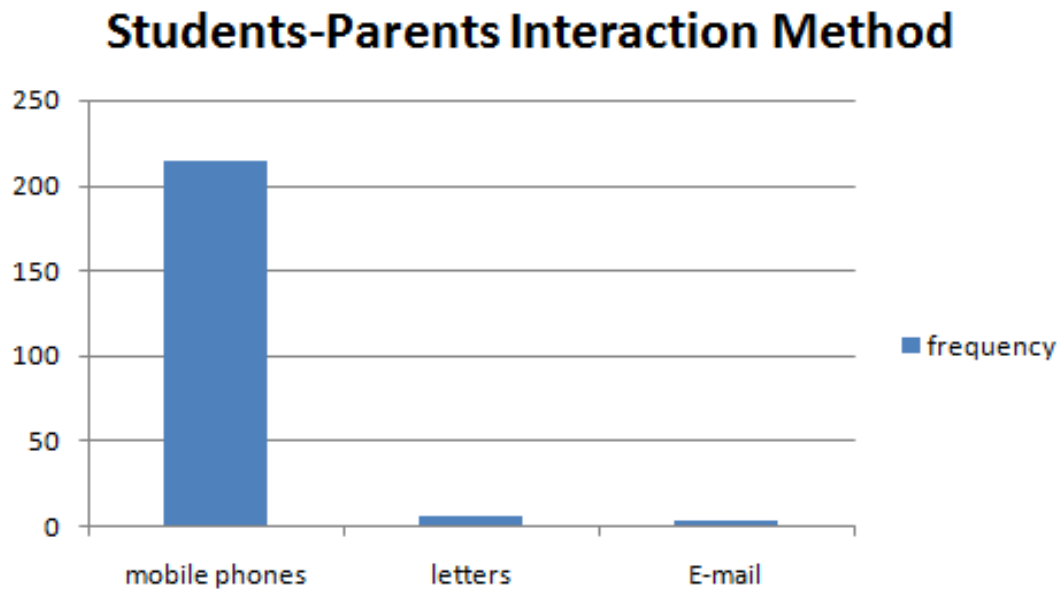


Figure 4.1: Frequency of existing interfaces

Source: Researcher (2018)

The trend in figure 4.1 shows that mobile phone is still the most popular interaction method among the secondary boarding school students and the students have not embraced the other existing interaction methods like letters and electronic mails. Mobile phone is ranked first followed by letters and then electronic mail.

4.4.1 Access to Mobile Phone Interfaces

Head teacher is the most senior teacher and leader of a school, he is responsible for management of staff and for school policy making. They are usually teachers with many years of experience. Their role is to give direction, resolve major disciplinary issues with pupils including working with police and parents. Their work is also to manage staff by delegating responsibility and evaluating their performance. Head teachers are also expected to motivate students and ensure an infrastructure is in place in which all

members of staff and pupils feel they can register their opinions on serious matters (reeves 2008)

Table 4.6: Access to mobile phone

How students access mobile phones	Number of students	Percentage (%)
From teachers	325	98.6
From support staff	3	0.93
From fellow students	2	0.47

Source: Researcher (2018)

Table 4.6 shows that most of the students (98.6%) get mobile phones from their teachers, 0.93% from the support staff and 0.47% of the students get mobile phones from their fellow students.

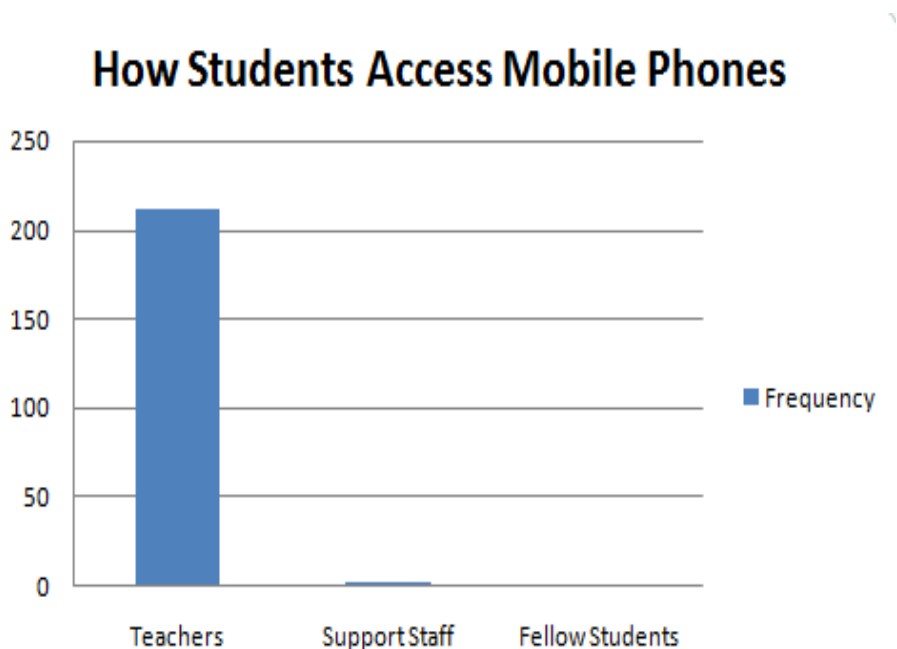


Figure 4.2 Frequency on how the students access mobile phones

Source: Researcher (2018)

The trend in Figure 4.2 indicates that most students get mobile phones from their teachers: the education policy implementers. This is a clear indication that mobile phone usage in school may not stop anytime soon unless a suitable alternative interaction method is available.

4.4.2 How Frequently the Students Interact With Their Parents

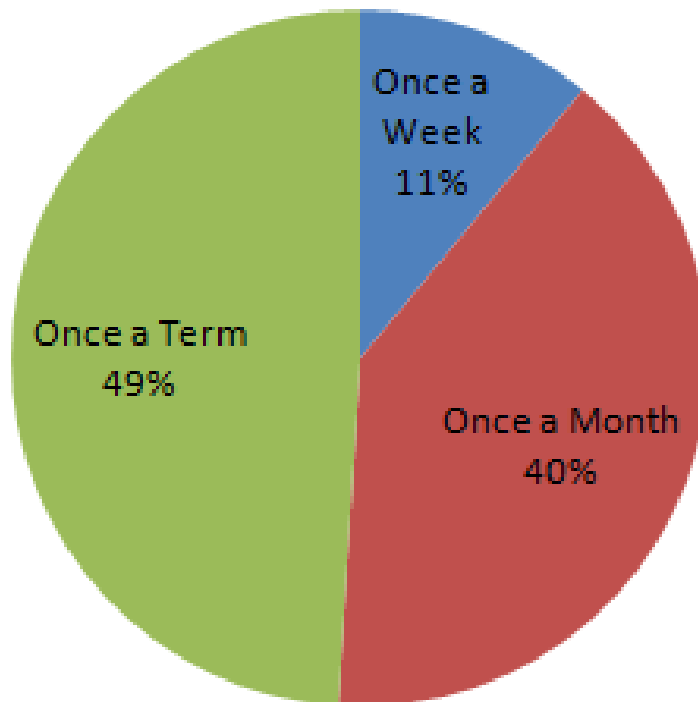


Figure 4.3 How Frequently the Students Interact With Their Parents

Source: Researcher (2018)

Majority of the students (49%) in secondary boarding schools interact with their parents once in a term, 40% of the students do interact with their parents once a month and 11% do it once a week and negligible numbers of students communicate with their parents every day. The findings show that there is need for parent-student interaction by students in boarding schools.

4.4.3 Stipulated Time for Student-Parent Interaction

Time for Student Parent Interaction

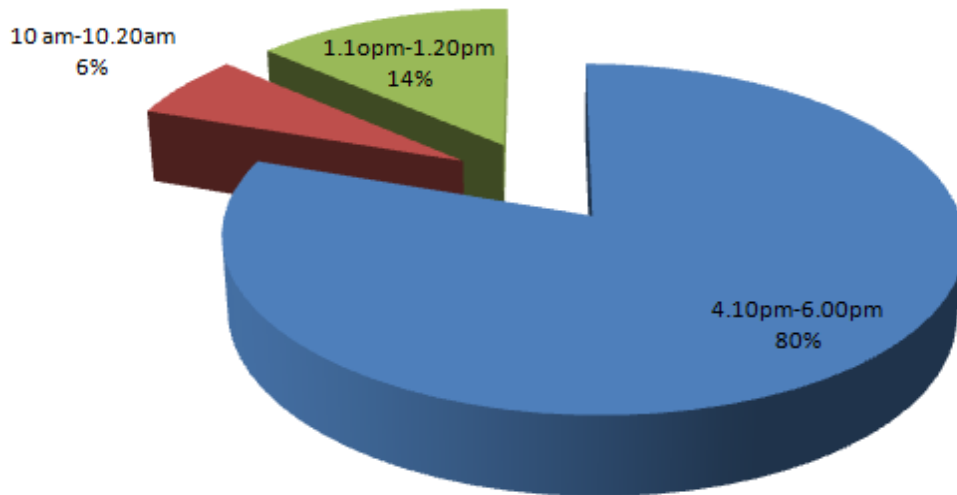


Figure 4.4 Time for student-parent interaction

Source: Researcher (2018)

According to the teachers, majority of the students (80%) interact with their parents at 4.10 pm-6.00 pm, 6% of the students interact with their parents at 10am-10.20 am and 14% of the students interact with their parents at 1.00pm-1.20pm. The periods mentioned above are short. It means therefore that a suitable platform must be fast and easy to use so as to enable the students use it within the short time available in schools. The interaction process should not interfere with the school's program.

4.4.4 Do Student Interact With Strangers

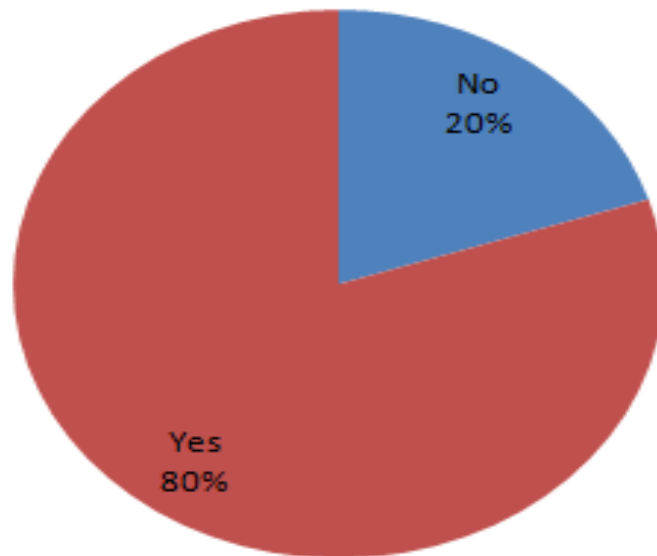


Figure 4.5 Interactions with Strangers

Source: Researcher (2018)

The findings show that 80% of the secondary boarding school students have at one point or the other interacted with other people apart from their parents and guardian when they access cell phone interface. Only 20% have never interacted with strangers on the cell phone while in school. This means that a suitable interface should be one that filters information and should only facilitate interaction between a student and a parent whose name is stored in the database.

4.4.5 Problems Faced by Students in School

The interface was designed to help eliminate some of the problems faced by students. That is why it was important to analyse some of the common problems faced by students in secondary boarding schools as they were handy in the interface design.

Table 4.7: Students' Financial Problems

Problems	Respondents	Frequency	Percentage (%)
Financial			
School fees	Students	325	98.6
	Teachers	8	100
Pocket money	students	299	90.6
	Teachers	5	62.5
Bus fare	students	292	88.4
	Teachers	6	75.0
Uniform money	Students	158	47.8
	Teachers	3	37.5
Tour money	Students	296	89.7
	Teachers	4	50

Source: Researcher (2018) to establish some of the problems faced by students in secondary boarding schools in Rachuonyo South Sub-county. This information was handy as the researcher wanted to find out the seriousness of these problems and how they affect learning. The information also helped establish the extent to which parent-student interaction was necessary.

Both students (98.6%) and teachers (100%) mentioned fees problem as a serious issue that needed parents' attention. One of the head teachers said;

“It pains me to send the students home for school fees when classes are on. This always affects their performance as they miss a lot and they also get exposed to adultery. I wish that the fees payment be a hundred percent (100%) so that no student suffers because of lack of school fees”.

Other financial problems that need parents’ attention are pocket money that was mentioned by 90.6% of students and 62.5% of teachers. The students need some little money to spend on basic needs and snacks. At their age, a teenage eats a lot of food so they need pocket money to supplement for the food provided in school. They use the money to buy bread and biscuits.

Whenever the students close school for half term or holiday, they contact their parents to send them bus fare. The same thing happens when they lose their uniform or when they have outgrown the ones they have. The students also contact their parents for tour money when they are supposed to go out on trips.

Table 4.8: Students' Academic problems

Problems	Respondents	Frequency	Percentage (%)
Academic			
Course Books	Students	296	89.7
	Teachers	8	100
Revision Books	students	267	80.8
	Teachers	8	100
Exercise books	students	75	22.8
	Teachers	4	50
Exams	Students	246	74.1
	Teachers	8	100
Career Choice	Students	143	43.3
	Teachers	4	50

Source: Researcher (2018)

The core business in school is academics. When students cannot perform well in school, they become demoralised, withdrawn and sometimes much stressed. Some of the academic issues addressed by parents are lack of course books; mentioned by 89.7% of students and 100% of teachers. A teacher mentioned;

“The government provides the students with text books but sometime they lose them and this may negatively affect their academic performance and so their parents must be contacted to replace the missing books”.

Other reasons for calling parents include: Revision Books - mentioned by 80.8% of the students and all the teachers interviewed at (100%). Exercise books for doing extra work are another reason for calling parents. (50%) of teachers mentioned that they have in many occasions called to advice the parents to buy exercise books for revision. Students (22.8%) recorded that they had called their parents over the same issue. Both students and teachers contact parents over exams related issues. Students (74.1%) noted that they call their parents to inform them about their performance and for a piece of advice. Teachers (100%) also contact parents when students fail exams. Teachers (50%) and Students (43.3%) may also contact parents for advice on Career Choice.

Table 4.9: Students' Social problem

Problems	Respondents	Frequency	Percentage (%)
Social Problems			
Food	Students	63	19.2%
	Teachers	1	10
Health	students	159	48.2
	Teachers	5	62.5
Bullying	students	21	6.25
	Teachers	0	0
Stress	Students	158	47.8
	Teachers	6	45.0

Source: Researcher (2018)

The table shows a list of social problems faced by students in boarding schools. Few students (19.2%) mentioned food as a setback. A handful of teachers (10%) complained about special meals required by some students which the school could not afford. The teachers said that they normally contact the parents over such issues. Students (48.2%) contact their parents over health issues. This is also done by 62.5 % of teachers. One of the head teachers accounts that:

“When a child is on medication but does not show any signs of improvement we call the parent for them to offer assistance”.

Few students (6.25%) mentioned that they still experience bullying and needed to contact their parents about it. Good number of students (47.8%) contacted their parents when they were feeling stressed. According to (45%) of teachers participants, student who showed signs of being stressed were always counselled and their parents were called upon to come to school whenever it was necessary.

Table 4.10: Problems handled by parents in secondary boarding schools

Problems (%)	Frequency	Percentage
Academic	328	99.3
Social	289	88.5
Financial	300	90.9

Source: Researcher (2018)

In the table 4.10, the researcher inquired from the parents some of the issues they discussed over the phone with their boarding school children whenever they call from school. They mentioned academics (99.3%), Social problems (88.5%) and financial problems (90.9%). The findings show that to an extent, the parents have been involved in their children's issues while in school. Yet, there is no clear policy tabulated and suitable platform to facilitate student-parent interaction. It therefore calls for proper platform for facilitation of student-parent interaction and a clear policy on this area.

The consequences of the challenges faced by students in secondary boarding schools include the following indiscipline cases as mentioned by the head teachers and deputy head teachers

Table 4.11: Consequences of the challenges

Indiscipline case	Frequency (number of teachers)	Percentage
Fighting	8	100%
Sneaking out of school	7	87.5
Burn the school	7	87.5
Strikes	6	75.0
Stealing	8	100
Abortion	5	62.5
Drug abuse	6	75.0

Source: Researcher (2018)

As mentioned by deputy head teachers and head teachers, depending on the nature and magnitude of the problem, the challenges faced by students may lead them to fight (100%), sneak out of school (87.5%), burn the school (87.5%), strike (75%), steal (100%), do abortion (62.5%) and drug abuse (75%)

Table 4.12: Causes of Problems Faced By Students

Cause	Respondents	Frequency	Percentage (%)
Interaction method	Students	294	89.2
	Teachers	8	100
Poor planning	students	52	48.2
	Teachers	5	62.5
Peer influence	students	211	63.8
	Teachers	8	100%
Laziness	Students	291	88.3%
	Teachers	7	87.5%
Lack of self-esteem	Students	264	79.9%
	Teachers	7	87.5%

Source: Researcher (2018)

According to (89.2%) students and (100%), students may lack pocket money, school fees, bus fare and uniform money because of poor interaction method. According to one of the head teachers,

“Mobile phone use by students in schools is illegal; there is therefore a restriction in accessing it. Meaning, the students may not be able to contact their parents in time for them to address their problems swiftly”.

If these problems for example: financial problems are not addressed in time may lead to lack of self-esteem (79.9%) students and (87.5%) teachers. When students lack self-esteem they may not plan well with their time hence, they become lazy. Laziness as mentioned by (88.3%) students and (87.5%) teachers and poor planning as mentioned by 48.2% of students and 62.5% of teachers may most likely lead to failure in their exams. Failure in exams may lead to withdrawal, sneaking out of school, organising for strike or even burning the school. Financial problems may also lead to stealing which is punishable by law.

According to 63.8% (students) and 100% of teachers, peer influence is another cause of problems faced by students in secondary boarding schools as it may lead to unwanted pregnancies. This may intern lead to abortion. Abortion may cause death if not handled properly. All these problems evolve around poor interaction. Because when a teenager is in constant and good relation with the parent or guardian they may not engage in sex or activities that harm them.

4.5. Suitable Functional Requirements for Automated Student-Parent Interaction Interfaces.

The researcher approached the concept of suitable functional requirement for automated student-parent interaction interface by first inquiring if indeed there was need for student-parent interaction methods.

Table 4.13: Need for Parents' Intervention in Matters Affecting Students in School

Attitude statement	strongly agreed	Agree	Undecided	Disagree	Strongly agreed
Degree	%	%	%	%	%
Need for student-Parent Interaction in school	62.58	26.81	5.4	1.3	1.3
The current interaction Methods are suitable	2.2	4.5	4.9	29	61.1
There is need for a suitable Student-parent Interaction method	83	9.8	4.9	2.7	2.2

Source: Researcher (2018)

A question was posed to the students on what extent they wanted their parents to be involved in the school matters. 62.5% strongly agreed, 26.8% agreed, 5.4% were undecided, 1.3% disagreed and 1.3% strongly disagreed.

The respondent were again asked to rate the current interaction methods if indeed they were suitable. 2.2% strongly agreed, 4.5% agreed, 4.9% were undecided, 29% disagreed and 61.1% strongly disagreed.

Researcher inquired if there was need for a replacement of the current interaction method with suitable interaction interface. 80.3% strongly agreed, 9.8% agreed, 4.9% were undecided, 2.7% disagreed and 2.2% strongly disagreed. The majority (86%) of the students who expressed need for parents' interaction on school matters were those who had already been exposed to student-parent interaction interface design and had used it to interact with their parents. The researcher inquired from the parents if they were okay being involved in solving their children issues while in school. 56% of the parents said yes and 44% said no.

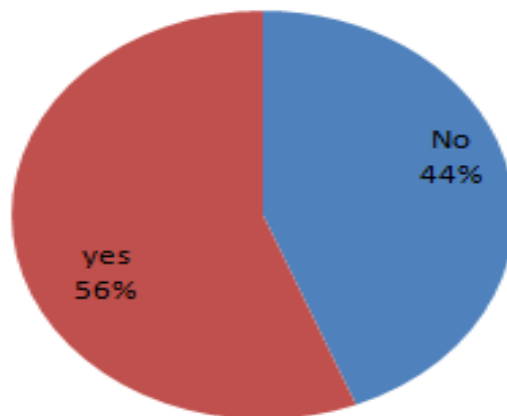


Figure 4.6: parents' involvement

Source: Researcher (2018)

4.5.1 Requirements for the nature of problems for interaction

Table 4.12: Students' Financial Problems

Problems	Respondents	Frequency	Percentage(%)
Inability to filter			
Information	Students	267	80.8
	Teachers	8	100
Inability to control			
Interaction process	students	293	88.8
	Teachers	8	100
Privacy			
	Students	159	48.2
	Teachers	4	50
Availability			
	Students	303	91.9
	Teachers	6	75

Source: Researcher (2018)

Some of the problems with current student-parent interaction method include inability to filter information. This was mentioned by 80.8% of students and 100% teachers. According to the respondent, information reaching the students should be filtered to avoid destructing them. Destructive information may lead to serious cases of indiscipline. Inability to control interaction process was mentioned by 88.8% of students and 100% of teachers. When students use mobile phones, it is not easy to track the

frequency of use and whether the type of people they are talking to are their guardians, parents, boyfriends, girlfriends or criminals like arsonists and even drug dealers.

Students (48.2%) want their conversation with their parents private. According to 50% of the teachers interviewed, students are not allowed to talk privately with their parents. Wherever they want to contact their parents, they must do so in the presence of a teacher as a way of controlling information that they may receive or pass to the recipient. The teachers then recommended a method that would filter information so that the students are allowed to interact privately with their parents.

Availability of an interaction method: This was mentioned by 91.9% of students and 75% of teachers. The teachers who are charged with responsibility of facilitating student-parent interaction may not be available and the student may not be able to communicate with their parents at that particular time. The respondent therefore recommends a method that would be available wherever there is need for interaction.

Students (61.7%) who were exposed to the proposed student-parent interaction interface design noted that the current method could not filter information exposing the students to destructive information. students (54.6%) mentioned the inability to control the interaction process as a failure. Students (96.3%) noted that they needed privacy as use of a teacher's phone would expose the problems discussed with parents. Students (54%) recorded that use of teachers' phones was dependent on that teacher's availability which was very inconveniencing to them.

Most of the parents (88%) talked about unavailability of the interaction method as a major setback in student-parent interaction. A farther (61%) of the parents were concerned about whom their children may get access to during the interaction and some (79%) still, were bothered about the kind of information that reach them.

Table 4.13: Destructive information

Information	Respondents	frequency	percentage(%)
Problems at home	Students	300	91.0
	Teachers	8	100
Information from Lovers	students	262	79.4
	Teachers	5	62.5
Information From arsonists	students	175	88.4
	Teachers	6	75.0
Information from Drug dealers	Students	51	47.8
	Teachers	3	37.5

Source: Researcher (2018)

Majority of the respondent (90.1%) mentioned problems at home as destructive information to the secondary boarding school students. Such information may stress them and expose them to psychological torture. Teachers (100%) interviewed all mentioned problems at home as the major destructive information to the students while in school. The students recorded that when they receive information about problems at home they are destructed and may fail in exams.

Student (79.4%) mentioned information from lovers as a very destructive information to the secondary boarding school students. According to 62.5% of teachers interviewed though there is restriction, students sometimes maneuver ways and use mobile phones to communicate to their lovers. Information they receive from them are destructive and may lead to withdrawal and even sneaking out of school.

Information from arsonists as mentioned by 88.4% of the students and 75.0% of the teachers is very destructive. Based on the findings students sometimes use mobile phones and other methods of interaction to contact arsonists. Arsonists help them burn their school by giving them money to buy fuel or sometimes buying for them. A student mentioned that students organised for burning of a dormitory through a mobile phone that was provided by the school.

The information from drug dealers facilitates access to drugs by the students in secondary boarding schools. Students (48.7%) lamented over this issue and according to them, current interaction methods expose them as they could easily order for drugs through the cell phones availed in school. Teachers (37.5%) also had the same observation and recommended a method that would filter information.

4.5.2 Requirement for Non Destructive Information on Students

table: 4.14 Consequences Destructive Information

Consequences	Respondents	Frequency	Percentage
			(%)
Student's unrest	Students	266	80.6
	Teachers	8	100
Academic failure	students	293	88.8
	Teachers	8	100
Sneaking out of school	students	281	85.3
	Teachers	6	75.0
Stress	Students	302	91.5
	Teachers	8	100
Burning of schools	students	320	97.6
	Teachers	8	100

Source: Researcher (2018)

Some of the effects of destructive information to the secondary school students are tabulated in the table 4.14. Teachers (100%) mentioned student unrest as one of the effects of destructive information in public secondary boarding schools. This was also mentioned by 80.6% students. Teachers (100%) mentioned student's academic failure as one of the effects of destructive information in public secondary boarding schools

and 88.8% of the students had the same observation. Teachers (75.0%) mentioned sneaking out of school as one of the effects of destructive information in public secondary boarding schools. This was also mentioned by 85.5% of the students. Teachers (100%) mentioned stress as one of the effects of destructive information in public secondary boarding schools and 91.5% of the students had the same opinion.

4.6 Requirements for a Suitable Student - Parent Interaction Interface

Table 4.15: current interfaces suitability

Suitability	Respondents	Frequency	Percentage (%)
Information filter	Students	209	93.3
	Teachers	8	100
	Parents	100	56
Privacy	students	206	92.0
	Teachers	5	100
	Parents	0	0
Control	students	189	84.3
	Teachers	6	75.0
	Parents	130	73
Availability	Students	193	86.2
	Teachers	5	100
	Control	126	71
Cost effectiveness	Students	150	67.0
	Teachers	8	100
	Parents	101	57

Source: Researcher (2018)

Researcher sought to understand some of the issues that needed to be addressed by the automated interface design for student parent interaction. Most of the responses were based on addressing the weakness of current interaction methods. They include; Information filters at 93.3% for students and 100% for teachers. Privacy as mentioned by 92.0% of students and 50% of teachers, Control that was mentioned by 86.2% of students and 75.0% of teachers and Availability was also mentioned by 86.2% students and 100% teachers. Another concern was cost effectiveness. The teachers recommended a system that would not be very expensive to establish and maintain. All the teachers (100%) interviewed wanted affordable system, 67.0% of the students had the same opinion.

The parents interviewed during this study also had some contributions on the features of a good student-parent interaction platform. Parents (71%) mentioned that their children complained that they hardly get the chance to use the interaction platform partly because sometimes the individual charged with the responsibility may not be in school, or the other students are using it too frequently and for too long denying others chance of using it. The parents (73%) therefore suggested that there should be some control in order to serve all the students. Parents were also worried about whom their daughters may contact using the mobile phones provided in school, and what type of information they would get access to, 56% recommended a platform that filters information to enable their children get access to the right information. Parents (57%) advised that a suitable platform should not be too expensive to maintain as the students may not be able to afford to use it.

4.7 Platform for Student-Parent Interaction

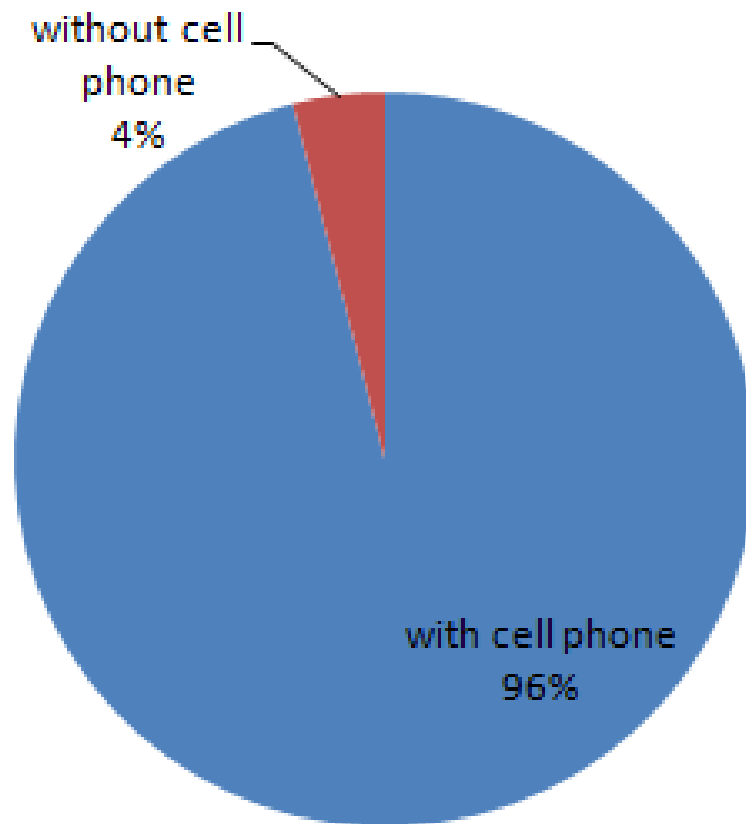


Figure 4.7 parents with cell phones

Source: Researcher (2018)

Figure 4.7 shows that 96% of the parents interviewed had cell phones while 4% of them did not have cell phones because most of them had either lost them or had them damaged and had an intention of acquiring one.

4.8 Requirements for Parents to Retrieve and Read Messages

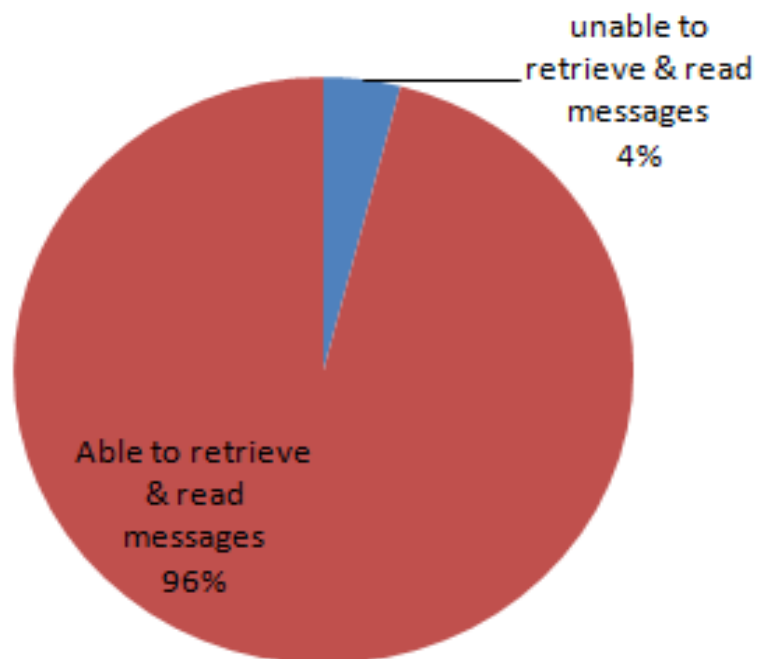


Figure 4.8 parents' retrieval

Source: Researcher (2018)

Most parents, (96%) are able to retrieve and read messages. Only 4% are not able to do so, meaning, most parents will be served well by the system and it is assumed that those who are not able to retrieve and read messages from their mobile phones would always seek help from their neighbours or friends.

4.9 Findings Analysis

The interaction interfaces available in schools are: mobile phones, letters and e-mail. 98.49% of the students use cell phones to interact with their parents because it is easily available to them, it is easy to use, the feedback is immediate and most of their parents (96%) have cell phones. Letter writing is not popular among the students because, in most cases, it does not reach the parents in time, and so the feedback delays. Only few parents have e-mail accounts. Some students (8%) whose parents have e-mail accounts occasionally use it to interact with them. Bigger percentages of the students (92%) get the cell phones from their teachers, the policy implementers. 38% of the students interact with their parents once a week, 28% do it once a month, 24% do it once a term and a small percentage (10%) do it every day. 62% of the students interact with their parents at 4.10pm-6.00pm, 23% of them interact with their parents at 10am-10.20am and 15% of them interact with their parents at 1.00pm-1.20pm. There is need for some control so that students are all offered equal chance to access the available interaction interface.

The students discuss many problems with their parents. The problems can be grouped into three categories which are; finances, academics and social issues. Many at times the parents help them solve the problems after sharing with them. Apart from parents, they confessed that they also interact with sisters, brothers, boyfriends, girlfriends and other strangers. The students said that in their cell phone conversations, they sometimes received destructive information like family problems, information about their lovers and others received issues like cases of drugs and arsonist attacks. This is alarming and it calls for a swift move towards establishing a suitable student-parent interaction interface. 96% of the parents interviewed had mobile phones. The parents said that they occasionally talked to their children in secondary boarding schools through the mobile

phones and would discuss academic, social and financial issues. 96% of the parents with mobile phones are able to retrieve and read messages. They narrated that sometimes they received messages from school sent by teachers or school heads.

CHAPTER FIVE

INTERPRETATION AND DISCUSSION

5.1 Introduction

This chapter interprets and discusses the findings from information gathered by the researcher to establish the need for suitable student-parent interaction platform in secondary boarding schools. The research result was a good source of information for drawing out conclusions into factors that can hinder or promote adoption of the interface in secondary boarding schools in Kenya. The results are discussed in two main categories based on research objectives.

5.2 Existing Students-Parents Interaction Interfaces in Secondary Boarding Schools

According to the findings, student-parent interaction interfaces existing in Kenyan secondary boarding schools include cell phones, letters and e-mail. 98.49% of the students in secondary boarding schools use cell phones to interact with their parents. Cell phones provide a convenient and direct student-parent interaction in case of an emergency. Kenyan secondary boarding school students are banned from carrying and using mobile phone while in school, but despite the ban, the students still use cell phones. In most schools (75%), there is one students' cell phone provided by the school administrator and kept by the boarding teacher. The students use the phone during tea break, lunch break and in the evening before night preps.

Research established that (98%) of the students have at one point or the other interacted with people who are neither their parents nor their guardians using the mobile phones they are provided with in school. The cell phone interface does not filter information and students get access to pieces of destructive information like, problems at home,

information about their lovers, and information on drugs which make them get involved in crimes like arsonist attack, sneaking from school and taking drugs. The existing student-parent interaction interfaces lack tools and features for access control. Some students use the school cell phone so frequently and may take too long on the phone hence denying their colleagues chance to access the interface.

The school administrators use cell phones, letters and e-mail to interact with parents. The administrators provide the students with letters whenever they are sent home. The letters are usually addressed to the parents outlining reasons for sending the students home. Only 9.55 % of the students use letters to interact with their parents. A letter is not a popular interface, it does not provide immediate feedback, the delivery process is very slow and it may not reach the recipient in some cases.

The 5% of the school administrators and 4% of the student's population use an e-mail interface to interact with parents. The administrators send copies of documents to parents by attaching files and images. One advantage of this interaction interface is the proof of receipts or email being opened. This interaction interface is not effective as both the sender and receiver must have an active e-mail account and this is not the case with most Kenyan parents. Most parents do not have active email accounts. Some change their email addresses as often as they switch Internet Service Providers (ISPs) while others rarely check their e-mail accounts. In some cases, the email boxes become too full to receive extra messages. And just like the cell phone interface, the students may use the e-mail interface to interact with strangers.

The students in Spain and Singapore use a Classroom Webpage Interaction Interface (CWII). According to Candler (2010), using the classroom webpage enables the learning process to take place anytime anywhere. Students can access class notes and

curricular resources even when they are at home. This help the parents monitor their children's progress and discover their weaknesses. The classroom webpage could be a better interface compared to cell phones because the interaction strictly involves the students, teachers and parents and being a public media, members only post constructive pieces of information. The major shortcoming is that the discussion is limited to student's academic progress only and the Kenyan parents, not having embraced the use of internet as an interaction interface may not easily adapt to the system. According to the findings, only 20% of the parents are able to access e-mail account and other internet services. This may pose a serious challenge in trying to employ the classroom webpage interface in Kenyan secondary boarding schools. The interface, being a public social media, bars the students from posting their personal problems. The parents can only get information on general progress of all the students in the classroom. The system is mainly teacher centred. Its content is teacher defined. Parents and students are only there to view whatever the teachers have posted and maybe comment on it. This makes the classroom webpage interface unsuitable for student - parent interaction in Kenyan secondary boarding schools.

According to Naditz (2015), Collaborize Classroom is an interface which provides a safe and protected way to engage students in activities. The interface that was developed by Democrosoft is mostly used in Santa Rosa and California. It is designed to complement classroom instruction and engage students in online activities, assignments and discussions that allow for deeper participation inside and outside the classroom. This interface limits interaction to teachers and students only and cannot help much in case the student wants to interact with the parent.

According to Java (2011), Buzz Mob is a cross-platform interaction tool that connects and engages classroom and school communities. It offers educators the simplest, most

effective way to send vital updates and semi-personal messages to parents and students. Buzz Mob allows teachers and school administrators to create updates in one simple place. Parents and students can choose to receive information via web mobile application, E-mail or short messages. Buzz Mob saves teachers time and energy and provides parents and students a simple secure experience that keeps them updated and engaged. Just like classroom webpage, this application is for interaction between teachers, administrators, parents and students. It has no privacy and students are not able to post their personal problems.

The Teacher Apps and Grade Book enhance collaboration between teachers, parents, students and schools administrators. It offers individual user interface for teachers, parents and students. Teachers can share any information with parents instantly. It also allows the individual users like parents, students and teachers to send individual messages or group messages. These applications used by most schools in United States may be suitable to Kenyan situation if all parents embraced the use of internet as it enables students, parents and teachers to interact freely. The system provides each category of people with their interface. There is specific interface for students, and it is different from the parents' interface and it is also different from the teachers' interface. The only problem is the lack of privacy because any post on student interface is public for all the other students, and the same applies to parents' and teachers' interface. This makes the interface unsuitable for one on one interaction and more especially in cases where the students have personal problems to discuss with their parents.

Reminder 101 is a free messaging app that helps teachers, students and parents interact quickly and efficiently. By connecting school communities, Reminder 101 makes it easy for everyone to interact. Reminder 101 is based in San Francisco CA and is used by more than 35 million people in and out of USA school district. It does real-time

messaging for school group or just a single person. Classroom teacher and school administrators are able to send messages via the interface. The parents get important school updates and interact with the school through the interface. Students are able to get messages that go straight to their phones and this feature automatically disqualifies the interface as the students in Kenyan secondary boarding schools are not allowed to carry cell phones to school.

5.3 Suitable Functional Requirements for Automated Students-Parents Interaction Interfaces Used in Secondary Boarding Schools

5.3.1 Students' Requirement

Researcher sought to understand some of the requirements for a suitable student-parent interaction platform. Issues that needed to be addressed by the automated interface design for student parent interaction were information filtering, privacy, control, availability, and cost effectiveness. The responses highlighted the weakness of the current student-parent interaction platform. 93.3% of the students noted that in one or two occasions, they had received stubbing information from parents, siblings and friends through mobile phones provided by school. These kinds of information destructs and may negatively affect their academic performance and general discipline. A student explained that the Ministry of Education was right in banning mobile phones in schools as the few who are able to sneak into school with them use them to promote immorality and serious indiscipline cases. 100% of the students who were exposed the student-parent interaction interface mentioned something on information filtering.

Some pieces of information they are exposed to include; problems at home: 90.1% of the respondent mentioned that sometimes their parents share with them information on domestic problems. The students also get information about their boyfreinds and lovers,

this was mentioned by 79.4%. According to 62.5% of teachers interviewed, going by some of the indiscipline cases handled in schools, though there is restriction, students still maneuver ways and use mobile phone to communicate to their lovers. Information they receive from them are destructive and may lead to withdrawal and even sneaking out of school. Information from arsonists as mentioned by 88.4% of the students and 75.0% of the teachers is very destructive. Based on the findings, students sometimes use mobile phones and other methods of interaction to contact arsonists. Arsonists help them burn their school by giving them money to buy fuel or sometimes buying for them. A student mentioned that students organised for burning of a dormitory through a mobile phone that was provided by the school. The information from drug dealers facilitates access to drug by the students in secondary boarding schools. 48.7% of the students lamented over this issue and according to them, current interaction platforms expose them as they could easily order for drugs through the cell phones availed in school. 37.5% of teachers also had the same observation and recommended a platform that would filter information.

A suitable student-parent interaction interface should promote a safe environment at school and help students make good decisions (Ochad, 2013). There is evidence that the current interaction platforms are not suitable as they expose the schools to a lot of problems like students unrest, academic failure, sneaking out of school and stress. Some of the effects of destructive information to the secondary school students as mentioned by 100% of the respondents (teachers) are; student unrest, this according to teachers, sometimes is triggered by outsiders by interacting to students through mobile phones. 80.6% of the students mentioned the same problem. Other problems include academic failure as mentioned by 100% of the respondents (teachers), and 88.8% of the student, sneaking out of school was mentioned by 75.0 % of the respondent (teachers) and by

85.5% of the students. 100% of the respondents (teachers) mentioned stress as one of the effects of destructive information in public secondary boarding schools. 91.5% of the students had the same opinion. As mentioned by 96.7% of students and 100% teachers, destructive information may also lead to burning of schools. The community around the school may have reasons to burn the school or may support the students in burning their school through mobile phone interaction.

Other than their parents students have interacted with their siblings and friends using mobile phones provided by schools. Some students (73.43%) revealed that they use mobile phone to interact with people who are neither their parents nor guardians. They were concerned about the kind of information they are exposed to when they use mobile phones. A suitable interface in their opinion should filter pieces of destructive information and bar the students from interacting with strangers.

48.2% of students proposed a platform that promotes private student-parent interaction. Some of their problems, as they put it, were serious private issues and would get seriously affected if they were made public. 50% of the teachers interviewed said that students were not allowed to privately use mobile phone, but would do so in the presence of a teacher or the person in charge. This according to the respondents was a way of controlling type of information passed to the recipient from the students but not from recipient to the students and students would still get access to destruct information. After being exposed to the proposed automated interface design for student-parent interaction, 100% recipient recommended a platform that is able to filter information from and to the students so that with this in place, students can be allowed to interact privately with their parents.

The mobile phones used by students in school are kept by individuals. Most of the students (98.6%) get mobile phones from their teachers, 0.93% from the support staff and 0.47% of students get mobile phones from their fellow students. Students are not able to access mobile phones when these particular individuals are absent. Availability of the interaction platform was of great concern and was mentioned by 91.9% of students and 75% of teachers. Teachers and other individuals charged with responsibility of facilitating student-parent interaction may not be available and the student may not be able to communicate with their parents at that particular time despite the urgency of the matter. 100% of respondent who interacted with the proposed automated interface design for student-parent interaction recommended a platform that would be in a strategic place which remained open on the stipulated time for student-parent interaction.

In their view, Student-Parent interaction platforms in secondary boarding schools should be user friendly, efficient, reliable, possess features that enable system control and have the ability to filter destructive information. 95.65% of the students were displeased with administrators' inability to control the student-parent interaction process as one student would use the cell phone interface as many times as they needed to do so denying their colleagues the opportunity to interact with their parents. A suitable student-parent interaction interface should inclusively provide the administrators with tools for controlling the interaction process. It should be able to control the number of times a student logs in into the interface and should control the duration taken when using the interface.

The research established that the students pay much money for the interaction services offered to them. 94.20% of the students complained of the charges. To them, a suitable

automated student-parent interaction interface should not be expensive to maintain so that the students are not charged a lot of money for using the interface.

According to the findings, 88.41% of the students required a reliable interaction interface. The current interfaces, especially the letters, were unreliable as they did not reach the parents in time, hence delaying the feedback, or in some cases they would not reach the parents at all. The e-mail interface was also unreliable as some parents took too long to check their mails and so the feedback was not immediate. The automated interface enables the students to send short messages to their parents' phones. The messages reach the parents as soon as they are sent and they respond by acting on their children's request or by calling the schools administrators.

Question was posed to the students on what extent they wanted their parents to be involved in the school matters, 62.5% strongly agreed, 26.8% agreed, 5.4% were undecided, 1.3% disagreed and 1.3% strongly disagreed. The respondents were again asked to rate the current interaction methods if indeed they were suitable, 2.2% strongly agreed, 4.5% agreed, and 4.9% were undecided, 29% disagreed and 61.1% strongly disagreed. Researcher inquired if there was need for a replacement of the current interaction method with suitable interaction interface, 80.3% strongly agreed, 9.8% agreed, 4.9% were undecided, 2.7% disagreed and 2.2% strongly disagreed.

The majority (86%) of the students who expressed need for parents' interaction on school matters were those who had already been exposed to student parent interaction interface design and had used it to interact with their parents. The researcher inquired from the parents if they were okay being involved in solving their children issues while in school. Most of them were for the idea, 56% of the parents said yes and 44% said no. The students want their parents to address their problems. The problems are categorised

into financial, academic and social. The interface designs a list of students' likely problems as per the findings based on the three categories. The student operates the system by selecting their problems from the menu and sending it as a short message to their parents. The student (84.54%) needed an interface which is fast. This design will enable many students to use the system within a short duration as it will be easy and fast to operate.

5.3.2 Head Teachers and Deputy Head Teachers' Requirement

The school administrator mainly required an interface that would not interfere with the normal running of the school. According to them a speedy interface would help to serve the large number of students very fast within the short time available in the school schedule. They were also particular about the type of information the students pass to and receive from their parents. It meant, therefore, that the interface had to be able to filter information from either side so as to discard irrelevant information. The design took into account all these requirements by incorporating features that make the interface fast, user friendly and be able to filter information.

5.3.3 Parents' Requirement

In the table 4.10, the researcher inquired from the parents some of the issues they discussed over the phone with their children in boarding secondary schools whenever they call from school. They mentioned academics (99.3%), social problems (88.5%) and financial problems (90.9%). The parents and the students discuss academic problems like poor performance, need for revision materials and text books among others. Some parents, having acknowledged that domestic problems' information is destructive to their children still discuss them with them while in school. The parents interviewed during this study also had some contributions on the features of a good student-parent

interaction platform. The parents (71%) mentioned that their children complained that they hardly get the chance to use the interaction platform partly because sometimes the individual charged with the responsibility may not be in school, or the other students are using it too frequently and for too long denying others chance of using it. The parents (73%) therefore suggested that there should be some control in order to serve all the students. Parents were also worried about whom their daughters may contact using the mobile phones provided in school, and what type of information they would get accessed to. Good number, 56% recommended a platform that filters information to enable their children get access to the right information. Parents (57%) advised that a suitable platform should not be too expensive to maintain as the students may not be able to afford to use it.

5.4 Requirement for Developing Student-Parent Interaction Interface

The interface should have an account for each student. A student logging in for the first time uses registration number as the user name and creates a password that can be changed thereafter for privacy and confidentiality. The interface requires a menu containing a list of students' likely problems as derived from the research findings. Problem menus restrict the students to constructive interaction as they only need to select their problems from the menu and the interface automatically sends it to their parents' phone numbers. This feature enables the interface to work fast enough to be used by the large students' population in most boarding secondary schools. This feature will also help meet the school administrators' requirements. According to the finding, 100% of the administrators require an interface which filters information and blocks destructive information from reaching neither the students nor the parents.

The interface needs to limit the student-parent interaction to just selecting an item from a menu. There is a need for a good students' database with accurate information on parents' cell phone numbers to help limit chances of interaction with any stranger. For control, the interface limits the number of log in to ten times in three months, and interaction duration to only one minute, after which the system is to automatically be switched back to the homepage. The students can use the interface again only after one hour. The interface administrator should be able to log in and register new students, deregister absent students and update the problem menu.

5.5 Prototype Design

Design is the creation of a model for the construction of a system. Modelling is one of the first steps that were undertaken during the process of system design. A model is a simplification of reality or a simplified representation used to demonstrate the working of the actual system. According to Boch et al., (1998), a model provides a blueprint of the intended system. The purpose of this section is to outline the steps and decisions taken by the researcher in the development of the interface design to address the requirements of automated interface design for students-parents interaction in boarding schools.

5.5.1 Interface Design

According to Rolf (1984), Interface Design is the development of a clear structure of the interface based on the requirement specification. The interface structure should provide a logical view of the actual system. The designer was guided by the following experimental design principles during the design stage.

The users are the teachers (system administrators), parents (recipients) and students (senders). The researcher established the students' population per school. (50%) of the

schools visited had over 800 students, (25%) had between 500 to 800 students and the rest had a population that was slightly less than 500. According to the findings, (95%) of the student population are between the age of thirteen and eighteen. This age group, according to Unified Theory of Acceptance and Usage of Technology (UTAUT) easily accept and embrace new technology (Ayman, 2014).

The administrator will register new students, deregister absent students and update the problem menus. The menus contain a list of likely problems faced by the students as derived from research findings. The problems are classified into three categories which are, academic, social and financial. The student's task is to log to the system by keying in the correct password and user name, and then selects an item from the problem menu and send it by clicking the "OK" button. The parents' task is to retrieve the message and act on it. The researcher used object oriented analysis and design

5.5.2 Object Oriented Design

The designer studied two different principles widely used in interface design; the object oriented design and structured design. Object oriented design was preferred to structured design because of its suitability for sustaining huge instance interaction software. Borrowing from Boehm (1999), the design process was divided into five stages: abstract descriptions of the problem, designs stage, coding, testing and finally deployment

The automated interface design for student-parent interaction in boarding schools passed through all the five stages of object oriented development. The goal of the analysis phase was to create a functional model of the interface regardless of constraints such as appropriate technology. This was done via the following set of graphical system models: interface illustration model, sequence diagram model, use case model, data

flow diagram, class model diagram and flow diagram for the front page. Structural models of software were used to display the organization of the student-parent interaction interface in terms of the components that make up that system. Emphasis was laid on describing the various objects, their data, behaviour and interactions.

5.5.3 Parent Student Interactive Interface

Borrowing from other interactive interfaces like Collaborative Application, Buzz Mob, and Teacher App & Grade Book and with the guidance from other literature reviewed earlier the designer came up with the following student-parent interaction model.

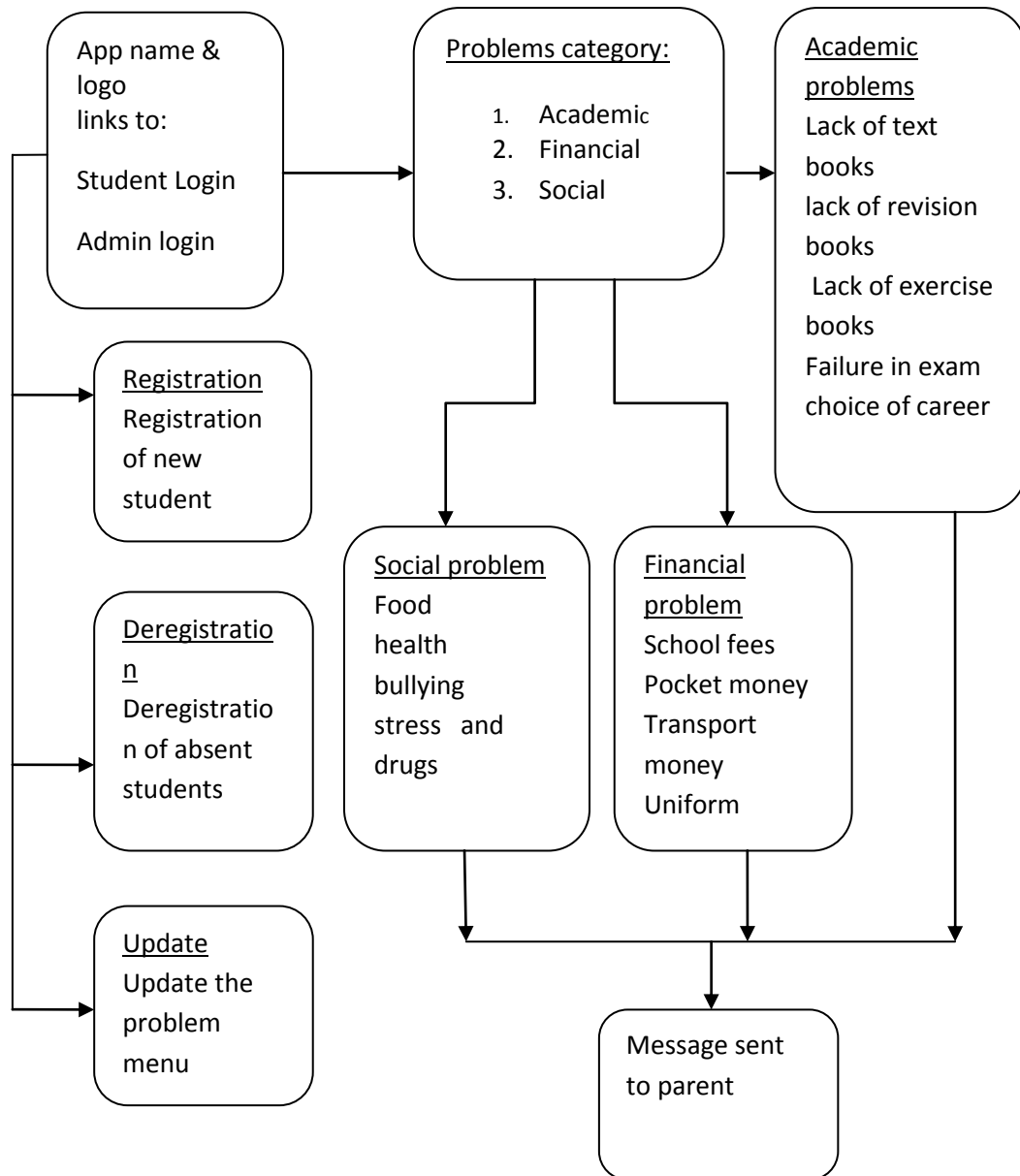


Figure 5.1 Student-Parent interface model

Source: Researcher (2018)

Figure 5.1 is an interface illustration diagram. It represents two major processes, the student login and Administrator login. The data flow is represented by arrows. The students login to select an item from the problem menu, and the administrator logs in to register students, deregister students and update the problem menu.

5.5.4 Use Case Diagram for student-parent interaction

CASE DIAGRAM

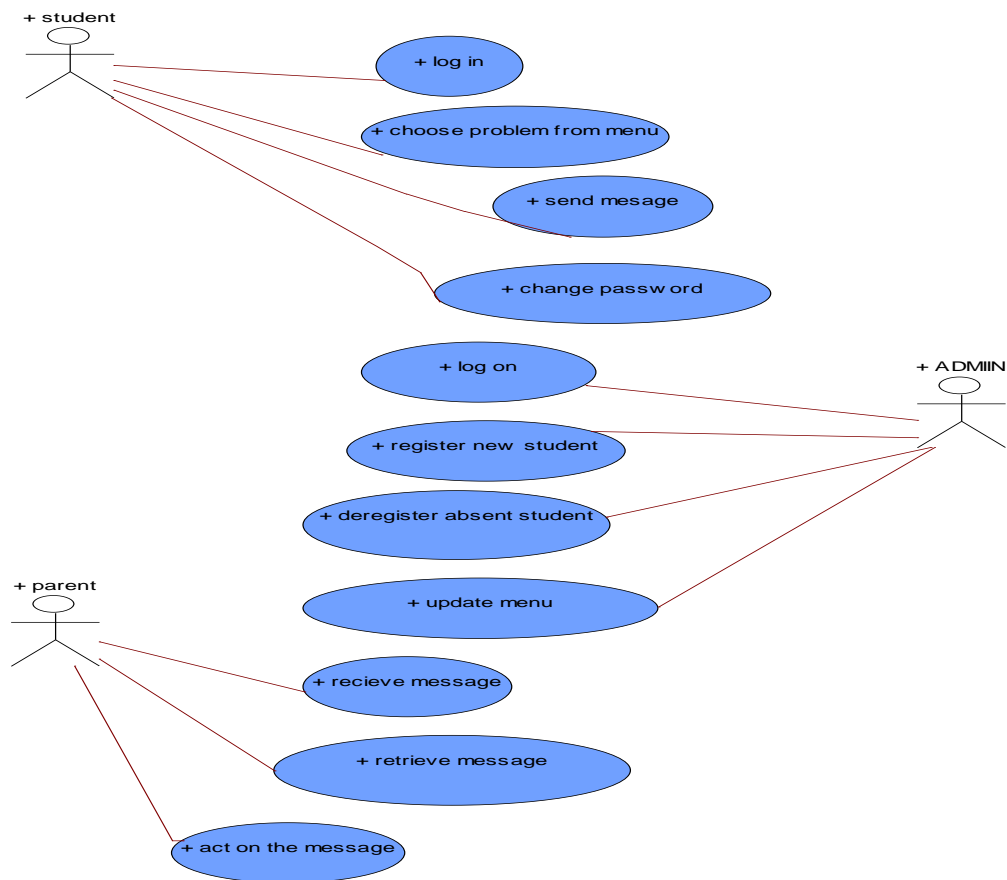


Figure 5.2 use case diargm

Source: Researcher (2018)

Use case is an effective bridge between usability engineering and user interface design, Larry (1999). It constitutes a complete course of interaction that takes place between an actor and the system. A detail use case is shown in figure 5.2. It shows essential components of student-parent interaction interface, how they relate to one another and entities that interact with each other. The actors in this context are the students (sender), teachers (system administrator) and the parents (recipient).

5.5.5 Sequence Diagram for student-parent interaction

sequence model

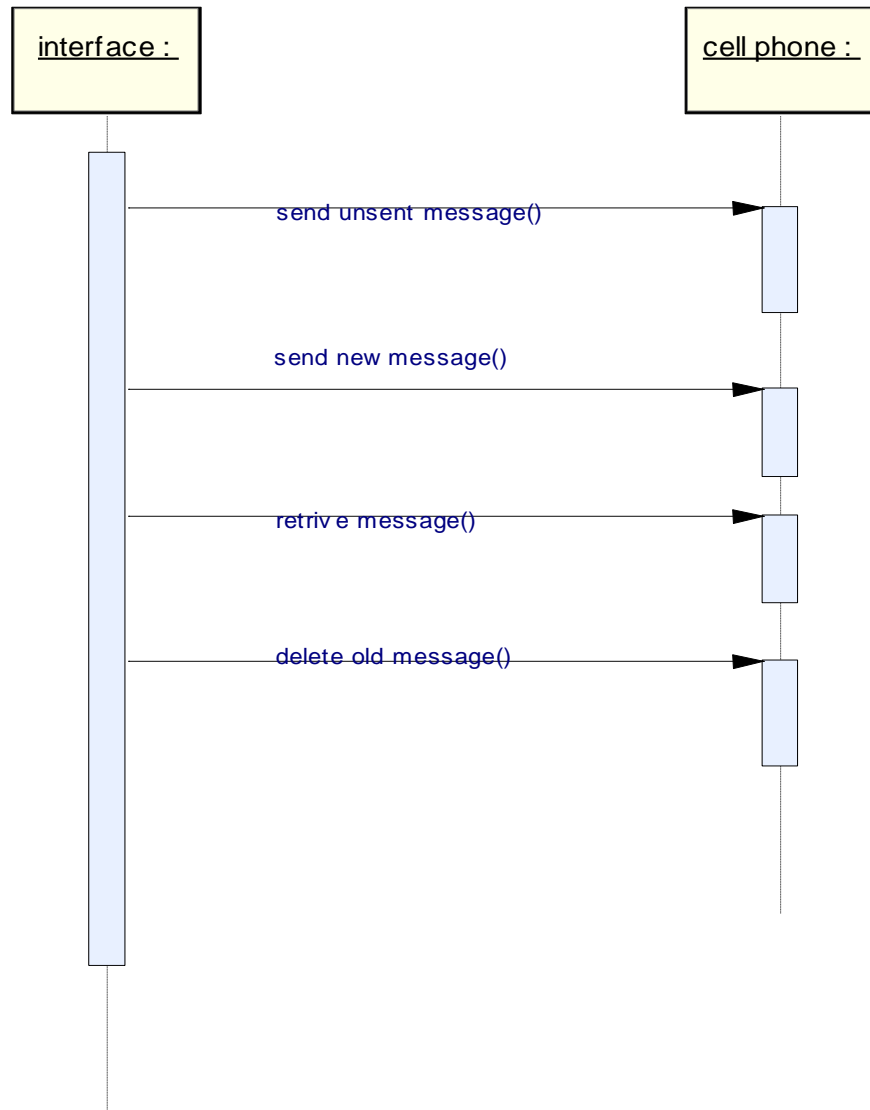


Figure 5.3: sequence diagram

Source: Researcher (2018)

As discussed earlier the students log in to the system using their password, the code is verified then the student is allowed to interact with the interface as illustrated in the sequence diagram as shown in the figure 5.3.

5.5.6 Data Flow Diagram for student-parent interaction

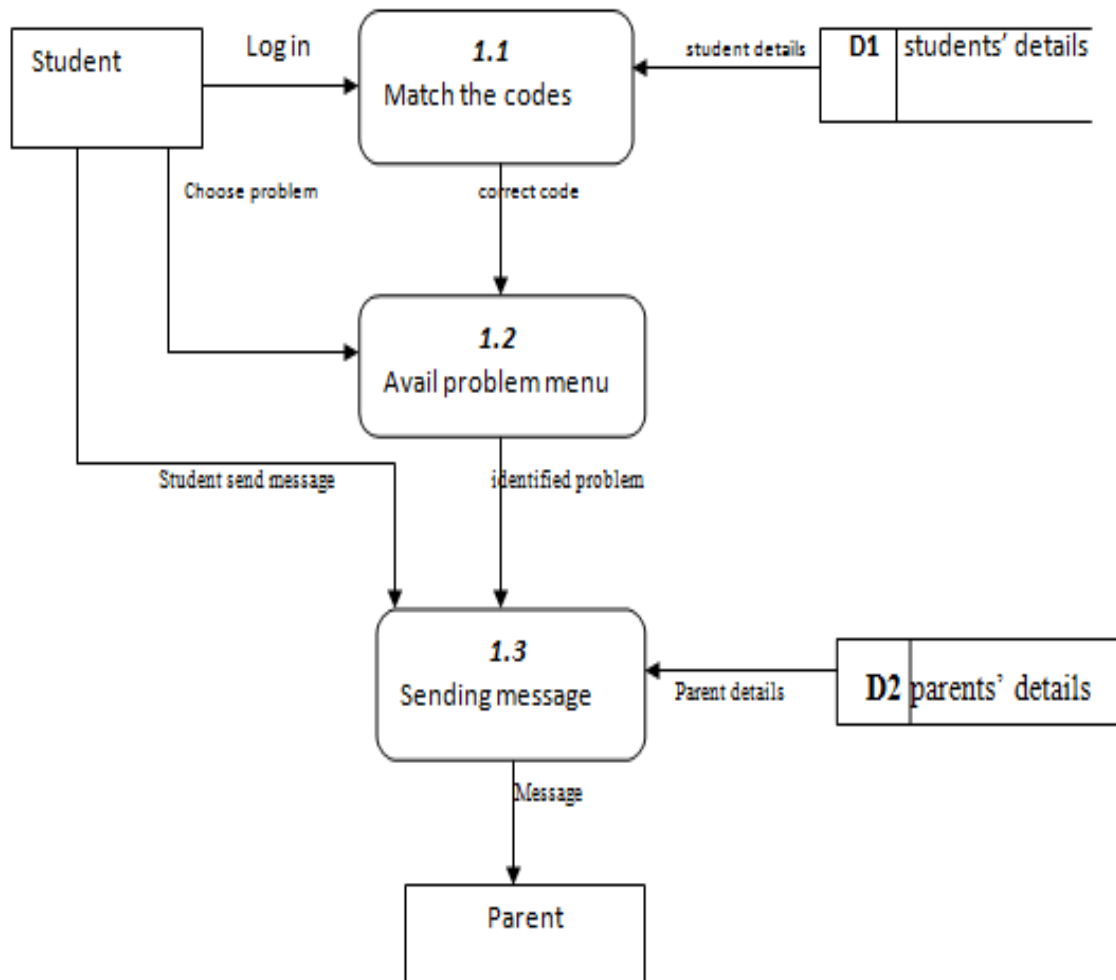


Figure 5.4 dataflow diagram

Source: Researcher (2018)

Figure 6.5 shows procedural flow of control between user (student), interface and parent while handling various activities. The process starts by student (user) logging into the interface and parent retrieving the message sent.

5.5.7 Class Model Diagram for student-parent interaction

interaction interface

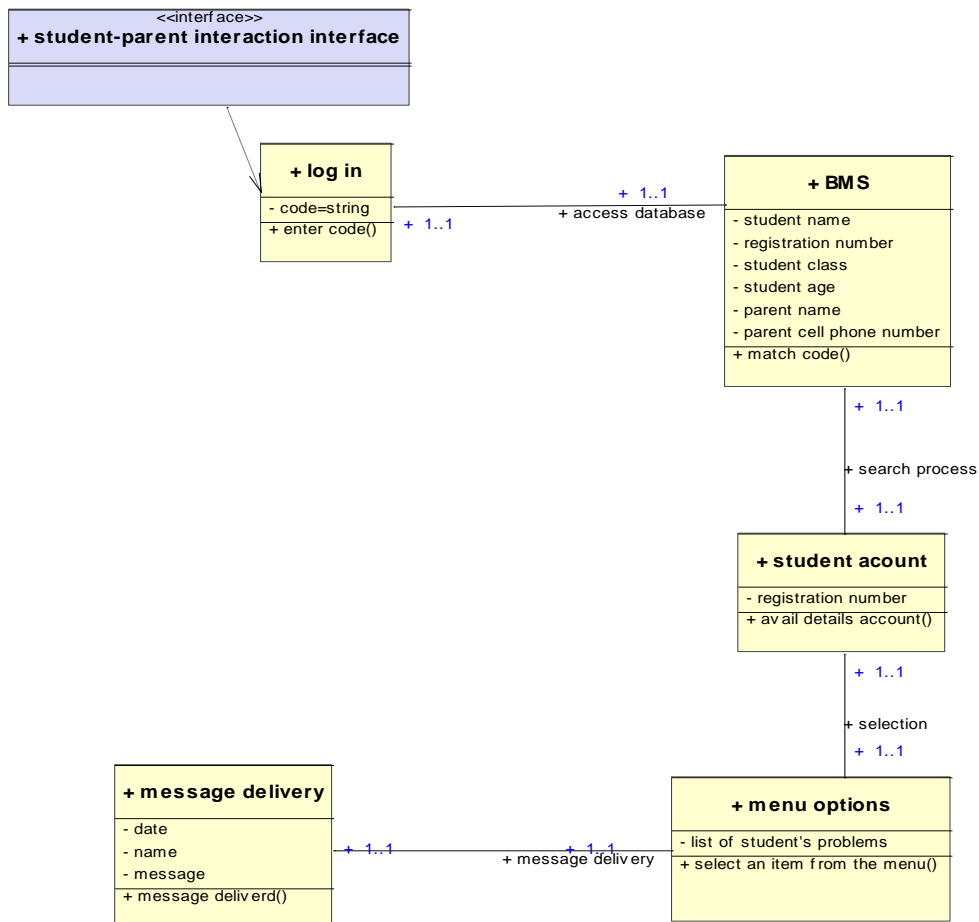


Figure 5.5: Class Model Diagrams

Source: Researcher (2018)

The class model diagram in figure 6.6 was used to display the various entities involved in the automated student parent interaction interface and their relation. It conceptualizes the automated student-parent interaction interface by displaying various important classes in the interface. Some of these classes include log in, menu options, student account and others.

5.5.8 Flow Diagram for Front End

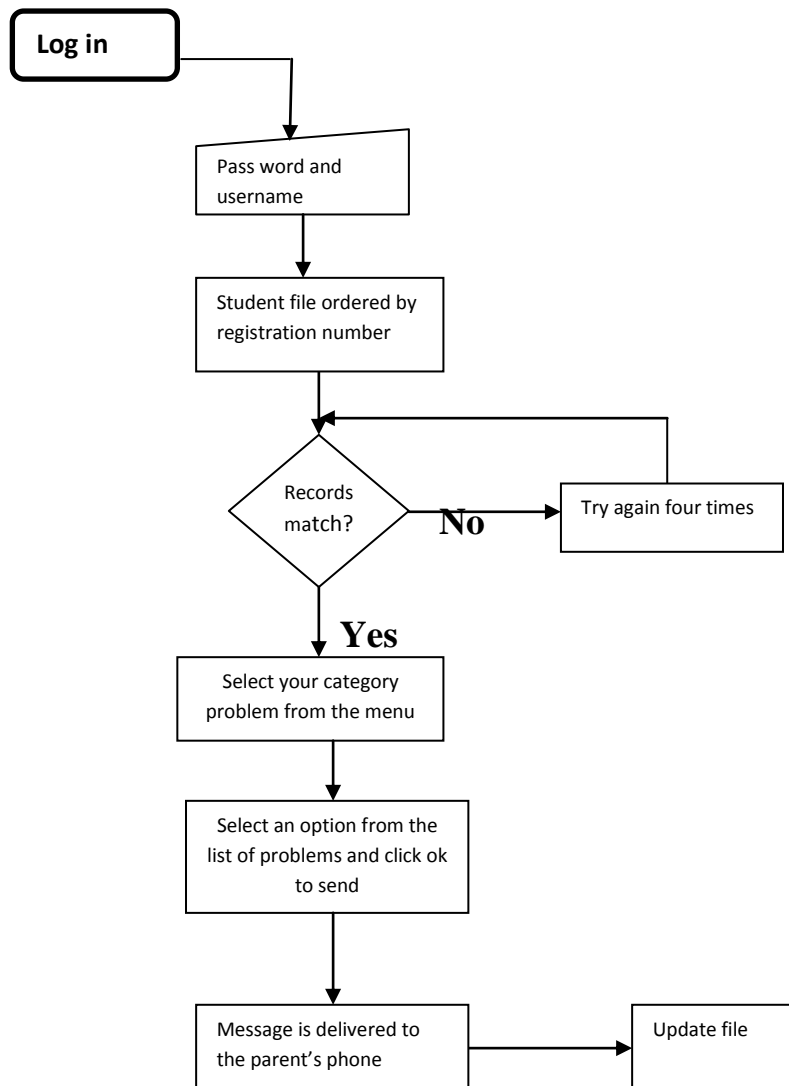


Figure 5.6 Flow Diagrams for the Front End

Source: Researcher (2018)

The flow chart diagram shown above depicts a clear simple orientation of different branching within the system. The student logs in using password and username. Other processes are then executed according to the options available.

5.6 The Prototype Front End

Front end of the student parent interaction interface is the application that the students and teachers interacted with during information gathering. It is the part of the interface that enabled the students and teachers to access and request for the services of the interface for it to deliver messages to their parents.

The front end of an interface is what the user sees; it's distinctly human. The user is able to touch and interact with it to gain experiences. In interface front end design, empathy is a required characteristic of a good front end developer. The front end of an interface is more about how a user interprets the interface into an experience. Table 5.1 shows how the students interact with the interface.

Table 5.1 Student's action

Step	Action	Expected system Response	Pass/fail	comment
Pre-conditions Password: 6-12 characters, user name is the student registration				
1	Log in with non-existing user details	Not logged in “error, wrong details four attempts left”	fail	ok
2	Log in with existing user name but wrong password	Not logged in “the password entered was not correct three attempts left	fail	ok
3	Logged in with the correct password and user name	Avail the three available categories of student's problem	pass	ok
4	Select one category from the menu	Avail the list of problems in this category	pass	ok
5	Select your problem and click “OK” button	Display “message is sent”	pass	ok
6	Attempt to select another item from the menu	Display “access denied come back after 48 hours”	fail	ok

Source: Researcher (2018)

The students interacted with the interface by inputting both valid and invalid data. Every section worked accurately as per the expectation. The figures below show how the interface appears.



Figure 5.7 Home page

Source: Researcher (2018)

Figure 5.7 is a screenshot showing the home page for the interface which bears the interface name with an attractive image and “OK” button below it. It was designed based on the user’s requirement and the guidance from the literatures studied during literature review stage. The student clicks the “OK” button to navigate through to log in page, see figure 5.8.

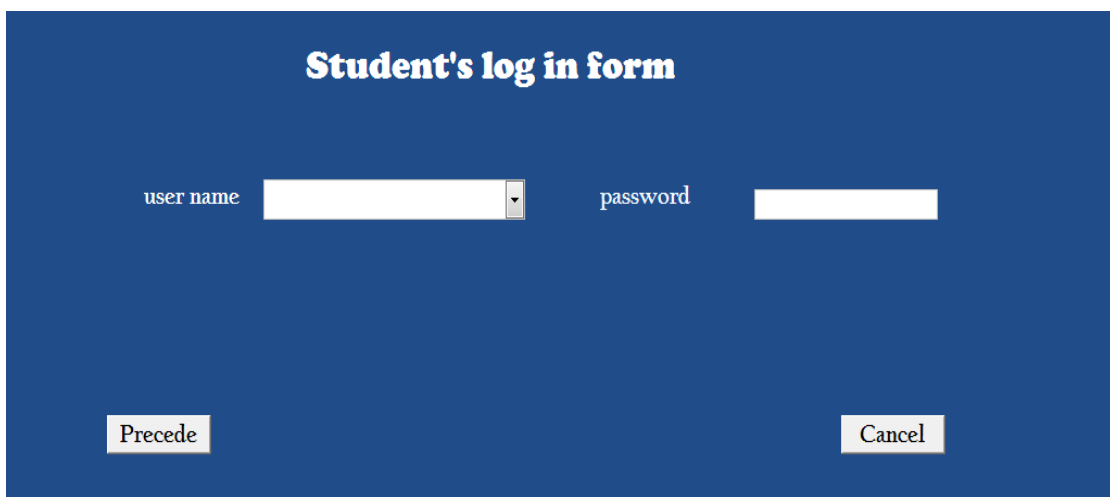
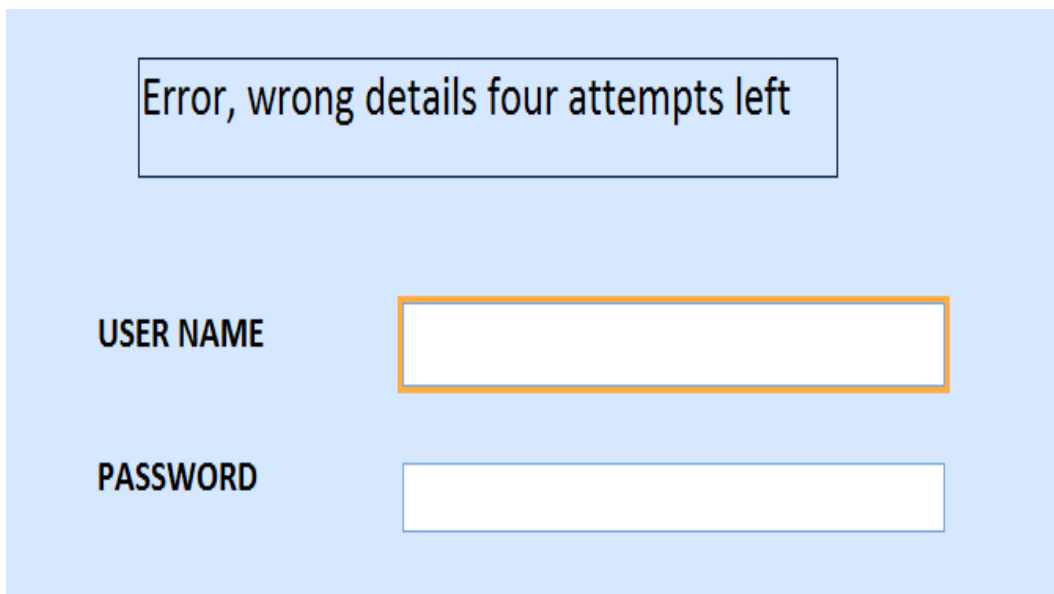


Figure 5.8: Student's log in space

Source: Researcher (2018)

Figure 5.8 shows log on form with two command buttons: the “Cancel” button takes the student back to home page and is used to cancel wrong operation. The “Proceed” button takes the user to the next page after carrying out the right operation. The form also enables the student to enter user name and password then presses on the “OK” button which avails other pages. When an admission number is entered, the application searches the database to find a record that matches the data. The interface displays an error message when no such data is found in the database as shown in the figure 5.9.



The image shows a light blue background with a white error message box at the top center containing the text "Error, wrong details four attempts left". Below this, there are two input fields. The first is labeled "USER NAME" and has an orange border. The second is labeled "PASSWORD" and has a blue border.

Figure 5.9: Incorrect Login Credentials Interface

Source: Researcher (2018)

Figure 5.9 screenshot shows what happens when a wrong data is entered. When wrong credentials are input, the interface gives the student four chances to enter the correct ones. When the students enter the correct admission number and the password, the interface takes them to the main menu page shown in figure 5.10.

When the student enters the correct details the interface avails menu page shown in figure 7.5.

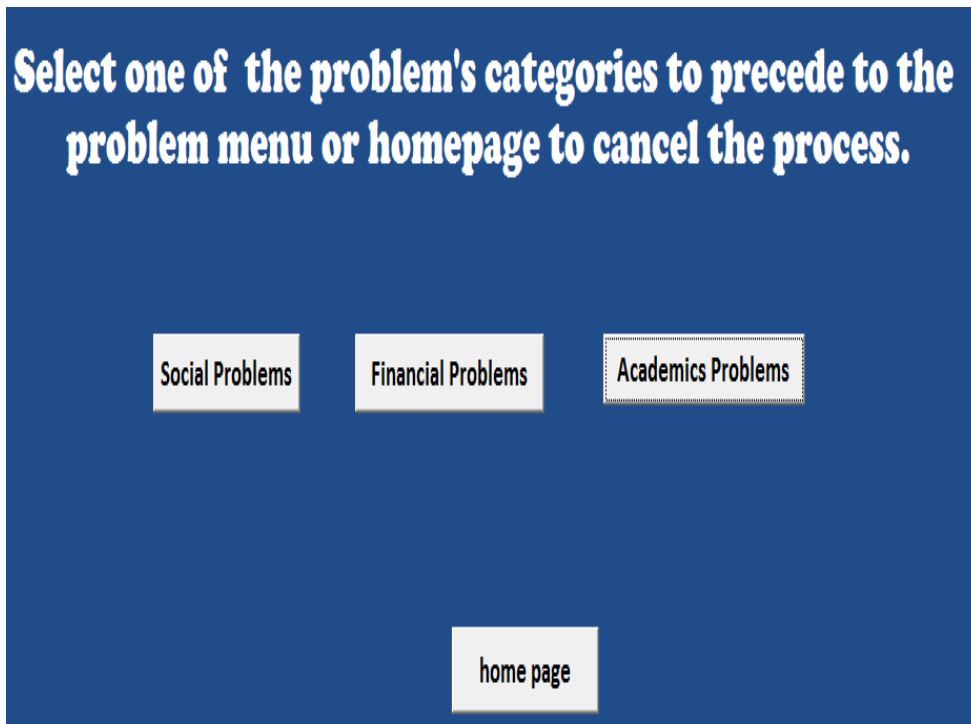


Figure 5.10: Main Menu

Source: Researcher (2018)

Figure 5.10 shows some of the issues that the students discuss with their parents as per the feedback from the research. The problems were divided into three categories; academics, social, and financial problems. A student clicks academic issues to access a list of academics problems, and the same applies to social issues and financial issues. A student selected academic problems and a drop down menu of list of academic issues faced by the students in public secondary boarding schools appeared as shown in fig 5.11.

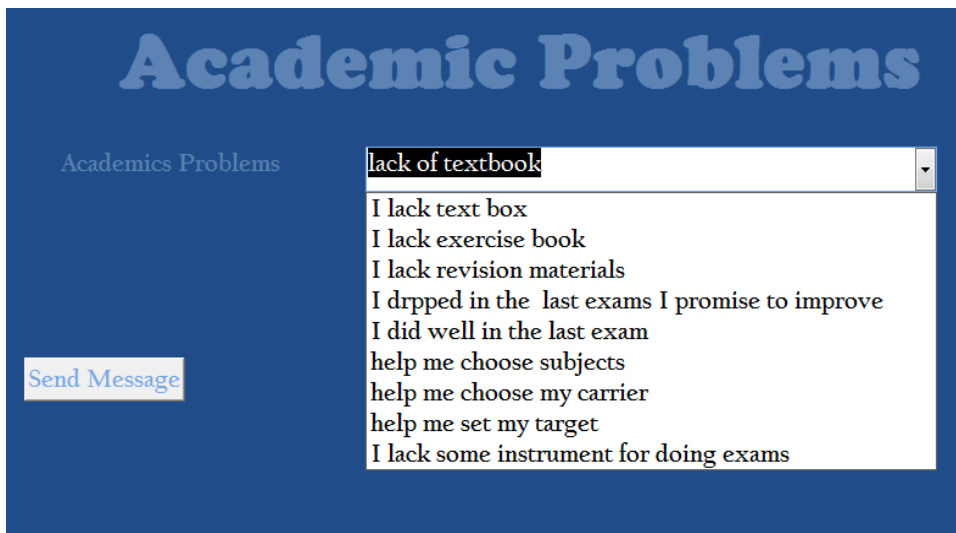


Figure 5.11: Academic Problems

Source: Researcher (2018)

Figure 5.11 shows a list of academic problems the students share with their parents as per research findings. A student selects one of them then clicks “Send message” for the next operation to be carried out.

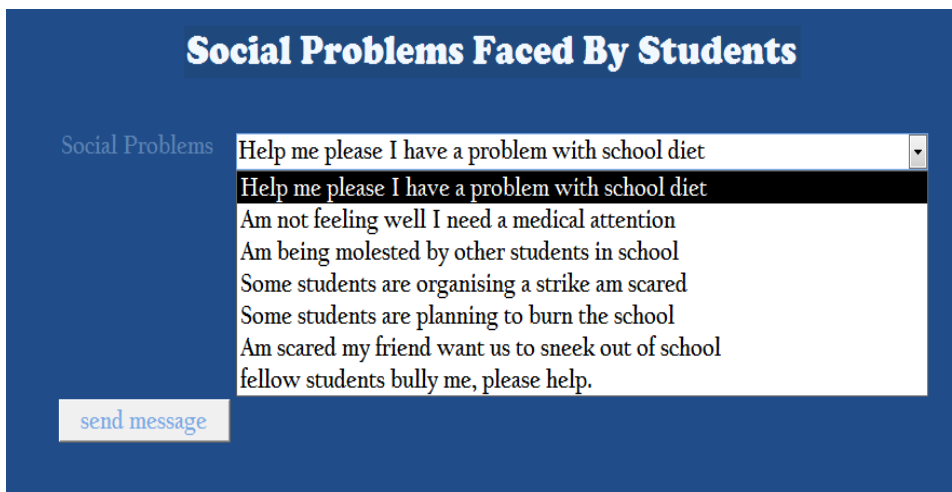


Figure 5.12: Social Problems

Source: Researcher (2018)

Figure 5.12 shows a list of social problems faced by students in public secondary boarding schools. As per the research findings, most students given opportunity would freely share their experience with their parents. A student is required to select one issue that matches his/her needs then clicks “Send message” to proceed to the next page.

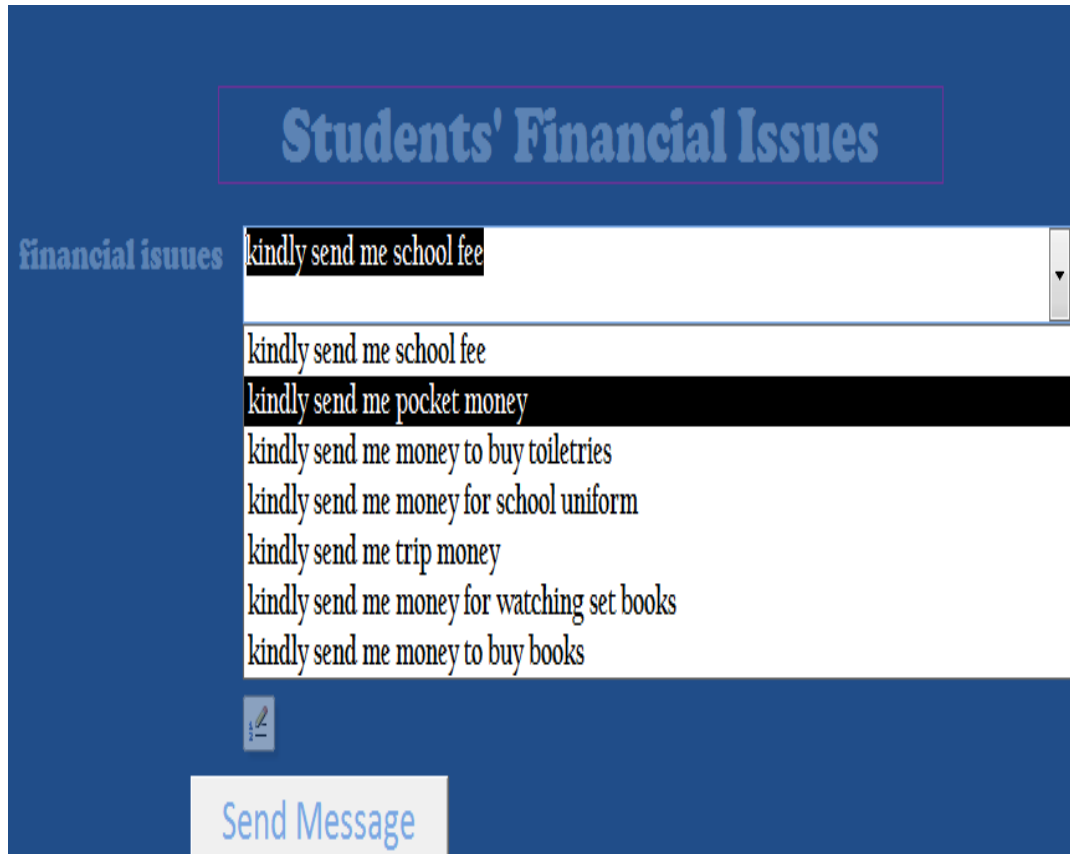


Figure 5.13: Financial Problems

Source: Researcher (2018)

Figure 5.13 shows a list of financial problems the students experience in schools as per the research findings. A student selects one of the problems then clicks “Send message” to enable automatic execution of operations.

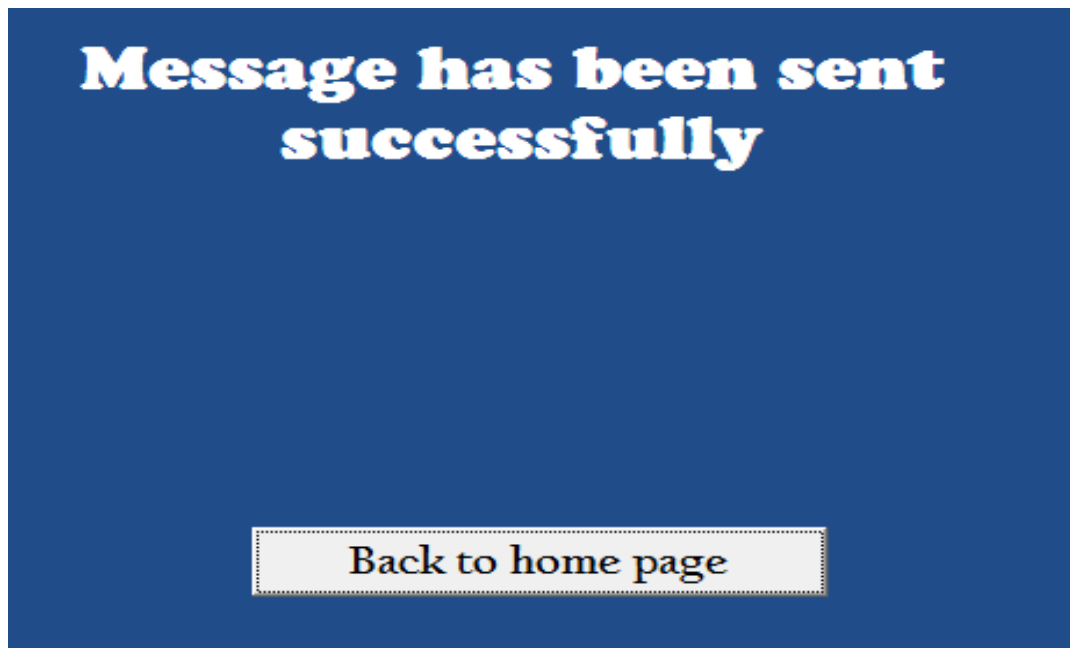


Figure 5.14: Sent Message

Source: Researcher (2018)

Figure 5.14 displays a screen indicating that the message was successfully delivered. The student selected an item from the menu then clicked “Back to home page” and the message was automatically delivered to her parent’s phone number as per the information in the database.

5.7 Recommendations

Based on the findings and conclusion of study, the following recommendations were made in order to promote efficient student-parent interaction process in secondary boarding schools in Kenya.

- i. The Ministry of Education, the school head teachers and stake holders should embrace the automated interface design for student-parent interaction in secondary boarding school by availing all the necessary resources for its full development and implementation.
- ii. The Ministry of Education and the school head teachers to allocate funds for provision of a special room in schools equipped with adequate computers. Each computer to be installed with interaction interface and the number should be enough to enable each student get an opportunity to interact with their parents.
- iii. A teacher on duty should be charged with additional responsibility of guarding the room and supervising student-parent interaction process.
- iv. The Ministry of Education and the school head to allocate funds for maintenance and repair of the computers so that the process is always efficient and reliable.
- v. The head teachers and deputy head teachers should be sensitized on consequences of not applying mobile phone policy in secondary boarding schools. This is because the study discovered that mobile phone interaction may make some student incline to some dangerous information that may jeopardize learning.
- vi. Head teachers and deputy head teachers should be made aware that consistent application and enforcement of policies in the secondary boarding schools is their responsibility.

- vii. The students should be made aware of the cell phone policy and should be sensitized about how violation of these policies may have serious repercussion.

5.8 Suggestion for Further Research

- i. How best the government's policy on ban of mobile phones in schools should be effectively implemented.
- ii. Effects of automated student parent-parent interaction on student's academic performance.
- iii. How the current technology could be used to ensure students are able to anonymously report sensitive issues that could affect the smooth running of the school.

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APPENDICES

Appendix i: Letter of Introduction

I am Mary Akeyo Juma, a student at Rongo University pursuing a Master's Degree in Information Technology. I am carrying out a study on an automated interface design for student-parent interaction in boarding schools. I am therefore seeking your permission to collect data about your school because it falls under my study sample. Your participation and co-operation will be highly appreciated. The information you provide will be treated with strict confidentiality and will only be used for academic purposes.

Appendix ii: Interview Guide for School Head Teachers and Deputy Head Teachers

Demographic questions

1. Male () Female ()
2. What is your years' experience in teaching?
3. What is the category of your school?

County school (), Extra county (), National school ()

Existing interfaces in boarding schools

1. Please mention some of the student-parent interaction interfaces available in your school

2. Which category of people use the above listed student parent interaction interfaces

7. How do the students access the interfaces? _____

8. How frequently do the students interact with their parents while in school? _____

9. At what time do the students interact with the parents while in school? _____

10. What are some of the problems faced by students in school?

11. In your opinion what are some of the causes of this problems

12. In your opinion is there need for parent's intervention in matters affecting students in school

Very strongly agree (), strongly agree (), fairly agree () least agree (), don't agree ()

Requirement for Suitable Automated Student-Parent Interaction Interface

13. In your opinion are the available student-parent interaction interfaces suitable

Agree (), least agree (), fairly disagree (), strongly disagree () very strongly disagree

14. What is the problem with the current student-parent interaction interfaces in school?

15 mention any type of information deemed destructive to the students

16. Is there need for a suitable student parent interaction interface in your school?

Very strongly agree (), strongly agree (), fairly agree () least agree (), don't agree ()

Appendix iii: Interview Guide for Parents

Demographic questions

1. Male () Female ()
2. What is your occupation? _____
3. How old are you? _____
4. Do you have children in any of the secondary boarding schools nearby? _____
5. How many children _____
6. Do you have mobile phone _____
7. If no. Why?

8. Have you ever used mobile phone to communicate with your children in secondary boarding school? _____
9. What are some of the issues that you discuss? _____
10. Do you sometimes receive messages from your child or from school? _____
11. Are you able to retrieve and read messages from mobile phone? _____
12. What does a suitable student parent interaction interface entail?

Appendix iv: Questionnaire for students

Demographic Questions

Kindly tick (√)

1. Male female

2. Which class are you?

3. How old are you?

Existing Student-Parent Interaction Interfaces

4. List down the student-parent interaction interfaces available in your school

5. Has the school administration allowed you to use the interfaces above? Yes (), No ()

6. How do you access the interfaces?

7. How frequently do you interact with your parent while in school?

8. At what time do you interact with your parent while in school?

Requirement for a Suitable Automated Student-Parent Interaction Interface

9. List down some of the problems you face while in school?

10. In your opinion what are some of the causes of this problems

11. In your opinion is there need for parent's intervention in matters affecting students in school

Very strongly agree (), strongly agree (), fairly agree () least agree (), don't agree ()

12. In your opinion are the available interfaces suitable for student-parent interaction in schools

Agree (), least agree (), fairly disagree (), strongly disagree () very strongly disagree

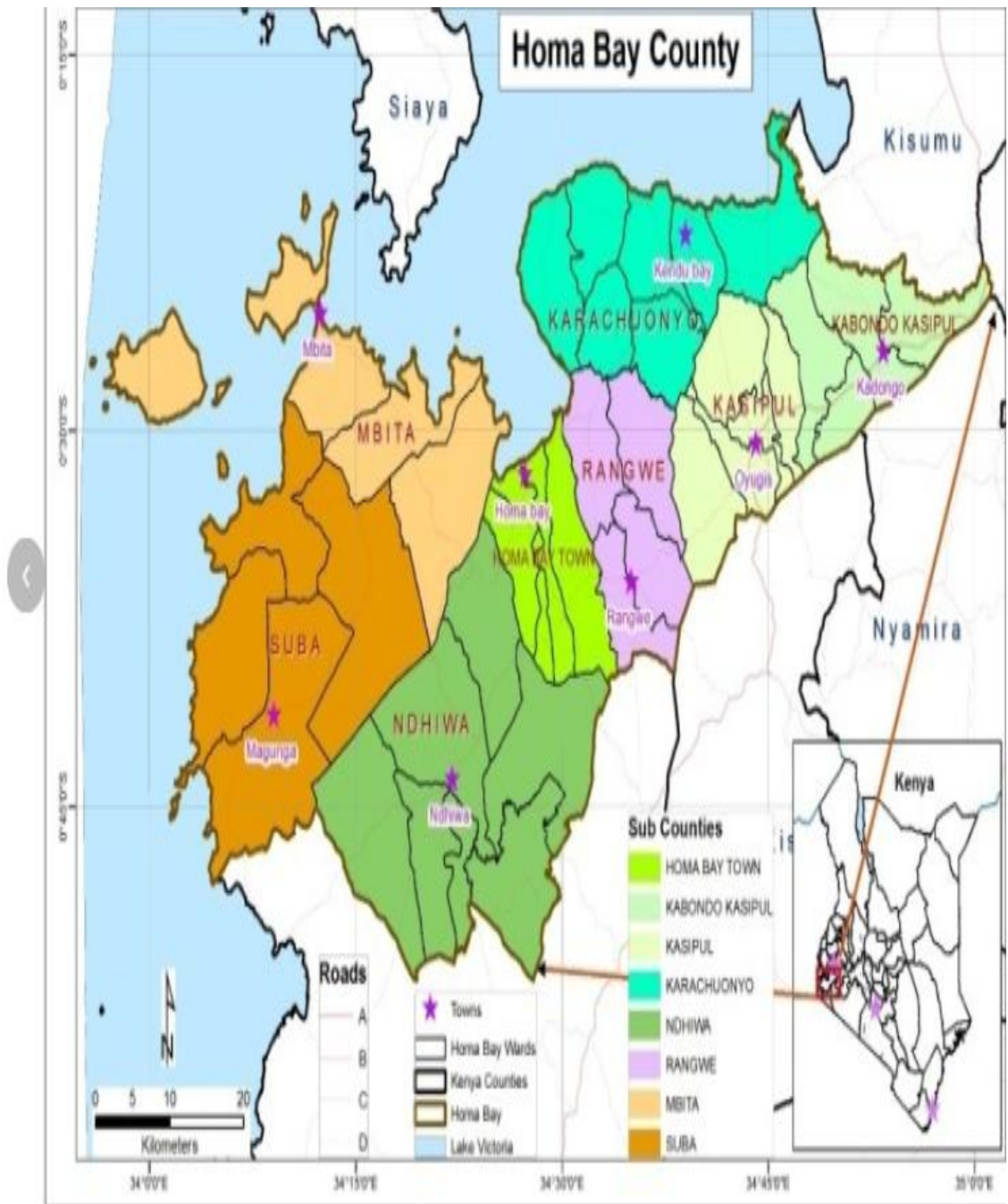
13. What is the problem with the current student-parent interfaces available in school?

14. is there need for a suitable student - parent interaction interface?

Very strongly agree (), strongly agree (), fairly agree () least agree (), don't agree ()


15. What does a suitable student parent interaction interface entail?

Appendix v: Homa Bay County Map



1: Map of Homa Bay County Source: GoK, 2013.

Appendix vi: Research Authorization



**NATIONAL COMMISSION FOR SCIENCE,
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Ref. No. **NACOSTI/P/16/63306/14862**

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Mary Akeyo Juma
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Rongo.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on “*An automated interface design for student-parent interaction in boarding schools: A study of schools in Rachuonyo South Sub-County, Kenya,*” I am pleased to inform you that you have been authorized to undertake research in **Homa Bay County** for the period ending **7th December, 2017**.

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

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


BONIFACE WANYAMA
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Homa Bay County

The County Director of Education
Homa Bay County

National Commission for Science, Technology and Innovation is ISO 9001:2008 Certified