

**A MODEL TO ENHANCE TUTORIAL MANAGEMENT IN TEACHING
AND LEARNING USING CLOUD COMPUTING**

**BY
JOHN KIIRU THUKU
REG. NO: E83/10862/2006**

**A THESIS SUBMITTED FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY IN EDUCATIONAL TECHNOLOGY IN THE
DEPARTMENT OF EDUCATIONAL COMMUNICATION AND
TECHNOLOGY, SCHOOL OF EDUCATION OF KENYATTA
UNIVERSITY**

FEBRUARY 2024

DECLARATION

I confirm that this research thesis is my original work and has not been presented in any other university or institution for certification. The thesis has been complemented by referenced works duly acknowledged. Where text, data, graphics, pictures or tables have been borrowed from other works- including the internet, the sources are specifically accredited through referencing in accordance with anti-plagiarism regulations.

Signature  Date 28/2/2024

John Kiiru Thuku

Reg. No E83/10862/2006

Department of Educational Communication and Technology

This thesis has been submitted for examination with our approval as University Supervisors.

Signature  Date 28/02/2024
Date

Prof Samson Rosana Ondigi

Department of Educational Communication and Technology

Kenyatta University

Signature  Date 28/02/2024

Dr Elizaphan Muuro Maina

Department of Computing and Information Science

Kenyatta University

DEDICATION

This work is dedicated to my wife and to my sons for their love and moral support which kept me moving to the end.

ACKNOWLEDGEMENT

First, my sincere gratitude goes to my supervisors, Professor Samson Ondigi and Dr Elizaphan M. Maina for their excellent academic guidance. Let me also thank and acknowledge the late Prof Henry O. Ayot for his excellent guidance when I did the proposal and published an academic paper. He was part of the team that guided my work. In addition, I convey my appreciation to the Kenya National Research Fund (KNRF) for granting me funds to carry out this research. I also like to acknowledge Kenyatta University for granting me three months to collect data. Let me give special thanks to all my research assistants, colleagues in the library and the software development team leader Ben Steve Thuku. Also, I would like to thank lecturers including Dr Kibe Macharia, Dr Francis Likoye, Dr Francis Kirimi, Dr Alice Omariba, and Dr Milkha Mathu who allowed me to test, experiment and evaluate Tutmas online application in their tutorial classes. I continuously thank the Almighty God for the grace that enabled me to continue with the studies in all prevailing circumstances. Finally, my family members including my wife, sons, brothers and sisters who kept encouraging me even when I considered abandoning the course all together.

TABLE OF CONTENTS

DECLARATION	II
DEDICATION	III
ACKNOWLEDGEMENT	IV
LIST OF TABLES	IX
LIST OF FIGURES	X
ABBREVIATIONS AND ACRONYMS	XI
ABSTRACT	XII
CHAPTER ONE	1
INTRODUCTION	1
1.1 Background to the Study	1
1.2 Statement of the Problem	5
1.3 Purpose of the Study	8
1.4 Objectives of the Study	8
1.5 Research Questions	8
1.6 Significance of Study	9
1.7 Limitation of the Study	10
1.8 Delimitation of the Study	11
1.9 Assumption of the Study	11
1.10 Theoretical Framework	12
1.10.1 Theory of Collaborative Learning	13
1.10.2 Constructivist Learning Theory	13
1.11 Conceptual Framework	14
1.12 Operational Definition of Terms	18
CHAPTER TWO	22
2. REVIEW OF RELATED LITERATURE	22
2.1 Introduction	22
2.2 Overview on Teaching and Learning at Universities	22
2.2.1 Teaching Methods at Universities	23
2.2.2 Tutorials Teaching and Learning Method	26
2.2.3 Benefits and Challenges in Tutorials Learning	28
2.3 Learning Management Systems	30
2.3.1 Features of LMS	31
2.3.2 Advancement in LMS	32
2.3.3 Deployment of a Learning Management System	33
2.4 Cloud Computing	35
2.4.1 Defining Cloud Computing	35
2.4.2 Cloud Computing Service Models	36
2.4.3 Deployment Models in Cloud Computing	38
2.4.4 Cloud Computing Architecture in Education	39
2.4.5 Global, Regional and National Internet Connectivity	41
2.4.6 Internet and Mobile Phone Services in Kenya	43

2.4.7	KENET and Internet Provision at Universities in Kenya.....	44
2.4.8	Cloud Software Development Process	45
2.4.9	Agile Software Development Methodology	47
2.5	Systems Testing and Evaluation	49
2.6	Action Research in Education	50
2.6.1	Uniqueness Characteristics of Action Research	51
2.6.2	Models of Action Research	52
2.7	Library Support in Tutorials	54
CHAPTER THREE		55
3.	METHODOLOGY	55
3.1	Introduction.....	55
3.2	Research Design	55
3.2.1	Survey on Tutorials at Kenyatta University	56
3.2.2	Agile Software Development Approach.....	57
3.2.3	Experimenting and Evaluating Tutmas Platform	60
3.3	Location of Study and Study Population	60
3.4	Sampling Procedures and Sample Size.....	61
3.5	Research Instruments.....	63
3.5.1	Interviews Schedule.....	63
3.5.2	Questionnaires	63
3.5.3	Observations	64
3.5.4	Document Review	65
3.5.5	Web Development Tools	65
3.6	Validity and Reliability.....	66
3.6.1	Validity	66
3.6.2	Reliability	67
3.7	Data Collection Procedure.....	68
3.7.1	Observations and User Feedback.....	68
3.7.2	Questionnaires	68
3.7.3	Tutmas System Logs Analysis.....	69
3.7.4	Document Review	69
3.8	Data Analysis.....	70
3.9	Ethical and Legal Considerations	71
CHAPTER FOUR		73
4.	PRESENTATION OF FINDING, INTERPRETATION AND DISCUSSION	73
4.1	Introduction.....	73
4.2	Study Participants	73
4.2.1	Lecturers' Experience in Tutorials	75
4.2.2	Students' Experience in Tutorials.....	76
4.3	Teaching using Tutorials at Kenyatta University	77
4.3.1	Use of Tutorials in Teaching University Programmes	78
4.3.2	Tutorial Class Formation	81
4.3.3	Tutorial Groups Formation.....	88
4.3.4	Tutorial Presentations and Assessment	92

4.3.5	Assessment, Quality and Publishing of Tutorial Papers.....	97
4.3.6	Tutorial Teaching Process	102
4.4	Benefits and Challenges of Tutorials in Teaching and Learning	103
4.4.1	Skills and Competences	103
4.4.2	Retention and Recall while Learning Through Tutorials	107
4.4.3	Challenges Facing Tutorials	108
4.4.4	Suggestions on Tutorials.....	111
4.4.5	Integrating ICT in Tutorials at the University	112
4.4.6	Overall Opinion on Tutorials as a Teaching Pedagogy	113
4.5	Development of Online Tutorial Management Platform.....	116
4.5.1	Participants during the Development of Tutmas Platform	116
4.5.2	Functional Requirements of Tutmas System	117
4.5.3	User Interface Design	118
4.5.4	Tutmas System Design	119
4.5.5	Software Development Team	120
4.5.6	Cloud Computing Services	120
4.5.7	Development of Online Tutmas Platform.....	121
4.6	Tutmas Functionalities and User Interfaces	125
4.6.1	User Interfaces	125
4.6.2	Tutmas Reports	128
4.6.3	Virtual Meeting Integration with Tutmas Platform	129
4.6.4	Academic Paper Publishing Practices	130
4.6.5	Library Support in University Publishing.....	131
4.7	Experimentation and Evaluation of the Tutmas Platform	134
4.7.1	Overview on the Checklist of Test Cases and Scenarios.....	135
4.7.2	Tutmas Compliance with Tutorial Activities	136
4.7.3	Tutorial Paper Submission and Sharing	138
4.7.4	Evaluation on ICTs for Tutmas	139
4.7.5	Evaluation on Tutmas User Interface	140
4.7.6	Virtual Tutorial Presentations.....	141
CHAPTER FIVE		145
5.	SUMMARY, CONCLUSIONS AND RECOMMENDATIONS	145
5.1	Introduction.....	145
5.2	Summary of the Study Findings	145
5.2.1	How Tutorials are Conducted at Kenyatta University.....	145
5.2.2	Perceived Benefits and Challenges in Tutorials	146
5.2.3	Development of a Cloud Computing Tutorial Management System	147
5.2.4	Experiment and Evaluate the Effectiveness of Tutmas	148
5.3	Conclusions of the Study	149
5.4	Recommendations of the Study	151
5.5	Suggestions for Further Research	152
REFERENCES		153
APPENDICES		166
APPENDIX I - INSTRUCTOR'S QUESTIONNAIRE		166

APPENDIX II - STUDENT QUESTIONNAIRE	170
APPENDIX III - TUTMAS STUDENT QUESTIONNAIRE	174
APPENDIX IV - APPROVAL OF RESEARCH PROPOSAL	176
APPENDIX V – REQUEST TO COLLECT DATA AT KU	177
APPENDIX VI - RESEARCH PERMIT	178
APPENDIX VII - TUTMAS USER GUIDE.....	179

LIST OF TABLES

<i>Table 2.1 Internet and Mobile Phone in Kenya</i>	44
<i>Table 2.2 KENET Membership and Connectivity Status, Nov 2019</i>	45
<i>Table 4.1 Summary of Participants in the Study</i>	74
<i>Table 4.2 Frequency of Giving Tutorials in Teaching</i>	75
<i>Table 4.3 Students Categories in Tutorials Experience</i>	77
<i>Table 4.4 Students' Latest Participation in Tutorials?</i>	77
<i>Table 4.5 Opinion on Teaching using Tutorial as per Student Category</i>	78
<i>Table 4.6 Year Preferred to Introduce Tutorials to Undergraduates</i>	79
<i>Table 4.7 Activities at the Commencement of Tutorials, N=31</i>	81
<i>Table 4.8 Usefulness of Preliminary Tutorial Activities to Students</i>	83
<i>Table 4.9 Lecturer's Opinion on Tutorial Group Formation</i>	88
<i>Table 4.10 Lecturers' Opinion on Tutorial Presentation and Assessment</i>	92
<i>Table 4.11 Students' Opinion on Tutorial Presentations and Assessment</i>	94
<i>Table 4.12 Lecturers' Opinion on Assessment and Quality of Tutorial Papers</i>	97
<i>Table 4.13 Students' Opinion on Quality, Assessment & Sharing of Papers</i>	99
<i>Table 4.14 Skills and Competences by Lecturers</i>	104
<i>Table 4.15 Students Skills and Competences</i>	105
<i>Table 4.16 Tutorial Topics Students Recalled</i>	107
<i>Table 4.17 Lecturers' Opinion on Challenges in Tutorials</i>	109
<i>Table 4.18 Challenges of Tutorials by Students</i>	110
<i>Table 4.19 Overall Opinions on Tutorials</i>	114
<i>Table 4.20 Participants at Tutmas Development Stages</i>	117
<i>Table 4.21 Cloud Computing Service Providers</i>	121
<i>Table 4.22 Virtual Presentations & Paper Publishing</i>	124
<i>Table 4.23 Tutmas User Category and Functions</i>	126
<i>Table 4.24 Collections at Kenyatta University Institutional Repository</i>	132
<i>Table 4.25 Kenyatta University Open Journal System (OJS)</i>	133
<i>Table 4.26 Commencement of Tutorial Classes</i>	136
<i>Table 4.27 Tutmas Functionalities and Key Indicators</i>	137
<i>Table 4.28 Tutorial Paper Submissions</i>	138
<i>Table 4.29 Tutorial Paper Submissions</i>	139

LIST OF FIGURES

<i>Figure 1.1 Action Research Conceptual Framework.....</i>	<i>16</i>
<i>Figure 2.1 Cloud Computing in Education.</i>	<i>41</i>
<i>Figure 2.2 African Undersea Cables.....</i>	<i>42</i>
<i>Figure 2.3 Waterfall Model in Software Development.....</i>	<i>46</i>
<i>Figure 2.4 Figure 2.2 Riding’s Action Research Model.</i>	<i>53</i>
<i>Figure 4.1 How Lecturers Taught Using Tutorials, N=31.....</i>	<i>76</i>
<i>Figure 4.2 Fundamental Features for Tutmas Platform</i>	<i>118</i>
<i>Figure 4.3 Tutmas Features and Functionalities</i>	<i>119</i>
<i>Figure 4.4 Tutmas Platform Development Stages.....</i>	<i>122</i>
<i>Figure 4.5 Tutmas Login</i>	<i>125</i>
<i>Figure 4.6 Student’s and Lecturer’s Dash Board</i>	<i>127</i>
<i>Figure 4.7 Class Summary Report.....</i>	<i>129</i>
<i>Figure 4.8 Open Journal Publishing Process. Source Researcher Construct</i>	<i>131</i>
<i>Figure 4.9 Devices Used to Access Tutmas Platform.....</i>	<i>142</i>
<i>Figure 4.10 Mode of messaging to communicate among your group members.....</i>	<i>142</i>
<i>Figure 4.11 Overall Experience and Skills Enhancement.....</i>	<i>143</i>

ABBREVIATIONS AND ACRONYMS

API	Application Programming Interface
ASD	Agile Software Development
EASSY	Eastern African Submarine Cable System
IaaS	Infrastructure-as-a-Service
ICT	Information and Communication Technology
KENET	Kenya Education Network
LION	Lower Indian Ocean Network
LMS	Learning Management Systems
PaaS	Platform-as-a-Service
SaaS	Software-as-a-Service
SDLC	System Development Life Cycle
SEACOM	Sea Submarine Communication Limited
TEAMS	The East African Marine Systems
TUTMAS	Tutorial Management System

Abstract

Integration of ICT in teaching and learning has been a growing concern that has attracted a lot of research and inquiry following the increase in the availability, accessibility and affordability of ICT among learners and the emergence of E-Learning systems. Universities face unprecedented demand to shift their pedagogues to be more learner-centered in an effort to improve student learning experience and outcomes using modern technology. However due to the increase in student enrolment there has been a gradual decline in the use of the learner-centered tutorials despite potential in enhancing students learning experience and acquisition knowledge and other academic skills. Modern technology, such as cloud computing can indicatively be integrated to improve tutorial administration and help increase students' participation in learning. There is a lack of locally developed E-Learning systems to address challenges appropriately. The main purpose of this study was to improve the management of tutorials in teaching and learning by developing an online application model based on cloud computing. The study was guided by collaborative and constructivist theories of learning. The study was conducted at Kenyatta University where the researcher used a snowball sampling method to identify participants since not all academic programs are taught using tutorials. The study was conducted in three stages: survey on tutorials, development of online tutorial management system (Tutmas) and experimentation of the platform. The main methodology was action research but it combined agile software development approach and qualitative method at specific instances. The findings show that students and lecturers appreciated the learning experience and skills gained in regular tutorials and that Tutmas platform was quite effective in the management and administration of tutorials as well as enhancing students' learning experiences. The recommendation is that institutions should purposefully enhance the use of tutorials and enhance their efficiency by using the cloud-based system. Students should be experiencing tutorials early once they join the University in their first year. It is recommended that tutorials should be harnessed and the system should incorporate peer review of tutorial papers in order to publish quality papers in an institutional online tutorial journal.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

In this study tutorial refers to a form of cooperative and collaborative method of instruction that brings a group of students together to discuss as they study. Learners are normally guided by the instructor on the topics and the tasks to engage in. The topics are normally derived from the course syllabus and the group members are then expected to research on the topic, write a paper and later make a presentation in class for discussion under the guidance of the lecturer. Tutorials were pioneered at the University of Oxford and Cambridge University more than two centuries ago and has continued to be used to date (Beck, 2005; Tapper & Palfreyman, 2011). At Cambridge University tutorials are called ‘supervisions’ (Gaston & Duschinsky, 2020). Tutorials help students improve academically, gain confidence and help them acquire lifelong learning skills. Considering its long history, tutorials require to be enhanced, sustained and improved continuously to increase effectiveness and relevance in teaching and learning.

Tutorials as a learning and teaching strategy is widely recognized as a useful learner-centered approach because it involves the learner as the active participant (Bremner et al., 2022; Mills & Alexander, 2013). The method is internationally renowned as a holistic approach to teaching and learning that cultivates resilience, independence and confidence in students. However, its success requires a great deal of investment in terms of staff time, student commitment and robust administration. It also faced some challenges such as having very large classes which reduces its effectiveness,

the group dynamics that can influence negative behaviour and the increase in use of online classes that threaten the physical interactions. However, with the emergence of affordable, flexible and accessible technology, such as cloud computing, there is great potential to enhance tutorial management and make the approach more attractive, effective and with less challenges.

The Commission for University Education (CUE) recognizes tutorials as one of the modes of curriculum delivery along with lectures, practicum, attachments and field work (CUE, 2014). It is a method that some lecturers use at Kenyatta University to help students engage in research, discussions and writing. At the University, tutorials are generally conducted in a systematic manner incorporating various teaching and learning activities such as introduction to the course, group formation, assigning tutorial questions, researching and writing the topics or questions assigned, scheduling group presentations, submission of tutorial papers and assessment (Thuku et al., 2019). At the commencement of a semester, lecturers use the course outline to identify tutorial questions or topics. Each group is expected to pick a topic to research on and write a paper. The papers are then presented in class for discussion under the supervision of the lecturer. Lastly these papers are then submitted for marking and final assessment. This process puts the students well at the center of learning and is actively involved.

Over the last few decades, institutions of higher learning have been emphasizing on learner-centered pedagogues as an effort to improve on student's learning experience (Biggs & Tang, 2011). Educational institutions are constantly adapting teaching and learning models that are learner-centered in order to enhance student learning experience and improve their academic achievement. Accordingly, a shift towards

learner-centred pedagogy has been a growing strategy for universities to attract students, make them actively involved in learning and at the same time address the needs and expectations from the industry, professional and regulatory bodies (Biggs & Tang, 2011).

Universities nowadays are integrating a Learning Management System (LMS) to improve on curriculum delivery, increase systems efficiency and engage learners better (Cantabella et al., 2018; Garcia et al., 2021; Watson & Watson, 2007). Kenyatta University uses Moodle LMS for blended, virtual and online learning. Moodle is open source that is widely used globally for administering and delivery of learning and training courses. It provides various teaching and learning features that promote collaborative activities such as group formation (Estacio & Raga, 2017). However, there is lack of literature on use of Moodle for tutorials for teaching and learning. Documented procedures from various university websites on group formation, that are often derived from Moodle's user manual, hardly describe the tutorial group processes as practiced at Kenyatta University. The procedures normally contain guidelines on creating study groups and the supported activities however are limited in administrative process of tutorial and activities. Some of the websites are University of New South Wales, Monash University and University of Wollongong.

Majority of learners joining universities are well exposed to contemporary technology: the internet, mobile phones, laptops and online information resources. Thus, institutions have little choice but to fundamentally shift towards use of modern technology in their operations, student engagements and curriculum delivery. Whenever LMS implementation is done, institutions often face some challenges.

Top among the challenges relate to technical functionalities (is the system able to accommodate all functions and processes effectively), user adoption and high costs. Since many of the LMS are developed elsewhere they often require customization which may not be comprehensive or accommodative enough to the institutional procedures and standards.

In regard to costing, there is heavy capital investment in hardware and software, system maintenance and user support that hinder effective transformation. Many institutions are not able to acquire all needed equipment and therefore unable to attain and sustain expected standards. Towards this, there has been a great need for alternative and affordable technological solutions that are cost effective and sustainable. This has made institutions to gradually focus on adopting cloud computing-based systems that greatly address this challenge.

Cloud computing technology provides all-needed computing resources including infrastructure, software and platform as hired services which significantly reduce the costs for establishing ICT based systems. Cloud computing resources are available as a service that is billed as per use. To benefit, institutions are only required to have reliable internet connection and a facilitation for the students to access. That means instead of establishing an ICT center, equipped with computer server, storage, backup systems and technical support staff, the equivalent can be made possible through cloud computing as a service billed at the end of a cycle: monthly, quarterly or annually at quite affordable rates.

Common models for cloud computing service are: Infrastructure-as-a-Service (IaaS) that provides hardware resources such as computer processor and storage; Software-as-a-Service (SaaS) that provides operating systems, applications and related

software, and; Platform-as-a-Service (PaaS) which is often provisioned to computer experts for system development and support (Bora & Ahmed, 2013; Kamarudin et al., 2022; Pocatilu et al., 2010b). The aim of this research was to develop a cloud computing-based tutorial management model to enhance learning experience in teaching and learning.

The researcher used action research which is the approach widely used by educational practitioners and professionals to systematically inquire, and ultimately improve, the pedagogy, processes and practice. Many writers have explained the uniqueness of action research in education in that its aim is to solve problems and improve on practice or social situation while the traditional research often aims at showing relationship between variables in a situation, test and explain a given hypothesis (Clark et al., 2020; E. Koshy et al., 2010a; McNiff & Whitehead, 2009; Mertler, 2017). Action research is both a philosophy as well as methodology of research that is generally applied in education. It is fundamentally participatory and focuses on systematic inquiry that aims at a plan of action to solve a problem or improve a practice. Usually, it consists of the following four steps: a plan of action to bring the change; take the action; observe the process and consequences as a result of the change; reflect on the changes and determine if the action achieves the intended outcomes. This process (acting, observing and reflecting) can then be repeated with a plan to improve further, and so on.

1.2 Statement of the Problem

The education sector faces numerous challenges arising from the dynamic nature of training requirements, emerging technologies and expectations from stakeholders: learners, society professional and regulatory bodies which call for adjustments in

teaching and learning approaches (Kirstein & Kunz, 2015). Institutions of higher learning are therefore keen at adopting suitable teaching and learning methods, innovate and integrate appropriate technologies that will help graduate students who are well trained and ready for the industry. Kenyatta University started by introducing use of technology in regular, virtual and open learning programmes to enhance some aspects of teaching and improve learning experience.

Literature shows that collaborative and learner-centered methods are preferred to regular teacher-centered methods. This is because the methods focus more on impacting skills to learners, encourage active learning, participation, collaboration, and improve on learning experiences and interaction (Biggs & Tang, 2011; Foster, 2014). Further, it has been demonstrated that small study groups and class presentations are particularly effective because they not only help in mastery of the subject and fostering active learning but also help develop academic, critical thinking and problem-solving skills (Alfares, 2017; Balan, 2018; Bremner et al., 2022; Laal & Ghodsi, 2012; Saleh et al., 2015; Shivananda et al., 2021). These kind of small study groups are invariably referred to as tutorials or ‘supervisions’. Tutorials are popular and highly regarded as suitable methods for helping students gain academic and lifelong learning skills. Although tutorials are widely recognized and has been used in many leading universities around the world, there is limited literature on tutorials’ administration and implementation in class. Hence this study aims at exploring on the processes and administration of tutorials in teaching as well as to the perceived benefits and challenges.

Tutorials being one of the traditional teaching methods can be leveraged with modern cloud computing technology to increase its potential in teaching and

learning. Over the years, emerging technologies has often been used to enhance teaching and learning especially through upgrading or developing new LMS (Garcia et al., 2021; Mijatovic et al., 2013; Singh & Baheti, 2017; Watson & Watson, 2007). There is limited works on use of modern technology in the management of tutorials in class despite the widespread use in universities, proliferation of affordable computing devices and improved accessibility to the internet. For example, conducting tutorials at Kenyatta University have tended to be conservative and there is hardly integration of technology in administering of tutorials. Thus study further aims at developing an online cloud computing-based platform to enhance tutorial management in teaching and learning using action research. The outcome on the exploration on tutorial administration, processes and activities as well as identified challenges and opportunities forms the basis for the design of the online platform to enhance management of tutorials in teaching.

Another concern in this study is addressing the challenges associated with high student enrolment particularly control and monitoring of tutorial groups. Tutorials are often compounded by the increase in number of students enrolled in class which leads to rise in student-lecturer ratio. This means that tutorial groups formed may either be too large to be effective or so many small groups that are difficult to control or monitor. Sometimes it may result in abandoning the tutorial group idea altogether thus losing all the benefits for a learner-focused learning. Large study groups have inherent problems that generally discourage student active participation and are difficult to manage whereas numerous small groups will have the benefits for active participation but are difficult to monitor and evaluate (Hassanien, 2006; Rezaei, 2018). In spite of these challenges, the emergence of accessible and affordable cloud computing technologies, proliferation of internet enabled devices

and availability of online resources can encourage scholars to innovate solutions through action research that can help improve management of tutorials in teaching and learning.

1.3 Purpose of the Study

The purpose of the study was to improve the management of tutorials in teaching and learning by developing an online application model based on cloud computing technology. This was undertaken through systematic inquiry on how tutorials are conducted, then developing an online cloud computing-based system to improve and make the management of tutorials more effective.

1.4 Objectives of the Study

The objectives of the study are to:

- i. Establish how teaching through tutorials is conducted at Kenyatta University.
- ii. Investigate from (a) lecturers and (b) students the perceived benefits and challenges of tutorials in learning and teaching.
- iii. Develop an online tutorial management system (Tutmas) based on cloud computing for facilitating administration of tutorials in teaching.
- iv. (a) Experiment and (b) evaluate the effectiveness of the online tutorial management system (Tutmas) in teaching and learning.

1.5 Research Questions

The research questions that will inform this study include:

- i. How is teaching through tutorials conducted at Kenyatta University?

- ii. What are the perceived benefits and challenges of using tutorials in teaching and learning?
- iii. How can the use of cloud computing be used to improve the administration of tutorials in teaching?
- iv. How effective is the cloud computing-based tutorial management system (Tutmas) in the management of tutorials in teaching and learning?

1.6 Significance of Study

This study was on the development of an online application to be used in the improvement of tutorial management in teaching and learning. A systematic inquiry on tutorials in teaching and learning was conducted. The findings contribute to the body of knowledge on tutorials as a pedagogy: thus, how tutorials are conducted, the challenges faced and perceived benefits. The findings give insights on conducting tutorials in a systematic way and identifying key activities to engage the learners. Further, these findings were the basis for developing a cloud computing-based model to improve the management of tutorials. This resulted in an online LMS for managing tutorials which is a unique contribution to knowledge.

The study also demonstrated use of cloud computing learning systems developed locally at the institution. Cloud computing technology has lately become popular to many organizations for the development and deployment of the online systems because of its flexibility, affordability and wide accessibility. Setting up a LMS has traditionally been expensive, especially due to heavy costs of buying, installation and maintenance of the ICT hardware, internet infrastructure and software. However, the deployment and testing of the online tutorial application was a

demonstration that institutions can successfully use cloud computing to improve their systems in a very cost-effective way.

Whenever students are engaged in tutorials, each group is required to write a paper to be presented in class and later shared to all students. Most of these papers are useful revision and study material for the students. The application model allowed students to upload their group's tutorial paper in an organized repository. The repository of tutorial papers becomes an important source of study materials for future reference and consultation by learners.

1.7 Limitation of the Study

Limitations of a study are the potential weaknesses or elements that are mostly out of the researcher's control. This study was constrained in three areas: first the sample size for both lecturers and students who participated in the survey on how tutorials are conducted, the perceived benefits and challenges were determined through snowball sampling. This was because teaching using tutorials at Kenyatta University is not mandatory and it is a choice by individual lecturers to teach using tutorials or not. Thus there is a limitation in regard to generalizability of the finding.

Another limitation was that the tutorial group sizes in the classes that participated in the evaluation of cloud-based Tutmas platform ranged from one to seven. The researcher had observed that in some large classes in the University, there were a few tutorial groups with ten or more students. Most studies recommend tutorial group sizes of one to 5 or 8 (Mills & Alexander, 2013; Palfreyman, 2008; Wood, 1988). However, during the testing and evaluation phase of Tutmas platform, the

lecturer posted enough questions that enabled students to form tutorial groups within the preferred eight or fewer members.

Another limitation was that those who were involved in the testing of Tutmas platform were assumed that they were committed to the improvement of the tutorial management by participating in the research.

1.8 Delimitation of the Study

Delimitations are characteristics or elements that limit the scope of the research study. It describes the boundaries of the study where the researcher can control. This study focused on teaching and learning using tutorials at Kenyatta University and not any other form of collaborative teaching. Further, the development of the online tutorial management system used Agile Software Development (ASD) over other approaches used in software development. ASD is credited with making the software development process faster and encourages continuous interaction with users as improvement on functionalities progresses. This delimitation was important so as to have a baseline for the system development scope and schedule.

Another delimitation was that the researcher needed to establish the best practices in academic publishing of online journals and book series. Due to the high number of publishers, the research made a selective sampling of journals and book series from databases subscribed by the University Library to assess the publishing practices.

1.9 Assumption of the Study

This study assumes that:

- i. Both the students and lecturers will have access to the internet and necessary gadgets such as personal computer, laptop, iPad or mobile phones to use the online tutorial platform.
- ii. The students will be committed to sending comments and feedback regarding their tutorial assignment over the online platform.
- iii. All tutorial papers submitted and posted in the platform will be accessible without restriction to all students who enroll in a particular course unit.
- iv. All tutorial papers that should be included in the repository will be selected on the basis of the grade given by the lecturer, thus the grade will determine the quality.

1.10 Theoretical Framework

The theoretical framework presents an overview of theories and ideologies that guided the research. This research focused on developing an online model based on cloud computing to enhance the tutorial management in teaching and learning. The researcher used an action research approach that is widely used to improve practice, solve specific classroom or school problems, and help make decisions at local sites (Mertler, 2021). Tutorials emphasize class members working in groups as they undertake their assignments. That means the learners should work collaboratively but under the guidance of the lecturer.

The tutorial process requires each group of students to research on the topic, write a paper and present in class. The tutorial paper is an important outcome of the tutorial process which means that this process is associated with constructivism theory that is based on the idea that learners are not just passive but construct knowledge as they

learn. This study was primarily guided by two theories: collaborative and constructivism.

1.10.1 Theory of Collaborative Learning

The theory of collaborative learning advocates involvement of students working together to support a learning activity (Sammour et al., 2008). Tutorial system engages the learners right from the beginning of the course when they form groups, through researching and writing a paper to class presentation and discussions under the supervision of the lecturer. For many decades tutorials have been used in universities where they encourage collaboration. For example at Oxford University and Cambridge University the students are expected to “orally communicate, defend, analyse and critique the ideas of others as well as their own in conversations with the tutor and fellow-students” (Balan, 2018, PG 186).

1.10.2 Constructivist Learning Theory

Constructivism is a learning theory that states individuals derive knowledge through involvement and associations. It emphasizes that the learners construct knowledge and form meaning with their own activities and upon their experiences (Biggs & Tang, 2011). Constructivist theory emphasizes that learners, and not just teachers, can contribute to education experience (Wu, 2008). Jeromy Bruner, one of the early advocates of this theory, emphasizes that students are active learners who construct their own knowledge (Bruner, 1961). The theory emphasizes the active role of learners in building their own understanding. Rather than being passive recipients of information, learners research on topics, reflect on their experiences, construct new ideas or concepts based upon their current and past knowledge (Balwant & Doon, 2021; Connolly et al., 2007; Elliott & Reynolds, 2014). The students learning

through the tutorial approach are required to produce tutorial papers based on the topics they were assigned. These tutorial papers are accessible to other students for reference and revision. It therefore shows that the groups of students have made a contribution to knowledge and this is the principle behind the constructivism theory of knowledge.

1.11 Conceptual Framework

Conceptual framework in action research is often used to help visualise the research problem, illustrate and guide the inquiry process. It serves as a roadmap to conceptualize and structure the research inquiry connecting the various ideas, concepts, variables, activities and relationships within the study. In action research it is usually presented as a model or diagram with accompanying narration to help clarify, explain and justify the research inquiry (Crawford, 2019; Elliott & Reynolds, 2014). In traditional research, especially those that aim at testing and explaining given hypotheses or require theoretical inputs, the frameworks emphasise on showing relationship of variables and their effects. However, in action research, which takes the form of a systematic inquiry to improve or change a practice or solve an immediate problem upon reflection on actions of change, conceptual frameworks are normally presented as models that show the repetitive nature of the inquiry process (Clark et al., 2020; Crawford, 2019). The inquiry process often takes a cyclic nature with a sequence of stages that basically include planning, action, observation and reflection. The number of cycles in the inquiry can be repeated until expected change, improvement or outcome is achieved.

Various studies show applicable models in action research, almost all are aligned with the fundamental principles that include identification of the practice to be

improved or the problem to be solved, planning on an action, acting, observation and reflecting on the outcome. These principles are associated with Kurt Lewin, a social psychologist and educator, who is believed to be the father of action research having first used the term “action research” in mid 1940s (Ferrance, 2000; Mertler, 2012; O’Brien, 2001). Kurt described action research with a model of repetitive cycle of planning, acting, observing and reflecting. The cycle of the activities can be repeated with an improved plan until the desired change is realised. The essence of systematic inquiry is to thoroughly understand the phenomena or practice, plan and act on improvement of the practice or change the process then reflect on the impact. Knowledge is therefore created on the outcome or solution and during the inquiry process, upon reflection on the impact and interpretation of data collected on the change (Ferrance, 2000; E. Koshy et al., 2010b; Vaccarino et al., 2006).

The current study, aims at developing an online platform, hereby referred to as Tutmas, for enhancing management of tutorials in teaching and learning, by adopting the principles of action research model described by Kurt Lewin. A conceptual model for the research is illustrated in Figure 1.1. It is adopted from Lewin’s idea of four developmental cycles that include plan, action, observation and reflection towards the development of online platform for enhancing management of tutorial in teaching and learning.

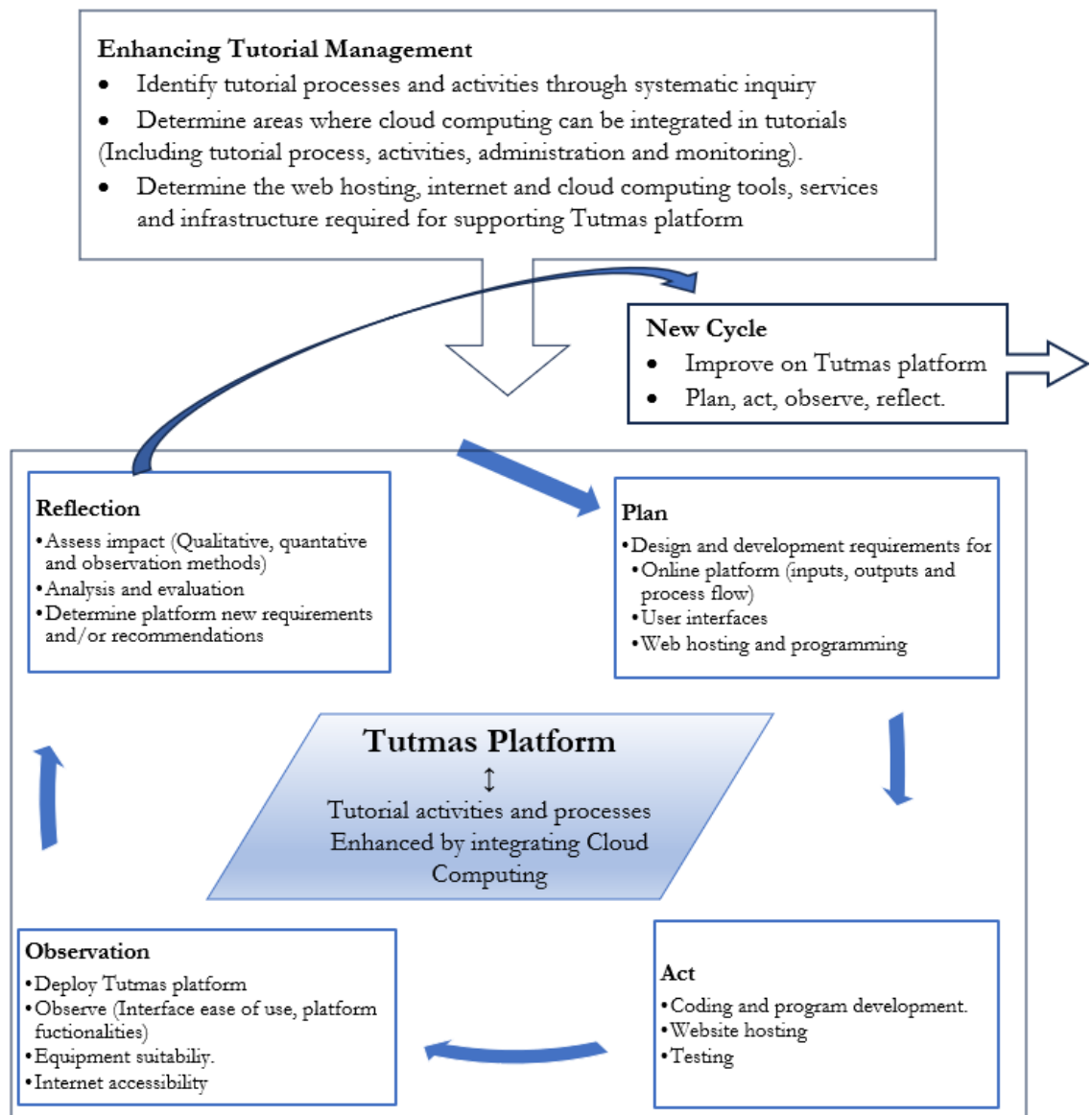


Figure 1.1 Action Research Conceptual Framework

Adapted from (Mertler, 2017)

The model shows the bases of the research problem which was to enhance management of tutorials in teaching and learning. The initial process is diagnostic through systematic inquiry on how tutorials are administered to help understand the tutorial activities and processes so as to determine areas that cloud computing can be integrated. The enquiry gave requirements for planning on the system inputs, outputs and design of the online tutorial management platform. Next was action to build the online platform. This was actioned by the software development team through web

programming, coding and testing, database design, and website design and hosting. This followed observations on how learners and instructors interacted with the platform's functionalities, features and user interfaces after deploying the online platform. The observation also included the efficiency in using the computing devices and access to internet by the users. The final stages were evaluation and reflection on the impact and assess the effectiveness as well as determine if further improvement on the platform was necessary. In case of further improvement, new requirements were spelt out and subjected to another cycle of plan-act-observe-reflect in the research process.

1.12 Operational Definition of Terms

Action Research – is a systematic study to improve educational practices by groups of participants by means of their own practical actions and by means of their own reflections upon the effects of those actions.

Agile Sprint Cycle – is a repetitive process that software developers use to develop a project.

API – stands for Application Programming Interface which is a mechanism that enables two software components to communicate with each other using a set of definitions and protocols.

Backup – a duplicate copy of computer files or data stored elsewhere that can be used to restore the original in case of a loss or damage.

Bandwidth – amount of information that can be sent through a communication cable, usually measured in bits-per-seconds (bps), Megabits-per-seconds (Mbps) or Gigabits-per-seconds (Gbps).

Client-server – is a computer network architecture model designed for end-users, called clients, to access resources such as files, databases or some other computing service from a server.

Cloud Computing – is the delivery of computing resources and services over the Internet. These resources include data storage, remote servers, databases, networking and applications which are accessed through the internet (“the cloud”)

Computer Server – A computer or device on a network that manages network resources.

Course – this means a single unit in a degree programme of study.

Database – is a data structure that stores organized information in multiple tables.

E-Learning – is a learning process that is conducted through electronic media, typically the Internet where students use electronic devices such as computers, laptops and mobile phones to access.

Learning Management System (LMS) – is a software application for administration, documentation, tracking, reporting and delivery of e-learning courses or training programs.

Online Tutorial Management Platform – is an integrated set of online services that provides learners and teachers with facilities and tools to support teaching, research, discussions and access to presentations by members of a class.

Open Source – software that is freely available to the public for download and use. Such software is normally developed by a social expert community other than a single organization. Open source development is often supported by donors with an interest in the project or by the user community, there is usually no restriction on who can modify or distribute the software.

Platform – is an underlying computer system on which application programs can run.

Smartphone – a mobile phone that has advanced functionalities, beyond making calls and sending text messages, such as checking or sending emails, accessing the internet, displaying photos and playing videos. They run on advanced operating systems similar to those used in computers which enable use of third-party applications.

Tablet – a kind of portable computer that primarily uses touch-screen technology for its input, a pop-up keyboard appears on the screen to allow one to type text, otherwise some have provision for fold out keyboards. They are smaller and lighter than the laptops but have comparable functionalities and sometimes unique extra features.

Test Case – is a set of actions executed to verify a particular feature or functionality of the system it contains test steps, test data, precondition and post condition developed for specific test scenarios to verify any requirement.

Test Scenarios – is any functionality that can be tested. It is a collection of test cases which assist in testing a system. Test scenarios give a high-level idea of what needs to be tested, for example checking the login functionality of a system.

Tutmas – is an acronym for tutorial management system which is an online platform to manage tutorials in teaching and learning.

Tutorials – a teaching method where topics are assigned to a student or group of students to research, write a paper and present in class for discussion and assessment.

Tutorial Paper – is a paper written by student(s) on a topic given by the instructor for discussion in a class and it is later marked and graded.

Unified Modelling Language – is a standard language used by programmers to organize and visualize flow of processes and link of program objects during software development.

Virtual Server – Computer and program server that is hosted at a remote location and allows sharing of its computing resources. The users are able to use and administer it as though they have complete control.

Virtualization – is a process of creating a virtual (rather than real) version of computer hardware service such as an operating system, a server, a storage device or network resources. It enables provision of multiple machines at the same time and allows sharing of computing resources and applications to multiple users.

Web application - is an application program that is stored and running on a remote web server. It is accessed through a web browser.

Web browser – is a software application used to locate, retrieve and display information on the internet such as web pages, images, video and other files.

Website – is a collection of related web pages usually belonging to an organization or individuals.

CHAPTER TWO

. REVIEW OF RELATED LITERATURE

2.1 Introduction

This chapter reviews literature on this study on a model to enhance tutorial management in teaching and learning using cloud computing at Kenyatta University. The literature review covers a background to teaching methods commonly used at universities with emphasis on tutorials of teaching and learning. It also covers cloud computing in learning management, software development, action research and applicable theories in the study.

Specific areas under review include:

- Tutorials in teaching and learning including benefits and challenges.
- Methods of teaching at universities with focus at Kenyatta University.
- Cloud computing technology: tools and services, service models and architecture, global, regional and national trends in cloud computing.
 - Integrating ICT in education, integrating cloud computing in teaching and learning
- Learning management systems: development and application.
- Agile software development, approach
- Action research including its uniqueness and distinction from traditional research methods.
- Theories applicable to the study.
- Harnessing of tutorial papers as study and revision materials.

2.2 Overview on Teaching and Learning at Universities

Teaching and learning constitute the core business in the universities. Quality teaching is therefore a priority in universities to help students gain education and acquire knowledge and skills. Education is widely recognised as a key factor to global, national and individual socio-economic success. Universities are expected to

provide quality education and training in order to graduate students who are knowledgeable and ready for the job market (Biggs & Tang, 2011; Mulinge & Arasa, 2017). It is therefore desirable that universities adopt teaching methods and practices that enhance student engagement and are well integrated with appropriate technologies in order to make learning successful as possible. The aim of this research is to enhance management of tutorials in teaching and learning by integrating cloud computing technology.

2.2.1 Teaching Methods at Universities

Teaching methods are techniques that lecturers use to help students learn or develop knowledge and skills. There are a variety of teaching methods and strategies available for lecturers at the universities. Among the common methods are: lectures, seminars and workshops, tutorials, laboratory sessions, online learning and problem-based learning methods. Wood (1988) and Jones (1997) have identified lecture, tutorials, seminar, laboratory and practical class as the top traditional methods that are still popular in teaching and learning at universities worldwide. Most of the methods are also recommended for use in universities nationally and in the region. For example, the Commission of University Education (CUE), which regulates university education in Kenya, recognizes lectures, tutorials, lab practicals and fieldwork as some of the course delivery methods in their policy guidelines (CUE, 2014).

The three most common teaching methods used include lectures, tutorials and lab practicals. According to Collins dictionary, a lecture is a talk someone gives in order to teach people about a particular subject, usually at a university or college (*Collins Online Dictionary*, 2020). Lectures are common and widely used in universities to

deliver information, ideas and theories to a large number of students. The lecturer presents information to the students, who are expected to passively assimilate the knowledge being presented (Jones, 1997; Wood, 1988).

Tutorials, on the other hand, involve smaller groups of students under guided discussions and class presentations moderated by a tutor. They are also referred to as supervisions or seminars (Gaston & Duschinsky, 2020; Tapper & Palfreyman, 2011). Tutorials provide students with opportunities to stimulate their thinking, when they discuss topics and issues with other students and the teaching assistants, and thus deepening their understanding (*Contributing to Seminars and Tutorials*, 2009) . Compared to lectures, which as largely teacher-centered, tutorials are more learner-centered as they involve much smaller groups of students discussing (Bremner et al., 2022; Shivananda et al., 2021; Uden & Beaumont, 2006).

Apart from tutorials and lecturing the other widely used instructional methods in universities are the lab practicals. The practicals are common in science, engineering and health related courses. Student can work independently, in pairs or in groups where they will be expected to submit a report on their experiments. These methods expose learners to working environment, perform experiments and gain practical knowledge on techniques and application of the materials taught in class (Wood, 1988). This study focuses on tutorials, which is one of the traditional methods that is still in use today at universities worldwide and locally.

Research on the teaching methods has been a growing concern among the stakeholders in the education field. As a result, there are numerous publications and reports on issues, opportunities and matters relating to teaching and learning methods. Teaching methods have been broadly classified into two main categories:

teacher-centered and student-centered (Bremner et al., 2022; Jones, 1997; Regmi, 2012). In teacher-centered approach the teacher is the main actor in passing the knowledge to learners while the students passively receive information through lectures or direct instruction. The method posits the teacher to taking the main responsibilities in the learning environment. This means that the teacher is in charge of the class, explains concepts, assigns tasks and directs all other learning activities while the students passively absorb the information and what is delivered by the teacher. A common example in this approach is in lecturing where the lecturer speaks and the students listen. After a certain period or at the end of a semester students are tested and assessed.

On the other hand, student-centered or learner-centered approaches encourage student participation, collaboration and active learning activities. In this approach the students take active role in the learning process and construct understanding (Biggs & Tang, 2011; Bremner et al., 2022; Kirstein & Kunz, 2015). The teacher remains the authority over the students and plays a role of facilitating the learning process through introducing topics, guiding on learning resources and assessing the students. An example of student-centered approach is tutorials, where students work in small groups on a topic and later present in class for discussion moderated by the lecturer. Assessment in the student-centered approach is done through various ways such as assessing group projects, class participation and students' portfolios. Learner-centered methods are based on constructivism theory that learners as active participants in learning construct knowledge rather than just passively absorb information (Biggs & Tang, 2011; Kirstein & Kunz, 2015; Wanner & Palmer, 2015; Webb, 2009). Other writers refer to these as inquiry-based learning, project-based learning, collaborative learning, cooperative learning, problem-based learning and

cooperative learning (Almarghani & Mijatovic, 2017; Barbosa et al., 2018; Laal & Ghodsi, 2012).

While recognizing that there is no “best” method, many writers acknowledge that learner-centered approaches are more effective and mostly preferred. Recent trends in teaching strategies show a gradual shift from the traditional teacher-centered methods such as lecturing to learner-centered approaches (Adams, 2009; Balwant & Doon, 2021; Kirstein & Kunz, 2015). However, it is important to note that choice for teaching can be influenced by other factors such as course content and technology to be applied (CUE, 2014; Regmi, 2012). In this research the aim is to build an online tutorial management platform to enhance its pedagogy and add use of technology to ultimately influence its application.

2.2.2 Tutorials Teaching and Learning Method

Tutorials are a form of teaching approach where students are encouraged to work in small groups to research on a topic, write a paper and present in class for discussion and assessment. Tutorial is one of the traditional methods that has been widely used for teaching and learning at universities. It has been used for centuries in many top universities such as Oxford and Cambridge universities. Its primary purpose then was for instruction as well as managing the conduct of younger lecturers (Balwant & Doon, 2021). The history of tutorials is traced back in the 18th century at Oxford University or earlier with the dialogues of Socrates the Greek philosopher with the students (Mills & Alexander, 2013). Morgan (2013) recognizes Professor Benjamin Jowett as the one who fully established it as a method of education when he became the Vice-Chancellor of Oxford University.

Though tutorials are widely used there is however limited literature on how tutorials are conducted. Many writers do recognize it as an effective learner-centred method but rarely do they outline exhaustively how tutorials should be conducted. For example in a report titled “Small group teaching: a toolkit for learning” has acknowledged the Oxbridge tutorial as an excellent small group teaching but points out that there is relatively small amount of research that has been conducted on its pedagogy (Mills & Alexander, 2013). Some reports from the CUE and Kenyatta University on tutorials only guides that it is a method for curriculum delivery and that two-hours of tutorials is equivalent to one lecture hour (CUE, 2014; Kenyatta University, 2014). Most writers tend to focus more on the benefits, potential (and challenges) of tutorials but give limited information on how they should be conducted. This is a gap in literature on a traditional and widely recommended pedagogy, thus the researcher’s motivation to use action research to inquiry and document on the practice of tutorials in teaching and learning.

Wood (1988) in an article on “Tutorials and small group teaching” describes tutorial as a form of small-group training and recognizes its great potential as an effective teaching method. Although the writer gives further detail on the aims, how groups function and deal with some challenges, it is however not adequate information to understand how to manage tutorials as well as identify areas that may need integration with modern technology. This research aims at making deep inquiry on tutorial process, identify activities and implement areas where cloud computing can be integrated to enhance its administration.

2.2.3 Benefits and Challenges in Tutorials Learning

Learning at universities purpose at producing graduates with a quality education, knowledge and wide range of academic and lifelong skills. Some of the skills are professional and problem solving skills, communication skills, teamwork and lifelong (Kamardeen, 2014). Towards this end, universities therefore purpose to utilize the best teaching and learning methods that encourage acquisition of quality education and skills.

Tutorials encourage student active participation with activities such as group work, class discussions, performing tasks and the like tend to enhance student learning experience and they acquire academic, social and other skills. Tutorials are a form of participatory and collaborative learning where student collaborate in research, writing and share their knowledge together, it is also a form of active learning where small groups of students participate in various academic tasks. The working together as small groups of students encourage collective participation on tasks. Such an approach has been described by many writers as collaborative learning, cooperative learning, inquiry or participative approaches (Elliott & Reynolds, 2014; Gunderson & Moore, 2008).

Many theories in education advocate for student active participation, as normally done in tutorials, to help improve learning experiences. Some of these theories include collaborative theory that advocate the involvement of group of learners to solve a problem or complete a task (Laal & Ghodsi, 2012). Bates et al. (2016) states that learning of any kind is best done collaboratively where there is supportive colleagues and facilitators who contribute to the overall quality learning.

Many writers agree that learning is not only listening where the lecturer impart knowledge but rather it is better when students are engaged in a number of activities. Tutorials has various activities that encourage learners to research, write, discuss, present and defend opinions making it a good learning strategy. The best learning strategies are those that are student-centred and encourage group work. A study done in the United Kingdom on the impact of group work in learning found out that group-work can have a positive impact on academic progress, pupil behaviour and relationships between teachers and pupils and among pupils themselves (Lawlor et al., 2010). A tutorial is a form of group work study that has a positive impact to learning (Beck, 2005; Kamardeen, 2014)..

Tutorial system of learning encouraged students to take active rather than passive role in learning and develop analytical skills. It has made students to work independently and provides opportunity to discuss ideas with tutors and fellow students (Kriflik & Mullan, 2007; Palfreyman, 2008; van den Hurk et al., 1999). Tutorials have been used for a long time in most leading universities as an effective method of engaging learners. It is a teaching and learning strategy with a long history having been proved effective. Indeed at Oxbridge, the reputation on teaching at these universities remains high (Tapper & Palfreyman, 2011).

Despite tutorials having been used widely and for a long time it has some challenges. Most challenges are associated with group dynamics such as size of a group, cohesiveness, domineering, complacency and lack of proper monitoring tools especially during virtual discussion. While it is the desire for everyone with some contribution to be heard, this is not usually the case. There is problem of dominance

and who gets heard. This can be a source of frustration and may affect some member negatively (Gaston & Duschinsky, 2020).

Student engagement can be a challenge especially where circumstances may not allow face-to-face interaction. This was evident during the COVID-19 pandemic where social interactions were not allowed. So lack of physical collaboration within the classroom negatively affects student engagement as well as the overall cohesiveness of learners cohort (Schwenck & Pryor, 2021).

2.3 Learning Management Systems

The intention of this study is to build a platform for managing tutorials in teaching and learning. That means the platform will be a kind of LMS that is not only developed for a specific purpose but should meet the requirements for system development cycle including deployment, testing and evaluation. The main purpose for the tutorial platform is to enhance management of tutorials in teaching and learning by integrating cloud computing technology. This ultimately is intended to enhance the quality of education and foster students' learning experience.

As the demand for quality education rises, there are deliberate efforts to improve on teaching methods and apply suitable technologies that can enhance management and delivery of learning programs (Biggs & Tang, 2011; CUE, 2014; Harold Elletson, 2019; Mijatovic et al., 2013). Use of LMS has often been perceived as a significant strategy to deliver quality education and training. Govender and Govender (2012) define LMS as software platform used for planning, implementing and assessing learning process. Institutions of higher learning, particularly universities, use LMS to support their education systems, deploy and track online learning. During the

COVID-19 pandemic, many universities started making more extensive use of LMS (Al-Mawee et al., 2021; Garcia et al., 2021; Mpungose, 2021). It's also becoming increasingly common in business enterprises, governmental and non-governmental institutions to use LMS for managing training and education programs. LMS provides an instructor with a way to create and deliver content, monitor student participation and assess student performance (Gavir, 2021). Some common examples are Moodle, Blackboard, Docebo LMS and Talent LMS.

2.3.1 Features of LMS

There are many kinds of LMSs on the market, each offering various instructional features and capabilities. It has therefore become increasingly difficult to evaluate and select best systems. However, literature on LMS has classified fundamental features for an LMS in various components as summarized in Table 2.1. The main components for LMS features include content management, administrative tools, assessment and testing, curriculum planning, reports generation, communication and collaboration, reports and visualization tools (Araka et al., 2021; Kulshrestha & Kant, 2013).

Access to various features and functions are set and determined as per user category. Each category of user is eligible for specific privileges and rights assigned during registration or later.

The regular users of LMS are students, lecturers and administrators. All users are required to login using username and password for authentication. Students, for example, once they login are able to access course plan for the semester, units registered, lecturers and timetable, activity schedules, list of enrolled students and study materials available for that course.

Table 2.1 LMS Features and Functions

LMS Component	LMS Feature and Functions
Content management and delivery	Content creation tools (to add/view text, images, audio, video, and other multimedia files). Course delivery tools i.e., e-learning/virtual learning; webinar integration with tools like Zoom, Google meet or Ms Teams Course materials e.g., lecture, assignments, tutorial questions and presentation.
Communication and collaboration	Discussion forums, chats, email, wikis and blogs. Classroom and college news and announcements.
Administrative tools	Curriculum planning and scheduling, timetabling, learning resource allocation e.g., lecture halls and labs. Student enrolment. Customization and user survey tools.
Assessment and testing	Tests and quizzes. Peer and self-assessment tools.
Reports and visualization tools	Reports and statistics for the learners' progress, performance and milestones. Customized reports for learners.
User interfaces	User interface for students, lecturers and administrators with respective access rights and privileges. Ease of use and friendliness.

2.3.2 Advancement in LMS

Once learning management software has been developed and deployed for use, there is always need for modification of features and demand for additional functionalities. This is normally motivated by the results of system evaluation, user experience and feedback that leads to having advanced systems (Alturki et al., 2016; Pishva et al., 2010) . That means systems keep on advancing and it is anticipated the tutorial management has potential to grow to advanced system upon its deployment and subsequent use.

Most systems in the market today, started as basic systems that focused on specific learning process with limited features but gradually advanced to large LMS with much functionality. The development in features is evidenced in various releases of

progressive versions usually documented in the user manuals. Each new release or version brings in improvements and additional features and functionalities. Some examples of learning systems that started as basic projects to improve a specific learning process and later to expanded to big systems are Moodle and WebCT.

Moodle LMS started as research project by Martin Dougiamas who was a PhD student at Curtin University of Technology, Perth, Australia (Dougiamas & Taylor, 2003; Wu, 2008). Moodle has expanded to be one of the leading LMS being used by many institutions across the globe. WebCT started as research project by Murray Goldberg, a faculty member in computer science, at University of British Columbia, to help in creating of web-based learning resources and monitor student progress (Goldberg & Salari, 1997). It continued to expanded application and was later on acquired by Blackboard Inc, a private enterprise, and traded as Blackboard LMS (Kotkamp, 2009; UBC News Digest, 2004). The tutorial management system (Tutmas) platform envisioned in this research may appear modest, however it has potential for growth having been developed on determined institutional needs to enhance administration of a popular pedagogy.

2.3.3 Deployment of a Learning Management System

Deployment of LMS refers to the process of setting up and implementing the system for use by the organisation. Deployment is a critical process that requires careful strategy so as to ensure use of the system irrespective of its complexity or simplicity. A setup normally consists of two basic elements: a server where the LMS application and databases are installed and the client that provides the user interface for instructors, students and administrators. The LMS can either be hosted locally or by a vendor (Hillis & Munro, 2005; Sorensen & Glassman, 2011). Local hosting

requires that the LMS application and all infrastructure is owned and managed by an institution. This setup is traditionally referred as client-server that operates on a local area network or intranet (Beaty et al., 2009; De Oliveira et al., 2013).

On the other hand, vendor hosting imply that the application and data are hosted and maintained by the vendor. User access the application through the internet, on a computer or mobile device. Many organizations are shifting to vendor-hosted, cloud-based systems which are easier to implement, use and require less technical expertise (Choudhary et al., 2014; Kaur & Chawla, 2014; Mhouti et al., 2018).

Some of the setups that have been used over the years to date can be summarised as follows:

- a) **Desktop Application**, the LMS application is installed on the desktop. In a local area network the application can be accessible by others connected to the network.
- b) **Self-Hosted**, the LMS application is hosted on an institutional computer system. Users access the system through the network or the intranet using computer and laptops.
- c) **Cloud-Based (SaaS)**, the LMS software is hosted on the cloud. The LMS is usually maintained by the vendor who is responsible for maintenance of the system and carry out any technical upgrades or updates. Online the user (learners, instructors and administrators) login to the LSM user name and password. There's no need to install any software, which makes it a great option for businesses that want to get started as soon as possible.

- d) **Mobile Application**, the LMS is accessible through mobile devices. You can upload online training content so that online learners can track online training programs and schedules.

The desktop application and self-hosted are the traditional setups while the cloud-based and mobile applications use the latest technologies which are relatively easier, faster and cheaper to implement. This study intends to use both cloud-based and mobile application setups that are flexible, faster and cheaper to implement and easily accessible to students, teachers and administrators.

2.4 Cloud Computing

This section reviews literature on cloud computing technology that will be used for development, deployment, hosting and access to the tutorial management system (Tutmas platform). The review covers cloud computing definition, service models, deployment model, the architecture in learning (LMS) and the supporting infrastructure particularly the internet. Thus, literature includes review on the internet connectivity in the country, regionally and globally.

2.4.1 Defining Cloud Computing

Cloud computing is simply defined as the delivery of computing resources and services over the internet. Choudhary et al., (2014), defines cloud computing as the provision of ICT infrastructure through the Internet. The services and resources are availed by providers such as Amazon Web Services (AWS), Heroku and Google cloud through subscription or pay as per use. AWS defines cloud computing as the “on-demand delivery of IT resources and applications via the Internet with pay-as-you-go pricing” (*What Is Cloud Computing*, 2022). The computing resources include

hardware such as servers and storage, and software such as operating systems, applications and databases are provisioned through the internet.

This technology allows institutions, businesses and individuals to rent ICT infrastructure and software instead of buying. The arrangement helps institutions avoid investing heavily in databases, software, and hardware but access via internet but rather pay only for what they use (Julisch & Hall, 2010; Liao et al., 2014). The technology allows users to order and pay for computer-based services in the same way billing is done for electricity and water (Liao et al., 2014; Masud & Huang, 2012). It has provided the educational sector a cost effective and efficient way of using and managing ICT resources and enabled them focus on core mandates (Masud & Huang, 2012; Sharma, Goyal, & Singh, 2014).

This research utilizes various kinds of cloud computing resources. These resources are: computer server services to host the online tutorial management platform, programming software needed for web coding; database for storage of data; computer storage to save learning resources and tutorial papers by students; and virtual meeting application. In this regard it is important to understand how cloud computing service models and how the technology is deployed.

2.4.2 Cloud Computing Service Models

Cloud computing has enabled the development, deployment and maintenance of online system so cost effective and easy to implement that many institutions are fast migrating from the traditional server-based systems to the cloud systems. It has also opened opportunities for small organizations and individuals to develop online systems. In cloud-based systems, computing resources and services are available on hire thus reducing or eliminating the reliance on local installations such as servers,

storage, and networking (A. Jain & Pandey, 2013; Simmon, 2018; Zhang, 2020). This therefore means that the researcher, in this study, would never need to buy the computer server, storage and networking equipment and software needed for development and hosting the platform but rather understand and use the suitable cloud service model.

The literature on cloud computing service models show three service layers (Julisch & Hall, 2010; Kamarudin et al., 2022; Manro et al., 2011). These cloud computing service layers include the infrastructure, platform and software as described below:

Infrastructure-as-a-Service (IaaS) - This is the base layer that provides the hardware and accessories remotely. The service provider supplies cloud infrastructure such as the servers, network components, storage, backup and support. The client simply pays on per-use basis (Manro et al., 2011). All the hardware components are provided through virtualization technology and users access them through the network (Dai, 2012).

Platform-as-a-Service (PaaS) - This is the middle layer that enables IT experts use the IaaS. PaaS enables the experts build applications more quickly and efficiently where they use programming languages and tools supported by the provider. It is the responsibility of the provider update such tools (Puustjärvi & Puustjärvi, 2012).

Software-as-a-Service (SaaS) - SaaS is the software distribution layer in which applications are hosted and made available to customers over the Internet by a service provider (Manro et al., 2011). This means that the software is deployed over the internet rather than when it is installed in a computer and are accessed through a browser (Christensson, 2011).

2.4.3 Deployment Models in Cloud Computing

Cloud computing has four deployment models that include public, private, community and hybrid clouds. Private and community clouds are owned, managed and operated as specific entity such as an organization existing in or off the premises (Bora & Ahmed, 2013; Choudhary et al., 2014; A. Jain & Pandey, 2013; Okai et al., 2014). Sometimes the cloud service can be managed by a third party on behalf of the organization. The public cloud and community cloud are exclusively managed by service provider.

Private clouds are for exclusive use by a single organization usually large enterprises such as government agencies or business establishment such as eBay. Private clouds are preferred best for minimizing security concerns (Choudhary et al., 2014). The public clouds are provided for use by the public. They are normally owned and managed by business enterprises, academic institutions and government agencies. Often they are domiciled at the premises of the cloud service provider (Choudhary et al., 2014) (Choudhary et al., 2014; Okai et al., 2014). Some examples are Amazon Web Services, Digital Ocean, Oracle cloud, Heroku, Google cloud and Microsoft Azure.

Community cloud is a cloud service provider with multi tenants referred to a community with shared interest such as security concerns and policies who manage the cloud services and resources. Often the community cloud service is usually maintained for specific purposes by the group such as insurances or banking industry. It may be operated jointly by the partners, by one partner or by a third party (Choudhary et al., 2014) (Bora & Ahmed, 2013; Choudhary et al., 2014). Cloud4C is one notable example that operates community cloud service in the insurance

industry. The KENET cloud is another example of a community cloud. It provides services such as backup storage, hosting websites and E-Learning systems to member institutions.

The final deployment model is hybrid cloud that normally combines the private and public cloud models. This model allows execution of services at different environments on premises, private cloud and/or public cloud. Each cloud remains unique but technology allow data and application portability and sharing (Puustjärvi & Puustjärvi, 2012).

2.4.4 Cloud Computing Architecture in Education

Cloud architecture is the way different computing technologies and components are arranged to provide cloud computing service. Zhang (2020) has identified key components as servers, storage, operating systems, databases, applications and interfaces, networks (Internet or Intranet), front-end and back-end platforms. The writer explain that cloud computing architecture is about how these components are used together to provide services and application to meet the organization's needs.

Other writers explain cloud computing architecture models in education as comprising of three layers including physical, services and cloud management layers (Buyya et al., 2014; Dinh et al., 2013; M. A. H. Masud & Huang, 2012; Mhouti et al., 2018; Zhang, 2020). The physical layer comprises of the computer storage, servers, computer memory, processors and other critical hardware needed for hosting the cloud services. Then the software services which probably is what most internet users are familiar with. Clients are not usually concerned with underlying technologies but rather on the services. Some common applications under this service include emails and office applications. A good number of these applications

have free services while some are billed monthly or as per the use. The third layer is platform layer which provide a forum for the management of cloud computing services. It provides resources that facilitate building of applications, hosting and deploying for use by various clients.

Apart from the cloud services and infrastructure, the other important components are the users and institutional support. Users include learners, instructors, administrators and technicians who use the front-end services while the institutional support comprise of back-end services such as hardware, networking infrastructure and application software. The internet connects the back-end and front-end services.

In the last few years cloud computing has been successfully promoted as the new paradigm in organizing and managing IT resources for all kinds of organizations (X. Tan & Kim, 2011). Indeed the cloud computing model Infrastructure-as-a-Service (IaaS) is “emerging as a viable alternative to acquisition and management of physical resources” (Keahey, 2009). This service becomes accessible to institutions at a fee and removes all the headache of hardware support. So when institutions integrate cloud computing services they are able to concentrate on core activities that is teaching and learning. As Manro et al., (2011) observes by sharing Information Technology (IT) services in the cloud, “educational institutions can outsource non-core services and better concentrate on offering students, faculty and staff the essential tools to help them succeed” (Manro, 2011, pg131)

A review of various literature show that ICT is beneficial in educational management systems and benefits faculty, students and administrators. Tan and Kim (2011) has summarized how cloud computing applied in the educational categories in Figure 2.1.

Category	Areas where Cloud Computing can be applied	Stakeholders as users of Cloud Computing based application		
		<i>Faculty</i>	<i>Students</i>	<i>Administrators</i>
e-Learning	Course Contents Management	X	X	
	Collaborative Learning	X	X	
Communication	Email communication	X	X	X
	Notification Management	X	X	X
Administration	Enrollment Management		X	X
	Registration Management		X	X
	HR Management	X		X

Figure 2.1 Cloud Computing in Education.

Source: Tan and Kim. (2011). Pg 642

2.4.5 Global, Regional and National Internet Connectivity

Internet is critical infrastructure in cloud computing as it links the front-end services (the client devices, browsers, local networks, desktop software and mobile apps) with the back end, which consists of computer servers, operating systems, databases and computers (Buyya et al., 2014). All cloud-based systems and services require internet as it enables users to store data, files and applications on remote servers and then access through the Internet. Therefore global, regional and national connectivity is critical. The review on literature gives an overview on connectivity situation for local users to the globe. Internet connectivity allow users to work remotely thus increasing the efficiency of doing business regardless of geographic boundaries. It is an important tool of accessing information and communicating.

Governments across the globe, are investing heavily on the connectivity infrastructure to ensure that the citizens have internet access at affordable cost. Countries connect to the internet global infrastructure that transverse the space, air, land and sea. African countries are connected in the international broadband highways through the undersea fibre optical cables. Before 2009, Kenya and other

Eastern African countries relied on satellite connectivity however today they are connected to TEAMS, SEACOM, EASSY and LION international broadband highway as shown in Figure 2.2 (*The Kenya National ICT Masterplan April 2014: 2013/14 - 2017/18, 2014*).

According to E-Learning African Survey, 2013 on use of digital technologies, the use of ICT in education is on the increase across Africa. In the survey that covered 42 African countries, there are various projects and initiatives relating to use of modern technology such as mobile phones, social media and tablets in learning and teaching.

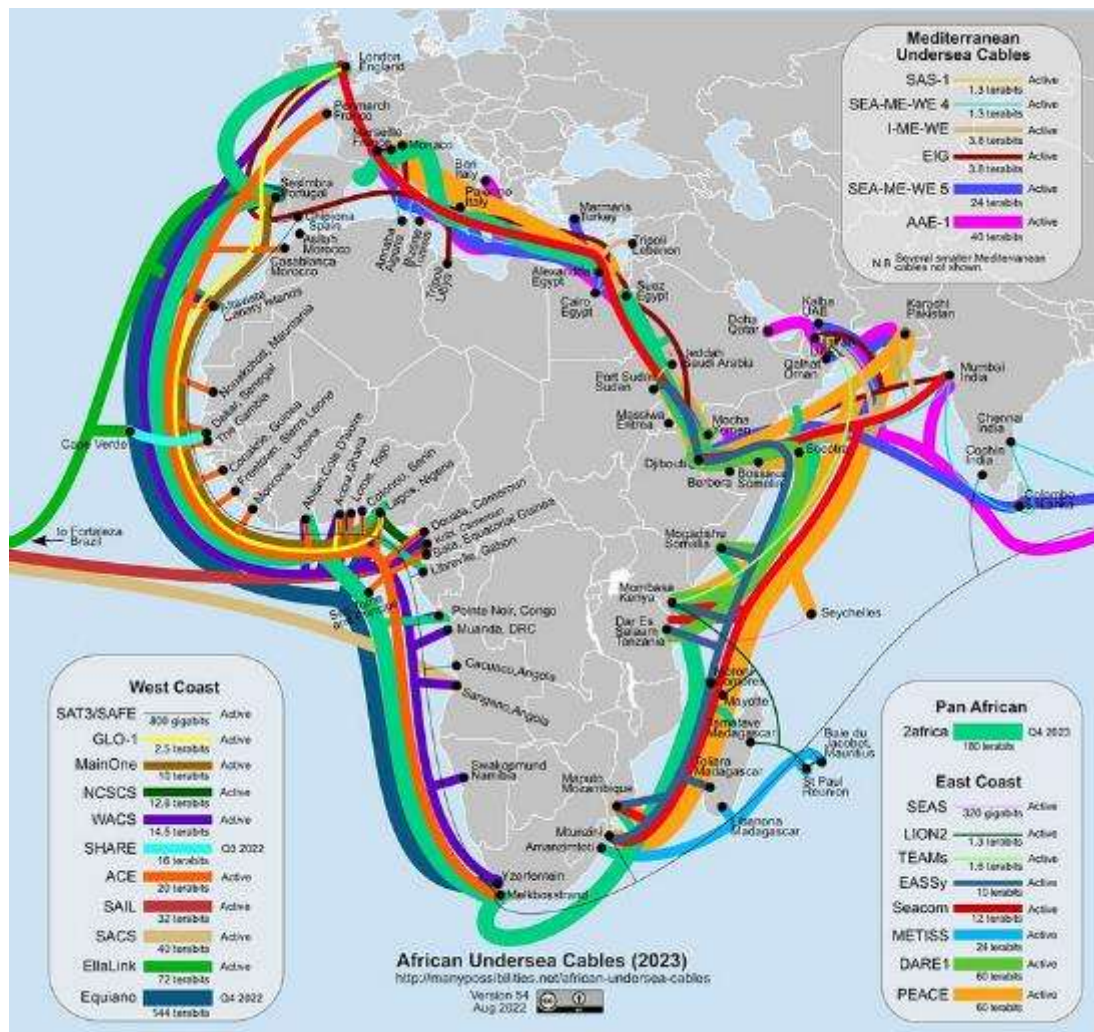


Figure 2.2 African Undersea Cables.

Source: <https://manypossibilities.net/african-undersea-cables/>

A further survey show that African practitioners in the education sector commonly use laptops (83%), mobile phones (71%) and stand-alone Computers (67%) over other technologies (TV, Radio, Computer labs, digital projectors, tablets which rated at 34% and below) every day to support learning in their institutions (“The ELearning Africa Report 2013,” 2013)

2.4.6 Internet and Mobile Phone Services in Kenya

The research output in this study is a cloud-based platform that is highly dependent on the internet connection. The internet is needed to link the users with the online platform. Therefore, a review of the status on the internet access in the country is important.

According to the quarterly statistics reports by the Communications Authority of Kenya (CCK), summarized in Table 2.1, it shows that in the last six years (June 2017 to June 2023), mobile phone subscriptions increased from 40.3 million to 66.4 million. Mobile phone data subscriptions increased from 29.4 to 49.4 million. International internet bandwidth available in the country provided by undersea SEACOM, TEAMS, EASSy, LION and Satellite services increased from 2,906 to 16, 114 Gbps against the used bandwidth of 882.6 and 7,722.2 respectively. The reported data confirm that Kenya infrastructure has enough bandwidth for cloud computing services. Also the end users show a gradual rise in internet subscriptions for both mobile data and fixed data.

Table 2.1 Internet and Mobile Phone in Kenya

Service	2016/2017 (Jun 2017)	2019/2020 (Jun 2020)	2022/2023 (Jun 2023)
Mobile Subscriptions (million)	40.3	57.0	66.4
Outgoing SMS - On-Net (billion)	14.6	20.1	10.9
Mobile data subscriptions (million)	29.4	40.8	49.4
Fixed data/Internet and broadband Subscriptions (thousands)	71.3	619.6	1,178.2
Mobile phones – Feature phones (million)			32
Mobile phones – Smart phones (million)			30
International internet bandwidth in the country by SEACOM, TEAMS, EASSy, LION & Satellite. (Gbps)	2,906.8	7,393.0	16,114.4
Total International Internet Bandwidth Used (Gbps)	882.6	3,235	7,722.2

2.4.7 KENET and Internet Provision at Universities in Kenya

Kenya has prioritised provision of internet to all educational institutions across the country. In 2014, the Kenya Government published a national ICT masterplan that recognised the potential of ICTs in stimulating socio-economic growth and development. The was designed to ensure the potential of ICT is harnessed a lot more so as to help the country transition into a knowledge economy. This policy also set a legal and regulatory framework for the development of the ICT sector and partnership with the private and development partners (Kenya. ICT Authority, 2014).

In facilitating provision of internet to support research and educational need in a country, governments establish National Research and Education Network (NREN). Towards this end, Kenya Education Network Trust (KENET) has as one of its roles is to provide learning institutions with a cost-effective, fast and reliable Internet connectivity. According to the 2019 newsletter, the institutional membership was

160 which included 36 public universities and 34 private universities as shown in Table 2.2 (KENET, 2019).

Table 2.2 KENET Membership and Connectivity Status, Nov 2019

No.	Membership Categories	Number of Members	Connected Members
1.	Public universities and university colleges	36	36
2.	Private universities and university colleges	34	31
3.	TVETs	34	29
4.	Teaching hospitals and medical colleges	10	10
5.	Government institutions	20	16
6.	Research institutions	20	16
7.	Affiliates	6	6
	Total	160	144

Source: KENET Newsletter, 2019

The data indicates the readiness and potential in institutions of higher education in Kenya towards cloud computing services. All public university and university colleges are connected to KENET for internet access. Kenyatta University is among 36 public universities connected to the Internet.

2.4.8 Cloud Software Development Process

Cloud software development refers to the process of creating computer programs or software applications that run on the Internet. Also known as cloud application development utilizes computing resources, software development tools and apps to create software. (anjura (2014) describe cloud application development as the process to create, build, and deploy software applications from the web browser. The writer explains that one just requires internet connection and skills to code on a web development platform such as Cloud9 IDE. Once the code is developed and tested it is then deployed on cloud servers through a browser where the application is accessed through URL.

Bridging the gap between systems requirements and the final product is the main task in software development process that programmers undertake. Thus, the requirements in this study aim at improving the management of tutorials by developing a cloud-based platform. The programming task in this process is to utilize cloud computing resources and tools to code the software application to be hosted on the cloud. The traditional formal process in software development is known as System Development Life Cycle (SDLC). The common method in this process is called waterfall. This method progresses in systematic manner from one stage to another starting with defining requirements, then analysis, development, testing and deployment. and maintenance as illustrated in Fig 2.5 (Boyde, 2014; Khan & Beg, 2013).

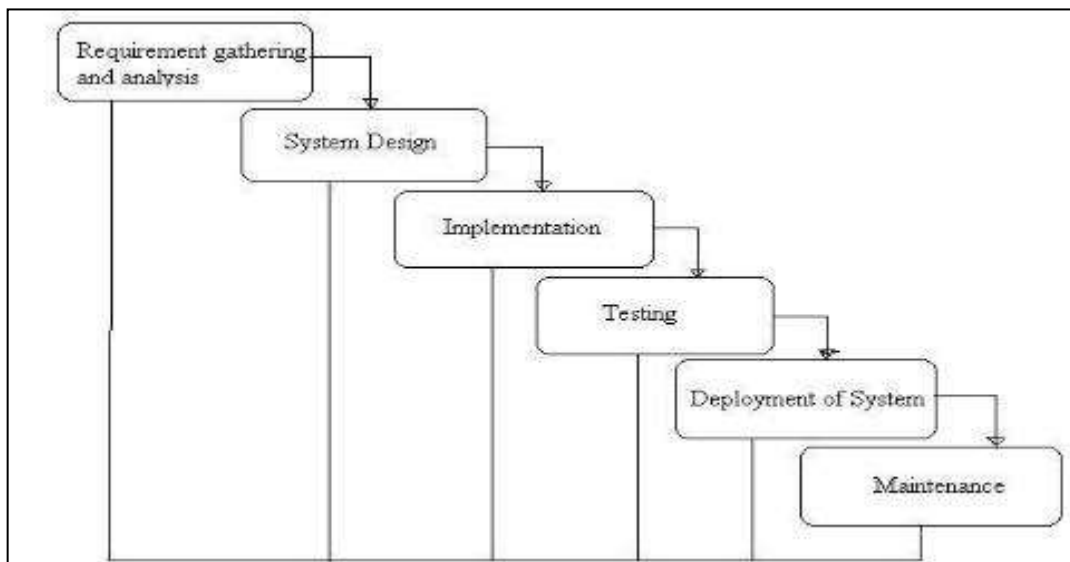


Figure 2.3 Waterfall Model in Software Development.

Source: <http://istqbexamcertification.com/wp-content/uploads/2012/01/Waterfall-model.jpg>

The Waterfall Model has been used successfully for a long time, it is easy to understand and use. For a long time, it has been the most preferred method by development teams and managers as gives clear documentation of the project and

consists of sequential phases focusing on the goals. However, this model has a major weakness for example testing is done when the development is complete, making it potentially expensive if correction has to be done. Also due to its rigid structure and tight controls, method is potentially slow and costly. Due to these drawbacks, system developers have devised other approaches that are faster, less expensive and flexible. Among them is the ASD approach.

In a way to mitigate this weakness an alternative methodology has been devised that has iterative approach and allows for adjustment as development progresses. New approaches to software development such as ASD adopt similar principles to SDLC on that the implementation is executed in different manner where smaller development is split in two or more cycles (P. Jain et al., 2018; Khan & Beg, 2013).

2.4.9 Agile Software Development Methodology

Agile Software Development (ASD) methodology is a flexible, less costly and faster alternative to traditional Waterfall approach for software development. ASD is built on principles of SDLC however its implementation is executed in different manner where the project is split into smaller and short period cycles called sprints (P. Jain et al., 2018; Khan & Beg, 2013). The researcher adopts ASD for the development of the tutorial management platform for flexibility, reducing costs and time.

ASD is guided by a set of principles which were developed by a group of experts based on their best practices and previous success and failure in software development. Misra & Misra (2014) has summarized these principles as follows:

- *Individuals and interactions* over processes and tools.
- *Working software* over comprehensive documentation.

- *Customer collaboration* over contract negotiation.
- *Responding to change* over following a plan. (pg 975)

One of the key benefit of ASD is that the approach “interactively produce deliverable products” (Aken, 2008). It provides a flexible approach is which is more adaptable to new product development. It is described as Agile Project Management (APM) and is widely used in software development (Conforto et al., 2014). Agile approach offers significant benefits in risk reduction and quality improvement (Simons, 2006). Software development using Agile methodology are able to quickly generate value and receive feedback faster thus enabling them to identify problems and resolve them early (Aken, 2008). This approach is an incremental and interactive method for the design and development of software whereby the software application is broken down into smaller sprints that undergo a complete cycle of development, design, coding and testing. The sprints are then integrated to the final software.

A study on the level of adoption and effectiveness of software development methodologies in South Africa found that Agile is most dominant and “is also preferred methodology to be used in the future” (Ramnath, 2010). Proponents of this methodology emphasize on delivery of a working product and contend that the approach “can adapt and react promptly to changes and demands” in dynamic software development environment (Meso & Jain, 2006). The choice to use ASD methodology in this study to develop online Tutmas platform is informed by the literature. However, what these kinds of surveys lack are empirical and conceptual review on the development process particularly on LMS. Development of software is not only determining the method but there are stages in SDLC which includes

system analysis, system design, system development, testing and evaluation. This study therefore aims at giving not only a comprehensive review on the tutorial process in teaching and learning but also detail on the design, development, testing, deployment and evaluation of the online cloud-based tutorial management system which is an LMS.

2.5 Systems Testing and Evaluation

Software testing and evaluation is a crucial process to assess the performance, reliability, and safety of the software. It is an integral part of software development, which helps identify levels of performance, weaknesses, bugs and areas of improvement thus enabling developers to make necessary adjustments before the final deployment. Testing simply helps finding out whether software is working as it should or is doing what it is supposed to do. Literature emphasizes on the value and different levels of software testing before final deployment (Agus Herlambang et al., 2022; Pocatilu et al., 2010a, 2010b; Rashid & Khan, 2018). Some of the tests are: acceptance testing which is intended to verify if the whole system is working as intended; unit testing is to validate a specific function or unit is performing as expected; integration testing is to ensure software modules operate together; and usability testing is to validate is the customer can use the system successfully.

Evaluation on the other hand is the determination that the software achieving the intended goals. It focuses more on the users' feedback including students, lecturers and administrators. This is normally done through surveys and observations and system logs after the system has been implemented and used for a while.

In this study, a system testing and evaluation is intended to determine whether it was effective in the administration of tutorials. It also focuses on the platform's quality assurance and performance of platform covering areas such as interface, technologies deployed, student opinions and their experiences.

2.6 Action Research in Education

Action research is an inquiry method used for improving educational practice. Its goal is to investigate problems or issues in a practice and provide a solution or improvement. This research has adopted action research approach to develop an online platform to enhance the management of tutorials in teaching and learning. Action research methodology offers a systematic approach to introducing innovations in teaching and learning (Koshy, 2010).

Some writers described action research as a systematic study to improve educational practices by groups of participants by means of their own practical actions and by means of their own reflections upon the effects of those actions (Kiilo & Kutsar, 2012; Mertler, 2012; W. K. Tan et al., 2009). Other writers have called action research as classroom research (Hopkins, 2014), participatory action research, teacher research or research by practitioners (Fraenkel & Wallen, 2009; Gall et al., 2014). It is the method of inquiry that is conducted by or directly involves practitioners with the intention of bringing change in practice. Ferrance (2000) while explaining action research in education writes that it is a disciplined inquiry often conducted by educational practitioners with the intent that research will inform and change the practice. It is a collaborative activity often involving teachers and other stakeholders searching for solutions to problems experienced in teaching and learning while at the same time looking for ways to improve instruction,

administration and enhance student learning experience. Rather than conducting a theoretical or experimental enquiry, action research allows practitioners to address concerns in their practice where they have some influence to make changes or improvements (Clark et al., 2020; Ferrance, 2000; Mertler, 2017).

2.6.1 Uniqueness Characteristics of Action Research

Action research has unique characteristics that distinguish it from formal research. Fraenkel, et al. (2012), Gall, et al. (2014) & McNiff and Whitehead (2009) have identified a number of characteristics some of which are highlighted below: first is the scope of the study and the purposive sampling. The scope is often narrow and therefore the results may not be replicated. However, over the years the outcomes in some studies have been used to resolve problems in different location. For example, the widely used Moodle LMS started as a PhD research work for a student at Curtin University of Technology, Australia (Wu, 2009).

Another characteristic relates to the focus of the study where the goal and intention of action research is to identify and solve a problem of local concern or a problem relating to ones own practice. This is different from formal where the intention is to investigate on a problem or question concern a larger educational situation or issues. Action research is often undertaken by the practitioner or other professionals with experience on the situation and as such their opinions are considered useful data. This is different with formal research where the researcher is not usually involved in the local situation and their opinions are not considered as data. Action research has more practical purposes, it systematically identifies the problem and seek solutions and reflects on the results. The inquiry process generates information on the practice and the outcome contributes to the knowledge base that educators use to enhance

their practice (Koshy, 2010; Gall et al., 2014). In addition, Vaccarino et al., (2006) has also observed that apart from generating scientific knowledge, action research concern to improve a practice or solve practical problems leads to bridging between theory and practice.

Another characteristic is that action research offers to bridge the gap between theory and practice. While acknowledging that research often develop theories that help better the practices in teaching, there is often a breakdown in flow of information between practitioner and the researcher such that what happens in class does not reflect research finding (Mertler, 2017). Hirsh et al., (2022) in a study that reviewed issues on teaching methods identified a research-practice as a gap in contextual research. The writer found that there is failure in primary research to validate why a particular teaching method worked or not in a certain context. This research aims at making inquiry on tutorial practices, identify areas of improvement and integrate with cloud computing in a class setting. Thus bridging the findings, with proposed action then implement and evaluate the solution.

2.6.2 Models of Action Research

Different action research models have been explored by various authors. These models show a systematic problem-solving approach that involves the researchers and practitioners to identify the problem, plan for a change and act on the change, observe and reflect on the consequences. This can lead to re-planning and therefore a new cycle of plan, action, observation and reflection. The concept behind these models can be traced from Kurt Lewin. Lewin was a social psychologist and educator who came up with the expression “action research” in mid 1940s to describe research that combined inquiry with action needed to solve a problem

(Ferrance, 2000; Mertler, 2012; O'brien, 2001). Unlike conventional research that focus on hypothesis-cause-effect-conclusions, Lewin works focused on solving a problem in a practice or improving a situation through inquiry process to identify and determine how to go about solving or improving it. He conceptualized a model as a spiral process with four sequential steps: plan, action, observing and reflection (O'brien, 2001; Spiegel & et al, 1995).

These steps could be repeated in case the solution needed further refinement. Various models adopted from the Lewin Kurt's action research model have since evolved. Some notable examples include: Kemmis and McTaggart's action research spiral; Elliot's action research model and; the O'Leary's cycles of research (Koshy, 2010). (Carr & Kemmis, 1986). All of them adopt an iterative approach based upon four phases of action research often repeated in cycles. These phases are problem identification, action planning, implementation, evaluation, and reflection. Insights gained from the initial cycle feed into planning of the second cycle, for which the action plan is modified and the research process repeated as illustrated in Figure 2.2 (Riding,1995).

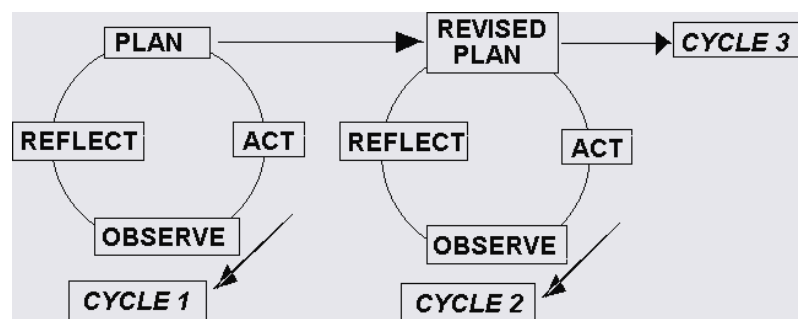


Figure 2.4 Figure 2.2 Riding's Action Research Model.

Source Riding (1995)

This study adopts the original concept and principles by Kurt Lewis for systematically solving a problem or improving on a practice. Therefore, the research

model hereby makes thorough inquiry on tutorial practices and activities so as to identify areas of improvement thereafter a plan of action on changes are implemented using the Kurt Lewin's model (plan-act-observe and reflect) approach.

2.7 Library Support in Tutorials

The library support tutorials in various ways. First by providing core textbooks, journals and other reference materials needed for learning. However, the process of acquiring library books in the University can sometimes be quite laborious and may have delays depending on the levels of approval and procurement rules in an institution.

Other ways the library can support tutorials is hosting of tutorial papers in case they are of good quality and facilitating academic publishing. Buckland (2015) has identified ways libraries can support publishing. Some of these is hosting of institutional journals and making students publications available through a repository. The Kenyatta University catalogue has links to online journals hosted by the Library and also a link to the Institutional Repository for works published by Kenyatta University scholars (*Kenyatta University Library Catalogue, 2020*).

Academic publishing is a process of putting published academic research and scholarship into a book or journal. The library can collaborate with lecturers, students and librarians for the creation, publishing, storage and dissemination of the scholarly works through tutorials at the University. It is a global trend that libraries provide publishing support services especially in open access (Richard et al., 2009).

CHAPTER THREE

METHODOLOGY

3.1 Introduction

The chapter describes the research methodology used in this study to develop a model to enhance tutorial management in teaching and learning using cloud computing technology. The chapter covers the research design, the location of study, sample size and sampling procedures, research instruments, validity and reliability, legal and ethical considerations and data analysis. It also includes software development process: piloting of the prototype, design and development of the online tutorial management system (Tutmas) and description of system development tools.

3.2 Research Design

The research design is a strategy that the researcher uses to conduct the study from initial investigations, through actions taken to reporting of findings. According to Henn research design involves “initial specification of how the problem is to be investigated and the plan for collecting and analysing data” (Henn et al., 2009, pg 336). Miller (2001) states that design is programme of planned sequence of the entire process involved in conducting a research study. That means the research design give a plan that facilitates collection and analysis of data by using appropriate research methods.

In this study on a model to enhance tutorial management in teaching and learning using cloud computing, the researcher used action research approach that consisted

of three main stages. The stages were aligned to the research objectives and adopted certain research designs and instruments as summarized in Table 2.1.

Table 3.1 Research Design Summary

Stage	Objective	Research Design	Research Instrument	Respondents
One	I: To establish how tutorial are conducted. II: To Investigate perceived benefits and challenges.	Qualitative & Quantitative	Observations, Interviews & Questionnaire	Lecturers & Students
Two	III: To develop online platform for tutorial administration	Agile Software Development & Qualitative	Observations & Interviews	Lecturers, Students & Research assistants
Three	IV: To experiment and evaluate the effectiveness of Tutmas platform	Qualitative & Quantitative	Observation, Interview & Questionnaire	Lecturers & Students

3.2.1 Survey on Tutorials at Kenyatta University

This was a survey on how tutorials are conducted at Kenyatta University. It included also opinions from both lecturers and student. The survey was done through observations, interviews and questionnaires. Two questionnaires were used: one to the lecturers and the other to the students. The questionnaires were piloted with selected members from classes that had an tutorials session in the semester. The questionnaires aimed at gathering qualitative and quantitative data from lecturers and students on the following:

- Understanding the activities and how tutorials are conducted at Kenyatta University.
- Establishing the perceived benefits and challenges regarding use of tutorials in teaching and learning.
- Suggestions on enhancing tutorials in teaching and learning.

Most of the questions were closed, on Likert scale, and others were open-ended questions that gave respondents opportunity to express their opinions on tutorials. Eligible respondents needed to have had some previous experience on tutorials and therefore they were identified through snowballing. The researcher visited various teaching departments and through referrals was able to identify lecturers who were teaching using the tutorial method to participate in the survey. On part of the students, most respondents were identified by librarians who participated as research assistants. The research assistants briefly interviewed respondents to determine if they had experienced tutorials so as to participate in the survey. The students also helped in identifying other respondents.

3.2.2 Agile Software Development Approach

The researcher used Agile Software Development approach to build the tutorial management system (Tutmas) and worked closely with stakeholders who included lecturers and students to determine the requirements. ASD is an iterative approach in software development where the system developers work interactively with their customers to deliver software in small sprints that progressively meet the needs and expectations. The development team continuously collaborate with their customers and continuously test the software making the process faster and acceptable. Ramnath (2010) has observed that “Agile method in programming is currently the most dominant and preferred methodology to be used in the future”. In an effort to maintain a systematic development and testing Tutmas features, the researcher adopted the agile life cycle that consist a series of sprints or cycles for incremental and iterative approach to software development. Each sprint has a cycle of five steps in software development: analysis, design, action, deployment and reflection as

illustrated in Figure 3.1. Each sprint is incremental and builds towards final release of an acceptable and complete Tutmas platform.

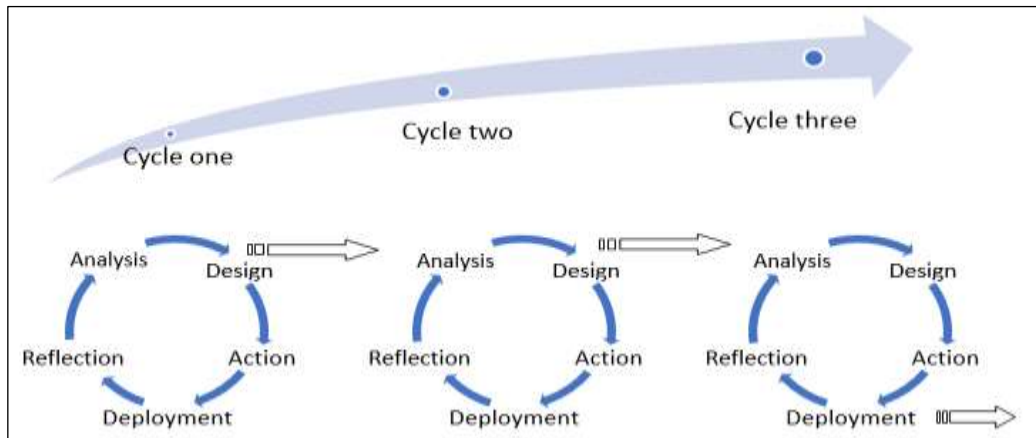


Figure 3.1 Agile Software Development to Tutmas Platform.

Source: Researcher's construct

Tutmas Development Process

The main aim of the study was to develop an online tutorial management platform (Tutmas) based on cloud computing to facilitate administration of tutorials in teaching and learning. The researcher used ASD process that consisted of sprints. Each sprint had five had five stages as follows:

- a) **Requirements/ System analysis** – this was synthesizing the information obtained on how tutorials are conducted, feedback from users and any kind of useful observations for identifying the requirements and features that the platform require.
- b) **Design and development** – this included design and planning of the structure of the platform thus the features, functionalities, user interfaces and kind of input and output data. The development team was responsible for building the code depending on the requirements. The team constantly

engaged with various stakeholders i.e. students, lecturers, research assistants and the researcher.

- c) **Testing** – The platform was thoroughly tested to ensure it meets the requirements for lecturers to administer tutorials, use by students and provision of needed reports.
- d) **Deployment** – the platform is deployed and put in use. The necessary cloud computing infrastructure for online hosting of website and data.
- e) **Reflection and evaluation** – This is a reflection on the observation, feedback and impact on platform. Also, a deliberate evaluation to get feedback from users to determine whether the platform meets its intended purpose and is friendly to use. Otherwise in case further changes or improvements are required

There were additional requirements for the tutorial management system for managing the tutorial papers. This necessitated survey on management of online journals and support by the library to host published documents.

- a) **Survey on Online Journals and Book Series** - The researcher undertook an exploratory survey on the requirements for publishing academic journals and book series. The aim was to get some insights on best practices and identify key requirements for publishing journals and books produced serially. This was motivated by the fact that tutorial papers had the potential of being published periodically after every semester and these papers would be a lasting and verifiable outcome for tutorial sessions. A sample was therefore purposely selected to help the researcher gain insight on publication of periodical publications.

b) **Document Review on Library Institutional Repository** - In recognition that one of the roles of university libraries is to manage institutional repositories and institutional journals, it was therefore important to establish the extent at which the Kenyatta University Library was achieving this role. The relevancy in this study is to have a repository for tutorial papers that could be recommended for future use as revision and study materials for a specific unit. The information in this respect regarding the institutional repository (IR) and online journals system (OJS) is to be sort at the library catalogue website, <https://maktaba.ku.ac.ke>.

3.2.3 Experimenting and Evaluating Tutmas Platform

This stage focused on the experimenting and evaluating the final released version Tutmas platform for its effectiveness in meeting the expectations form users and satisfying the requirements determined previously in stage one (Section 3.21). This involved observations and use of questionnaire to get the feedback from users.

3.3 Location of Study and Study Population

The study was conducted at Kenyatta University, which is located, about 20km north of Nairobi, along Thika Road. The University was established in 1985 and it is now the second largest university in Kenya. The University academic structure has teaching department under established Schools. The teaching departments are responsible for the academic programmes that are offered. Many of these are degree programs including undergraduate, masters and PhDs, but there are also diploma and certificate courses. The University allows various methods of teaching such as lecturing, tutorials, practicals and fieldwork. This research was focusing on a tutorial which is one of the methods used in teaching and learning at the University.

Since tutorials are not used in all academic programmes it was necessary to do a purposive sampling to target lecturers and students who would participate in the survey. The study population therefore was the students and staff that had experienced tutorials at the University. It was from this population that a sample of study participants was identified. Gray (2009) has defined population as the possible number of all units or elements to be included in the study. Denscombe (2010) has also defined population as the entire category of things to be researched on while the sample is that which is selected to take part in the research. It was therefore important to focus on a population that had experience in tutorials and apply a judgemental sampling.

3.4 Sampling Procedures and Sample Size

The primary goal of sampling is to identify a representative sample to use in the study. According to David & Sutton (2004) the basic principle for sampling is to get a part of a group that will be representative of the larger group or study population. The target population were students and faculty at Kenyatta University. The respondents were identified through snowballing. Majority of students who responded to the survey on how tutorials are conducted were identified by librarian who assisted in administering the questionnaires at the library. Before a respondent was given questionnaire, a brief interview was done to determine if they had experienced tutorials. The students also helped in identifying other respondents. For the students who participated during the development and evaluation of Tutmas platform, the researcher identified lecturers who had scheduled tutorial class during the semester and allowed the students to participate.

This study was conducted in three stages as per the objectives. Each stage used a different kind of sample as summarized in Table 3.2. During the first stage, the study focused on objective I and II that surveyed on how tutorials are conducted and the perceived benefits and challenges. The second stage was on the development of online tutorial management platform that included piloting, testing and deployment of the platform in a class. The final stage was experimenting and evaluating the platform by students in a tutorial class setup.

Table 3.2 Sample Size

Stage	Research Objective	Class Code	Lecturers	Students	Assistants
One	<ul style="list-style-type: none"> Establishing how tutorials are conducted. Investigate perceived benefits and challenges 		31	234	2
Two	<ul style="list-style-type: none"> Develop online tutorial management system (Tutmas) 	ECC800	1	32	2
		ECT253	1	35	2
		SCH803	1	3	1
		PML010a	1	35	2
Three	<ul style="list-style-type: none"> Evaluate the effectiveness of Tutmas 	EFN204	1	57	4
		SCH415	1	43	1
		PML010b	1	17	4

Apart from the data gathered from lecturers and students on the requirements of Tutmas platform, it was necessary to get additional information on best practices in academic journal publishing so as to improve on Tutmas functionality on supporting hosting of tutorial papers by students. Thus, a purposive sampling on journals and book series publishing and a document review on University Library support in online publishing was done. The researcher surveyed on 124 periodical publications

which include 112 online journals, 7 book series and 5 KU journals. The sample was purposely selected from open access journal and book series from databases subscribed through the University library.

3.5 Research Instruments

Research instrument refers to tools used to collect or obtain data in research. This study used different kind of research instruments as described below:

3.5.1 Interviews Schedule

Interviews are conversation between the researcher and the participant in the study (Mertler, 2012). The researcher held unstructured interviews with the lecturers who had their tutorial classes participate in the study. The purpose was to get more insight on how tutorials are conducted as well as getting their opinions on this kind of pedagogy. Indeed, this kind of interviews “provide qualitative depth by allowing interviewees to talk about the subject in terms of their frame of reference ... [and] enables the interviewer maximize her or his understanding of the respondent’s point of view” (Henn et al., 2009, pg 186). The engagement with the lecturers continued throughout the class period in the semester. The interviews helped the researcher to setup classes, tutorial topics and groups appropriately and also learn more about the lecturer’s past experiences in tutorials from other universities where they attended as students or had previously taught.

3.5.2 Questionnaires

The study used four different questionnaires to collect data needed in the study. A is a written list of questions where the answers are written by the respondents (Kumar, 2014). The first and second sets of questionnaires were administered to the lecturers

and students respectively to gather information about tutorial activities, challenges faced and the perceptions while the other two sets of questionnaires were used by students to evaluate the Tutmas platform. The questions had been pretested before administering them. Most of the questions were closed and required a response on a Likert scale or a simple yes/no answer however a few questions were open ended and required the respondent to record their responses.

Three sets were administered manually with the help of some research assistants. The last set was administered through a link to a Google online form to gather data from students who had used Tutmas platform in class. The questionnaires had the advantage of ensuring that the questions were standardized, less expensive and could give reasonable anonymity which encouraged objective responses especially where the information appeared sensitive.

3.5.3 Observations

Here, the researcher did direct observations on the events around the conduct of tutorials. The purpose was to observe and note the activities and processes in a tutorial class. The researcher had prepared an observation schedule to help gather data consistently. Observations were made by the researcher and research assistants who were non-participant observers, thus their roles were to watch, listen and make note of activities as they happen.

Some of the information gathered was on tutorial composition, activities or process such as the number of students in class, size of tutorial groups, whether the presentation was collaborative and if the groups submitted their papers for marking immediately after presentation.

3.5.4 Document Review

The document review involved a systematic analysis on selected academic journals and book series to collect and analyse data on publishing process. This was necessitated by the initial responses from both lecturers and students that some of the tutorial papers could be considered for publication as journal articles or book chapters. It was important, therefore to survey on best practices in academic journals and book series publishing. Special attention was paid to editorial requirements for the authors such as page and paragraph formatting and fonts; size of editorial team; and frequency of publications.

3.5.5 Web Development Tools

Web development tools refer to instruments or programs used to help programmers create, test, debug and maintain web applications. This research used a set of web application tools to develop, test and maintain the online tutorial management system (Tutmas). These tools are highlighted below:

- i) Unified Modelling Language used to graphically represent the sequence and flow of activities in the online tutorial platform.
- ii) JavaScript programming language for making web applications and websites.
- iii) PostgreSQL is an open-source relational database management system used for design of databases. It was used for the design of database to accommodate data such as students' details, course information and tutorial questions.
- iv) Cloud computing services to host Tutmas platform and website. The services were accessed through subscription.

3.6 Validity and Reliability

Validity in research is about the accuracy of measurements while reliability is about consistency of results. In research, both validity and reliability are important consideration by the researcher in regard to the methods and measurements used. Validity refers to the accuracy and precision of the data being measured (Denscombe, 2010). According to Mertler (2012) it relates to the extent in which data collected accurately measures that is purported to be measured. Reliability is the consistency in the results of measurements and therefore relies on the effectiveness of data collection instruments in measuring accurately and consistently (Henn et al., 2009).

In order to enhance data validity and reliability in both quantitative and qualitative methods to data collection, Denscombe (2010) and Gray (2009) suggests triangulation approach can be used in certain situations. The researcher used various methods to collect data that included observations, interviews, questionnaire and analysis of logs and data captured in the Tutmas platform in order to enhance validity and reliability.

3.6.1 Validity

The researcher used observations, interviews and questionnaire to collect qualitative data relating to tutorials in teaching and learning. The interview to lecturers was to help understand how tutorials are initiated and executed; observations were mainly to understand how tutorials are conducted in class while the questionnaire covered aspects of initialization of tutorials, how they are conducted and perception about tutorials by students and lecturers. Information gathered was used as basis for the platform design and establish requirements of the tutorial management system both

at piloting and development stage. The questionnaires were first pre-tested with students who were having tutorials during their semester.

Later on, software validation and verification were done during the final stage of testing and evaluation of Tutmas platform. Software validation at this stage was concerned with the correctness of the platform ensuring it is free of errors, satisfies user requirements and met the specifications. This process was a system quality check that involved review, analysis and testing by the developers, researcher, research assistants, students and staff.

3.6.2 Reliability

Reliability relates to the effectiveness of data collection instrument in taking accurate and consistent measurements. In order to enhance reliability, the researcher had a checklist on interview and observation schedules to guide gathering information on how tutorials are initiated and conducted. The questionnaires to the students and lecturers were pre-tested and improved before administering them. Although the questionnaire had some open-ended question, most of them were structured using the Likert scale. Further the research focus on respondents that had experience in tutorials.

The other aspect for consideration was the software reliability which is an important attribute in software quality. It related to the functionality and performance of Tutmas platform. The reliability was evident during the time of testing and evaluation where three classes used the platform in the administration of tutorials. Some of functionalities under test were the setup of tutorial class, groups and topics; presentation schedules; and uploading of tutorial papers by various groups.

3.7 Data Collection Procedure

The researcher obtained an authorization to carry out research at Kenyatta University then a research permit from NACOSTI as it was a requirement from the Kenya Government. Data collection procedure was based on the action research methodology where the development of the final Tutmas platform was progressively developed. The data collection included observations, surveys, user feedback and document analysis as described below.

3.7.1 Observations and User Feedback

During the initial phase of the study, observations were made in a tutorial class by the researcher and researcher assistant. In an effort to establish rapport with the students the lecturer had informed the class about the purpose of the visit which included the observation and a talk about information literacy and library resources. Both the researcher and the research assistant were librarians at the University which gave an opportunity to inform students about locating library books, journals and online resources useful for their studies. Thus, it was hoped that presence of the researcher did not create unnecessary anxiety nor change their usual behaviour.

Further observations were made as the Tutmas platform was progressively used and tested with the students. The feedback helped improve on the features and introduce new ones.

3.7.2 Questionnaires

The first set of two questionnaires was administered to lecturers and the other to students during the initiation stage of the research. The aim was to gather more insight on the processes and activities while conducting tutorials at Kenyatta

University. The questionnaires were also used to understand the challenges faced, benefits, opportunities in tutorials and suggestions on improving the tutorials. An introduction letter to the participant accompanied each questionnaire and it briefly explained the purpose of the research, invited them to participate, and a statement appreciating their participation and an emphasis on confidentiality. Later on, questionnaires aimed at evaluating Tutmas platform were administered to students who experienced the platform in the management of tutorials. These questionnaires covered the Tutmas user interface, accessibility and usability, technologies used, internet access, virtual presentations and overall user experience.

3.7.3 Tutmas System Logs Analysis

The other kind of data collected as system logs on student activities while using Tutmas in the management of their tutorial classes during the semester. This data was periodically in the design, development, deployment, testing and evaluation of the Tutmas platform especially by the system development team. The researcher closely worked with the lecturer in setting up the classes, adding tutorial questions and having students enrol and join tutorial groups in Tutmas platform. As the students continued using the platform, there was regular engagement with the researcher where feedback was given. Most of the data was triangulated with observations made and logs analysis on students' activities on the platform and it was often used in testing, designing system reports and improving the tutorial platform.

3.7.4 Document Review

This involved collecting data on the existing Kenyatta University institutional repository and online journals hosted at the library website. Lastly quantitative data

on best practices in academic publishing was collected to understand the fundamental processes and activities envisaged in publishing industry.

3.8 Data Analysis

The researcher used various data analysis methods in course of the study. During the initial stages a survey on tutorial activities, challenges and perceptions was conducted. The data obtained was qualitative measured on Likert scale. Some responses were open-ended requiring narrations. Similar data was also collected in the last stage where a survey on testing and evaluation of Tutmas platform was done. Qualitative data analysis method was used in the Likert scale responses while thematic analysis was applied the narrative responses. Data on the survey on best practices in academic publishing was analysed quantitatively.

Data and information during Tutmas development included observations and feedback that was used to improve and/or expand the functionalities of the platform. Essentially, ASD require continuous interaction with users and feedback or observations obtained is normally useful for further development. The underlying principle is that the feedback can be used to initiate a new development cycle that begin with a design for improvement, develop or program the platform functionality, test and evaluate. It is a strategy which has lately become popular due to its timeliness in delivery, reduced cost and higher user acceptability in software development. Ramnath (2010) has pointed out that Agile method in programming which is currently the most dominant and preferred methodology to be used in the future.

3.9 Ethical and Legal Considerations

While noting that this research was conducted at Kenyatta University where the researcher made observations on how tutorials are conducted and, interviewed and administered questionnaires to students and staff, it was necessary to ensure that the data collected was used solely for this study. The necessary approval to conduct the study were obtained prior to commencement of data collection i.e., approval letter from KU's Graduate School to conduct research and a research permit from NACOSTI.

Also, it was important to ensure confidentiality of the respondents and protect their identity in the thesis report to prevent any kind of harm or distress. Further the integrity of responses was crucial by ensuring accurate recording and that the respondents participated voluntarily without any form of coercion and were well informed that the study was an academic research work leading to PhD degree. The researcher also ensured the work was free of plagiarism thus results were presented accurately and referenced work acknowledged appropriately using APA referencing and citation style.

Research participants included lecturers, students and the researcher. All data gathered will fundamentally be for building the repository of tutorial papers. However, identity for all participants will be necessary because the process will require the lecturer to grade the papers. The grades will be part of the student's final mark. This means therefore students who participate should understand that the tutorial process will form a basis for assessment. Grades will not be disclosed to other members in the class.

The lecturer will be responsible for selecting tutorial topics in line with the course curriculum. Students will then be expected to research and present in class for discussion then forward the paper for assessment by the lecturer. The papers produced will be deposited in the repository and made accessible to all students in the class as revision materials. The documents deposited in the library institutional repository will be accessed freely accessible by future students who join the course. The access to the deposited tutorial paper should be guided by Kenyatta University institutional repository policy.

CHAPTER FOUR
PRESENTATION OF FINDINGS, INTERPRETATION AND
DISCUSSION

4.1 Introduction

This chapter covers data presentation, interpretation and discussions of the findings. It also describes the study participants. The findings are presented according to the objectives of this study on a model to enhance tutorial management in teaching and learning using cloud computing. The objectives were as follows:

- i) To establish how teaching through tutorials is conducted at Kenyatta University.
- ii) To investigate from (a) lecturers and (b) students the perceived benefits and challenges of tutorials in learning and teaching.
- iii) To develop an online platform based on cloud computing for facilitating administration of tutorials in teaching.
- iv) To (a) experiment and (b) evaluate the effectiveness of the online tutorial platform in teaching and learning.

The study was conducted in three stage: stage one addressed the first and second objectives; stage two and three addressed third and fourth objectives respectively.

4.2 Study Participants

The study participants were identified through snowballing since use of tutorials is not exclusive but one of the recommended strategies for teaching and learning at the University (Kenyatta University, 2014). Therefore, not all lecturers, nor the students, had experience in teaching and/or learning using tutorials at the University. Other

participants included few technical experts such as librarians, computer technicians and administrators, who give auxiliary learning services in the tutorial process. A summary of participants at various stages of the study as shown in Table 4.1.

Table 4.1 Summary of Participants in the Study

Stage	Research Objective	Lecturers	Students	Technical Assistants	Total
1	(i) To establishing how tutorial are conducted at Kenyatta University. (ii) To investigate the perceived benefits and challenges.	31	234	5	270
2	(iii) To development an online cloud-based tutorial management system (Tutmas). [4 classes]	1	45	1	118
		1	25	1	
		1	37	1	
		1	3	1	
	- Survey on the editorial practices in academic open journals and book series publishing.			4	4
3	(iv) To experiment and evaluate the tutorial management system (Tutmas). [3 classes].	1	40	1	115
		1	55	1	
		1	15	1	

Stage one had a total of 270 participants who included 31 lecturers, 234 students and 5 technical assistants. The second and third stage had 118 and 115 participants drawn from four and three tutorial classes respectively; each class had one lecturer and a technical assistant. The largest class had 55 students while the lowest had 3 students. During the second and third stage, the students in the respective classes continuously interacted with online platform which enabled systematic development, testing and improvement of the Tutmas interface and functions. Additional four

technical assistants were engaged to explore on editorial practices for academic article publishing in open access journals.

Eventually, the researcher analysed system activity logs that were being generated by tutorial classes. The system logs data was used to triangulate some of the responses from students and also to confirm the effectiveness of Tutmas platform in the management of tutorial in teaching and learning.

4.2.1 Lecturers' Experience in Tutorials

It was observed that teaching using tutorials is a recommended method of teaching and learning at Kenyatta University. It was therefore important to establish if respondents, who included lecturers and students, had past experiences in tutorials. The researcher established how frequently the lecturers taught using tutorials through a survey to the question: "How often do you give tutorial questions in the units you teach?". The responses are summarized in Table 4.2.

Table 4.2 Frequency of Giving Tutorials in Teaching

Frequency of Giving Tutorial	No	Percent
Always	21	67.7%
Sometimes	10	32.3%
Rarely	-	0%
Never	-	0%
Total	31	100%

Results show that 67.7% of lecturers always teach using tutorials while the rest 32.3% said they sometimes give tutorials. These results indicated all lecturers who participated had their experience in using tutorials in teaching which was the researcher's study focus.

The researcher further sought to find out from lecturers to which group of students they give tutorials at the University. Respondents indicated that they teach undergraduates, masters and PhD students at the University using tutorials as illustrated in Figure 4.1.

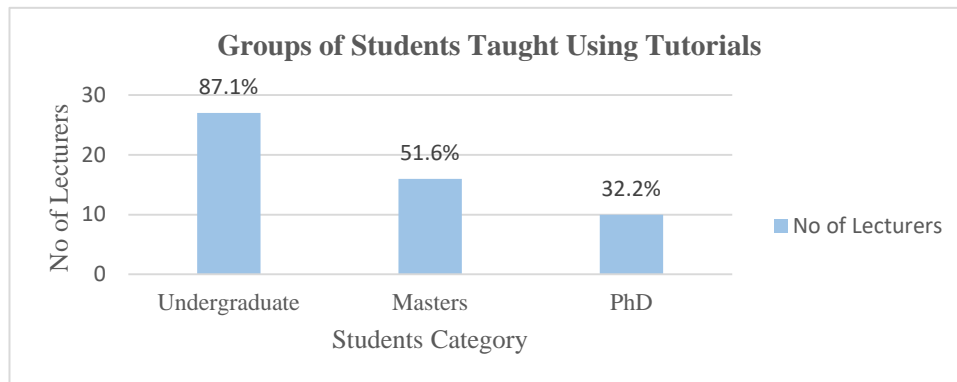


Figure 4.1 How Lecturers Taught Using Tutorials, N=31

Most of the lecturers 87.1% had taught undergraduates using tutorials, 51.6% had taught masters while 32.2% the PhD students. The trend shows that there are more lecturers giving tutorials to undergraduate than those teaching masters. The number reduces further for lecturers teaching PhDs. This trend is expected since the number of students reduces in the higher degree levels and therefore fewer lecturers are involved in teaching at higher levels. This could also be attributed to the number of programs at the University where there are more undergraduate programs than masters, and the number reduces with the PhD programmes (Kenyatta University, 2014).

4.2.2 Students' Experience in Tutorials

On part of the students, all those who participated in the research had answered in the affirmative to the question "Have you ever participated in a class tutorial as a

student?”. The respondents included undergraduates, masters and PhDs students as shown in Table 4.3.

Table 4.3 Students Categories in Tutorials Experience

Student Category	No	Percent (%)
Undergraduate	160	68.4
Masters	53	22.6
PhD	21	9.0
Total	234	100

Majority of the respondents were undergraduates (68.4%), then masters (22.6%) and PhDs (9.0%) which reflected the student enrolment at the University, thus the postgraduate student population is much lower than the undergraduates. Further it was important to establish how long ago the respondents last participated in tutorials. The responses are given in Table 4.4:

Table 4.4 Students’ Latest Participation in Tutorials?

Period	1-2 Years	3-5 Years	Over 5 Years	No Response
How long ago did you last participate in class tutorials?	161	44	14	15
	68.8%	18.8%	6.0%	6.4%

Majority of students 68.8% had recent experience of 1 to 2 years, while 18.8% had 3-5 years and 6% was over five years but 6.4% did not give a response. The different range of years since the respondents last participated in tutorials represent a wide experience in tutorials at Kenyatta University over time.

4.3 Teaching using Tutorials at Kenyatta University

The first objective of the study was to establish how teaching through tutorials is conducted at Kenyatta University. This study defines tutorials as a teaching method where topics are assigned to a student or group of students to research, write a paper

and present in class for discussion and assessment. The researcher made observations, administered questionnaire and interviewed some lecturers to get qualitative and quantitative data on tutorial process, activities and opinions relating to teaching using tutorials at the University.

4.3.1 Use of Tutorials in Teaching University Programmes

Tutorials are recommended to be used for teaching undergraduate, masters and PhD programmes. The researcher sought opinions from lecturers about teaching using tutorials at the University for various categories of learners. The responses are summarised in Table 4.5 on the opinion on teaching using tutorials.

Table 4.5 Opinion on Teaching using Tutorial as per Student Category

Students' Category Recommended to Use Tutorials	Lecturers	Percent	Cumulative
	No	%	%
Undergraduate, Masters and PhD	17	54.8%	54.8%
Undergraduate and Masters only	5	16.1%	70.9%
Undergraduates only	6	19.4%	90.3%
Masters and PhD only	2	6.5%	96.8%
Masters only	0	0%	96.8%
PhDs only	1	3.2 %	100.0%
Total	31	100%	

Most lecturers 54.8% agree that all categories i.e. undergraduate, masters and PhDs should experience teaching using tutorials. Cumulatively, however, an overwhelming majority of lecturers, 90.3%, are of the opinion that undergraduates should regularly use tutorials. Only 3.2% of respondents feel that tutorials should be exclusive to PhDs only and 6.5% to masters and PhDs only. These results suggest that tutorials should be used as a teaching strategy to be used in all categories of students. There should be more emphasizes to the undergraduates. Tutorials as a

form is small group discussions improve students learning experience and lead to higher satisfaction (Retna et al., 2009). Students should therefore be exposed to tutorials while pursuing undergraduate courses.

The researcher further sought to find out at which year of undergraduate study would be preferred to introduce tutorials. The responses are given in Table 4.6.

Table 4.6 Year Preferred to Introduce Tutorials to Undergraduates

	Year of Undergraduate Study			
	1st Year	2nd Year	3rd / Final Year	No Opinion
Response	17	7	6	1
%	54.8%	22.6%	19.4%	3.2%

Majority of the lecturers, 54.8%, prefer that undergraduate students should be introduced at 1st year of study, 22.6% indicated 2nd year while 19.4% indicated final year and only one respondent gave no opinion. Tutorials expose students to discussion groups and help in the building skills such as research, writing and presentations which is important at the University. The lecturers are keen that students should get such skills once they join the university. Some of the lecturers emphasized that it was important to introduce tutorials early: one respondent remarked that “by introducing the student to group discussions, class presentations ... in the first year at the university [is] laying a firm foundation for research work among students”. And another said “all students (regardless of level of study) should be exposed to a tutorial environment. By doing so it raises the bar of understanding study materials higher”.

However, there was a respondent in sociology discipline who had a different opinion that undergraduate should start at later years when the class sizes are not too big to

have fewer tutorial groups. Thus “tutorials will run better for undergraduates at 3rd and 4th year when the number [in class] is manageable and students have learnt major concepts.” Indeed, class size should be manageable to ensure effective application of tutorials. This was supported by another who remarked “when groups are small, they are manageable. That is the point at which tutorials as a teaching method become useful. This must be encouraged at all levels of the University learning experience.” This means that lecturers recognise the value of tutorials toward student’s experience, they are in support that students should be introduced to tutorials. It is important to expose students early when they join the university to lay a strong foundation in building their research, writing and presentation skills over the acquisition of knowledge. Tutorials are intended to help students engage more deeply with the subject and at the same time gain other academic and research skill such as problem-solving skills, developing confidence, critical and independent thinking, and presentation skills (Balwant & Doon, 2021; Retna et al., 2009; Wood, 1988). Tutorials are an effective teaching strategy and therefore lecturers should plan them well, guide the learners in the process and have clear goals.

Another respondent recommends at least a two-hour session for tutorials and observed that, for the undergraduates “tutorials should be conducted when the class has a double lesson (2 hours) ... and at least twice in a month meaning that the student will finish the semester with 6 tutorial sessions” while postgraduates i.e., masters and PhD, “tutorials can be a 3-hour session once in a month”. Without any doubt the lecturers place a high value of tutorials in teaching and it would be important to introduce to students as soon as they join the University.

Tutorials engage the learners all through the study period and help them gain an unprecedented learning experience. One important experience is during the class presentation and discussions because it helps learners to participate socially in class and also gain research, writing and presentation skills as they learn. The tutorial sessions are normally moderated by the lecturer. These presentations and class discussions are important means for achieving academic knowledge and enhancing social interactions (Laal & Ghodsi, 2012; Rosander & Chiriach, 2016). It also helps students to gain research and presentation skills (Palfreyman, 2008; Retna et al., 2009). Therefore, tutorial will help learners participate socially in class and gain research, writing and presentation skills as they learn.

4.3.2 Tutorial Class Formation

The research sought to establish what activities take place to commence tutorial classes. Opinions were sought from both lecturers and students regarding the activities at the commencement of tutorials. The responses from the lecturers are presented in Table 4.7.

Table 4.7 Activities at the Commencement of Tutorials, N=31

Activities at the Commencement of a Tutorial Class	Very Important	Important	No Opinion	Not Important
Students should be provided with course outline and topics.	30 (96.8%)	1 (3.2%)	0 (0.0%)	0 (0.0%)
Students should be given a list of reference books and journals to use.	18 (58.1%)	11 (35.5%)	1 (3.2%)	1 (3.2%)
The lecturer should provide a background on all tutorial questions or topics	20 (64.5%)	10 (32.3%)	1 (3.2%)	0 (0.0%)
Students should be provided with guidelines on format and layout of the tutorial paper.	22 (71.0%)	9 (29.0%)	0 (0.0%)	0 (0.0%)
Students should have competences on	15	13	2	1

referencing and citation. (48.4%) (41.9%) (6.6%) (3.2%)

Table 4.7 show that almost all lecturers 96.8% indicated that it is very important to give course outline to students and the rest 3.2% indicated it was important. Further responses on the provision of background to all tutorial topics or questions show 64.5% and 32.3% of lecturers agree it is very important and important respectively. It means therefore that giving students guidance on the course topics is important so as to help them choose topics rationally. This view is supported by some writers such as Webb (2009) who say that the lecturer guidance and intervention is critical to help a group function. Further responses on the provision of reference materials are also rated highly with 58.1% and 35.5% of lectures agreeing that it is very important and important respectively that students be given list of reference books and journals. The provision of references will help group members seek relevant materials on the topics they are to research on as they embark on the topics they choose, it a requirement by the CUE, which regulates academic programmes, that all units should have a list of core textbooks, references and journals (Commission for University Education, 2014).

Toward the end of the tutorial session the students are required to submit a well formatted paper for marking. It is the opinion of lecturers that students should be provided with guidelines on the format and layout of the tutorial papers with 71.0% indicating it is very important while the rest, 29.9%, said it is important. Correct referencing and citations are also necessary for academic papers and the researcher established that 48.8% and 41.9% of lecturers agree it is very important and to have competences in referencing and citation.

The students, on the other hand as learners, expressed almost similar opinions with what lecturers gave in regard to guidelines on tutorial topics, formatting of tutorial papers and competences in referencing and citation. Their responses relating to the usefulness of these activities are shown in Table 4.8.

Table 4.8 Usefulness of Preliminary Tutorial Activities to Students

Tutorial Activity	Ext. Useful	Very Useful	Useful	No Opinion	Not Useful
The lecturer giving background on all tutorial topics.	128 (54.7%)	69 (29.5%)	25 (10.7%)	10 (4.3%)	2 (0.8%)
Having the guidelines on format and layout of the tutorial paper.	96 (41.0%)	73 (31.2%)	53 (22.6%)	12 (5.1%)	0 (0.00%)
Students being provided with library reference books, journals and databases to use on the tutorial topics.	100 (42.7%)	85 (36.3%)	33 (14.1%)	13 (5.6%)	3 (1.3%)
Student's competence on referencing and citation.	82 (35.0%)	74 (31.6%)	60 (25.6%)	15 (6.4%)	3 (1.3%)

Majority of students i.e., 54.7% and 29.5%, agreed it was extremely useful to give background on tutorial topics and an additional 10.9% agree it is useful. Only 0.9% said it was not useful while 4.27% gave no opinion. The overall opinion from students is that they should be given background to all tutorial topics. This opinion not only collaborated with the lecturers' views (see Table 4.5) but also showed the students' enthusiasm to be guided on the topics. In regard to the provision of library reference books and journals, 42.7% and 36.3% of students agreed it was extremely useful and very useful respectively. These results indicate that students need to access to relevant reference materials for topics they are to write on. This findings not only agrees with the lecturers' opinion that students should be given a list of reference books and journals but also conforms with the CUE guidelines that

requires that every unit of an academic program must have a list of core texts, reference books and journals (Commission for University Education, 2014).

On the guidelines for the format and layout of tutorial papers, 41.0%, 31.2% and 22.6% of students agreed it is extremely useful, very useful and useful respectively to have the guidelines. Students also need skills on referencing and citation where 35.0%, 31.6% and 25.6% indicated it is extremely useful, very useful and useful respectively. Students should be guided on how to format, cite and reference academic papers as they write even the tutorial papers. Such guidance should be primarily be given by a lecturer since it relates on how the final paper appears before submitting for grading. Students and lecturers expressed further comments regarding activities relating to the commencement of tutorials such as views on background on tutorial topics, provision of reference materials, guidelines on tutorial paper layout and format, competences on referencing, citation and information searching. Some of the views and suggestions from students are sampled below:

“To make tutorials more effective, lecturers should first explain all the topics and say what they expect from each topic”

“... facilitators should clearly state the importance of tutorials to students”

“Facilitators to give out clear instructions and guidelines before giving out any activity to be performed”

“Without proper guidance the students tend to research beyond or outside given topic or subject”

“Lecturers being serious with the tutorials and give guidelines on outline to be used”

“Lecturers should give prior requisite guidelines on access, methodology, quality of tutorials beforehand to avoid stagnation”

“Define guidelines from the beginning”

Students also expressed desire to be given additional skills at the beginning of tutorials classes. These skills will research and prepare for presentation. Some of the remarks are presented below:

“By guiding the learners adequately to make them independent in information search and presentation”

“Teach students on presentation skills, search engines and referencing. Instructor to be proactive in class”

“...lecturers should offer topics for research and presentation skills in class”

Lecturers are the subject experts and they need to provide leadership and guidance on the tutorial process early enough so that the students and the groups are aware of their responsibilities and what is expect of them. Such guidance as suggested by the students is known to be very useful in group learning to enhance the focus and make tutorial process systematic and purposeful (Uden & Beaumont, 2006; Webb, 2009).

In addition to the comments on initial guidelines, the respondents gave other comments regarding to provision and access to books and other reference materials.

A lecturer respondent was specific that the students should “use ICT resources [from

the] ... Post Modern Library resources...” that is the main Library at Kenyatta University. And another emphasized that students should be equipped with information literacy skills. The students should “be introduced on library search tools quite early. It should not be limited to orientation only. It should constitute a topic in the units.” Students on the other hand expressed concern on lack of suitable references for the topics. They suggested that enough reference materials should be identified by the facilitators and made available through the University library. Some of the comments and suggestions from the students focused on the library that it should be well equipped with relevant books, thus:

“Relevant reference materials should be available in the School Library”

“Providing books which can be accessed on library shelves.”

“The School Library should be well equipped with books enough for all students to use and not delay their time while looking for limited resources.”

“Ensuring that all necessary resources are available. Lack of this often leads to presentation of shallow work”

They also suggested that should be proactive in identifying the relevant resources, thus:

“...lecturers making sure that students have the right materials for reading”

and

“Giving necessary hyperlinks related to tutorials”

Regarding the focus on tutorial topics, students suggested that:

“The questions should be enough for all groups. No question sharing.”

“The topics given by lecturers should be apparent from the scope of context from what is being taught during that semester....i.e. question[s] on the subject content.”

“The lecturer highlighting on the areas of research...”

“They [tutorial topics] should have their own learning goals.”

Students also suggested that tutorial classes should be scheduled early in the semester, thus

“Tutorial classes should be organised on time to do away with the eleventh hour when exams are nearing”

Students appreciated having the guidelines on tutorial sessions early in the semester, including the scheduling of presentations and how paper should be formatted. They also want the topics to cover the units well and the learning goals be clearly spelt. This kind of planning, it has been observed by various writers, is an important strategy for effective group discussions that benefits the students (Retna et al., 2009; Rezaei, 2018).

It was established that at the beginning of a semester, a number of activities take place that before tutorial class begin: first a teaching unit must be scheduled and included in the University timetable; and students should then register for the unit. Once the students have registered, the lecturer should prepare to meet the students at the earliest possible as per the schedule in the timetable to brief them the course outline and introduce unit topics. The lecturer should also provide a list of books and

other references and guide students on their expectations including writing of the tutorial paper. It was also important to guide students on referencing and citation.

4.3.3 Tutorial Groups Formation

The researcher sought to find out from both lecturers and students what it takes to form effective tutorial groups. Table 4.9 presents responses on statements regarding group formation by lecturers.

Table 4.9 Lecturer's Opinion on Tutorial Group Formation

Tutorial Group Formation Activity	Very Important	Important	No Opinion	Not Important
Students should be allowed to choose their preferred tutorial topics or questions.				
Allowing students to choose members of their tutorial groups, where groups have two or more members.	4 12.9%	10 32.2%	3 9.7%	14 45.2%
Each group should nominate a tutorial group leader.	15 48.4%	13 41.9%	1 3.2%	2 6.5%
Tutorial questions, presentation schedule and submission due dates should be given early in the semester.	23 74.2%	8 25.8%	0 0.0%	0 0.0%

Lecturers were asked how important to allow students to choose members of their tutorial groups, 12.9% said it is very important, 32.2% said it is important while 45.2% said it was not important. This result imply that lecturers appear to have divergent view whether students show choose or not choose their partners thus not significant. One respondent often uses the Random function feature in Ms Excel to reorganise the class list and assigns members of tutorial group. However, the student were of the view that they should be allowed to choose members of their groups with 26.1%, 24.3% and 29.1% indicating that it is extremely useful, very useful and useful to allow choosing of group members. Only 9.8% of the students said it was

not useful and 10.7% gave no opinion. In regard to whether tutorial groups should nominate a leader, majority of lectures agree it is important thus 48.4% of the lecturers said it is very important and 41.9% said it is important. Effective groups should be constituted in a way that encourages flow of communication and cohesiveness.

Another activity considered was whether lecturers should give timelines and scheduling of tutorial activities early in the semester. Respondents indicated that it is important to give tutorial questions and provide schedules for presentation and submission due dates early in the semester, with 74.2% and 25.8% of lecturers indicating it is very important and important respectively. Some students made further suggestions: for example, there should be learning goals for tutorials and that there should be enough questions for all groups. Other suggestions were that tutorials should not have too many members. One student suggests of “having smaller groups that can be easily managed”. A lecturer respondent remarked that “tutorials should have their own learning goals.” This was emphasized by another who suggested that “it is important for the lecturer to discuss the importance of tutorial with class so that they can appreciate the purpose.”

Further comments by students on tutorial preparation included that students should be made “aware of the importance or purpose of the tutorials”. Another added that “students should be made aware of the score/weight of participation in the tutorials i.e. marks to get.” They also suggested that “students should familiarize themselves with what is selected unit entails, what do they expect to learn out of the unit”. Other suggestions were on group size and class sizes: smaller groups and no too large

classes were preferred so as to enhance supervisions and students' participation.

Some of the suggestions by students on tutorial group sizes were:

"Having smaller groups that can be easily managed."

"Small tutorial groups to have each member presenting"

"More tutorial sessions needed [to] enhance supervisions"

"Addition of instructors to student groups"

"More time should be allocated to tutorials"

"Smaller groups so that each group has adequate time to present. More time [be] allocated for tutorials"

"Lectures should reduce number of members in tutorial class"

"Having tutorial groups with fewer members like 3-10 per group"

"... one semester to be for tutorials such that all students will present a topic to build their confidence"

"... allow students to work on topics that they are interest in This will motivate them to go a step ahead and get concrete information"

"Reducing the number of students in tutorial groups to a small manageable number"

Students prefer not too large tutorial classes, they suggested:

"Class size should be manageable"

“Reduce number of students per tutorial class”

“By checking the maximum number per [lecture] hall. Overcrowding reduces attention”

“Reduce number of students in a lecture hall for effective and smooth learning”

Students as the primary beneficiaries to the tutorials are keen on wider participation by the group members. The opinions from students were not to have large classes instead have smaller classes which are easily managed as it enables all members to participate, have effective discussions and will enhance the learner experience. These findings agrees with the views from various writers who agree smaller groups of between 5-8 students are more effective (Rezaei, 2018; Wheelan, 2009; Wood, 1988). Effective tutorial groups need not be too large to loss control, they should be sizes that are manageable so that they fulfil the intended purpose to improve the students' academic experience, participation and interaction (Foster, 2014).

The researcher found out that forming tutorial group is a fundamental activity in tutorials. Groups are formed from the class members who are expected to research on a topic or question given by the lecturer. Each group should nominate at least one group leader. Small tutorial groups are recommended of between 5-8 so that each member will have an opportunity to participate in researching and presentations. The topics are normally derived from the course outline. The groups are then expected to research on the topics independently then do a presentation in class for discussion when scheduled. Having functional tutorial groups therefore is important for successful sessions.

4.3.4 Tutorial Presentations and Assessment

The researcher set out to investigate the opinions from both lecturers and students on the presentations and group assessment. The findings are shown in Table 4.10.

Table 4.10 Lecturers' Opinion on Tutorial Presentation and Assessment

To what extent do you agree or disagree with the following statements regarding class presentations.	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
Class members should be allowed to critique, comment or seek clarifications on the presentations.	29 93.5%	2 6.5%	0 0.0%	0 0.0%	0 0.0%
Discussions should be moderated by the lecturer or his/her representative.	28 90.3%	3 9.7%	0 0.0%	0 0.0%	0 0.0%
Attendance records should be monitored continuously.	25 80.6%	5 16.1%	1 3.2%	0 0.0%	0 0.0%
Students should do a peer-to-peer assessment within groups on an individual's contribution on their tutorial assignment.	15 48.4%	13 41.9%	1 3.2%	1 3.2%	1 3.2%
A group should designate a main presenter.	16 51.6%	8 25.8%	2 6.5%	4 12.9%	1 3.2%
Presentations should be done using PowerPoint or similar software.	10 32.3%	16 51.6%	0 0.0%	5 16.1%	0 0.0%
The class size (no of students) during presentation has no significant influence on the effectiveness of presentations.	3 9.7%	2 6.5%	2 6.5%	5 16.1%	19 61.3%
Students should be allowed to revise their tutorial papers after discussions before handing over for marking.	21 67.7%	5 16.1%	2 6.5%	3 9.7%	0 0.0%
All tutorial papers should be checked for text similarity or/and plagiarism before marking.	21 67.7%	9 29.0%	1 3.2%	0 0.0%	0 0.0%

Majority of lecturers, 51.6% and 25.8%, strongly agreed and agreed that the group should designate a main presenter and that presentations should be done using PowerPoint or similar software where 32.3% of lecturers strongly agreed and

another 51.6% agreed. Regarding class discussions, an overwhelming majority of lecturers (93.5%) strongly agree that students should be allowed to critique and comment during presentations, and almost similar majority, 90.3%, indicated that discussions should be moderated by the lecturer. Most of lecturers, 48.4% and 41.9%, strongly agreed and agreed that students should do a peer-to-peer assessment within their groups for members contributions toward the assignment. Although 80.6% of lecturers strongly agreed that class attendance should be continuously, 61.3% strongly disagreed that the class size during presentations do not significantly influence the effectiveness of presentations. The class presentations and discussions are probably what has defined the value of tutorial over the years at Kenyatta University and elsewhere. Responses from the lecturers attest to this view with the majority showing positive support on tutorials. Various authors agree that class presentations and discussions has additional benefits that are not easily brought about by other teaching methods and they can be used for correction and interpretation of what students learn (Wood, 1988). Beck (2005) states that tutorials help students to think for themselves, have confidence in their own conclusions and opinions, and able to develop ability to express themselves in writing, or other means of presentation.

After presentation in class, 67.7% of lecturers strongly agreed that students should be allowed to revise their tutorial papers after discussions before handing over for marking and yet another 67.7% strongly agreed the papers should be checked for plagiarism before marking. This will enhance quality of tutorial papers.

Students, on the other hand, gave their opinions on class presentations as summarized in Table 4.11.

Table 4.11 Students' Opinion on Tutorial Presentations and Assessment

Please indicate how you rate the importance of these activities in making tutorials effective	Ext Important	Very Important	Important	No Opinion	Not Important
Requiring students to use online information resources when researching on their tutorial topic or question.	111 47.44%	80 34.19%	39 16.67%	2 0.85%	2 0.85%
Requiring students to make their tutorial presentations in class.	100 42.74%	93 39.74%	35 14.96%	3 1.28%	3 1.28%
Allowing discussions on papers presented in class.	97 41.45%	90 38.46%	36 15.38%	10 4.27%	1 0.43%
Having the tutorial paper checked for text similarity or/and plagiarism before marking.	87 37.2%	81 34.6%	40 17.09%	14 5.98%	12 5.13%
The lecturer to sanction tutorial papers that could be shared among other students.	58 24.79%	83 35.47%	66 28.21%	19 8.12%	8 3.42%
Requiring group members to do a peer-to-peer assessment on an individual's contribution on a joint tutorial paper.	76 32.48%	78 33.33%	54 23.08%	17 7.26%	9 3.85%

Majority of students, 47.4% and 34.2% agree that it is extremely important and very important to use online information resources when researching for tutorial topic, 37.2% and 34.6% agree it is extremely important and important that tutorial papers are checked for plagiarism before marking, 41.5% and 38.5% agree it is extremely important and very important that students should make their presentations in class, and 41.5% and 38.4% agree that it is extremely important and very important that discussions of papers presented be done in class. In regard to group members assessment 32.5% and 33.3% of the students agree it is extremely important and very important that members do a peer-to-peer assessment on individual group member contribution towards joint tutorial activities. These results show that students quite positive about tutorials, recognise the value of tutorials and are eager

for quality presentations and discussion. They also want to see group members active and assess individual performance. They are also keen on that lecturers should sanction the tutorial papers that could be shared among the students which means that the presentations and discussions should be moderated by the lecturers. The students gave suggestions and further comments regarding tutorial presentations some of which are as sampled below. They suggested that everyone should have a chance to participate thus:

“Each group member to be assigned a portion to present during the tutorials”

“Group members be allowed to pick a sub-topic each for all members to participate and gain knowledge”

“To check if all group members participated in preparing the presentation for the group presentation”

“The questions should be enough for all groups. No question sharing”

Student suggested some roles for the lecturers during and after presentations that included feedback and assessment. Thus, they should:

“Do some evaluation and assessment after tutorials” ... and give “feedback after presentation by the lecturer”

“Participate by asking questions and opinions from students”

“The lecturer highlighting on the areas of research and provide immediate feedback”

“After presentation the lecturer should give the group marks there and then on the spot and not go with the papers for marking”

“A lecturer guiding students in their presentations while in tutorial class and making fair remarks on work done.”

These feedback and suggestions show that students are eager to experience quality tutorials by having guided discussions and facts clarified by the lecturer who moderates all the sessions. Various writers agree that classroom discussions enhances learning experience, motivates students, help them to look at a problem from multiple perspective, become more creative and enhance satisfaction in learning (Biggs & Tang, 2011; Rezaei, 2018). Kember & McNaught (2007) identified three important strategies that are essential to quality teaching at the universities, first it is the student-centred active learning, then interactive learning environments and lastly feedback on student progress. Tutorials as given in the University have the student-centred approach, provide immediate feedback and enhance interactivity with the lecturer and other students particularly during presentations where ideas and opinions are discussed under the guidance of lecturers.

The survey established that tutorial presentations are probably the climax of the tutorials. It involves the class attendance, presentation, discussions, moderation and feedback on presentations by lecturers, assessment and evaluation the on groups' performance.

4.3.5 Assessment, Quality and Publishing of Tutorial Papers

The researcher sought to find out from both students and lecturers views about the assessment in tutorials, quality and subsequent handling of the tutorial papers. The findings from the lecturers are presented in Table 4.12.

Table 4.12 Lecturers' Opinion on Assessment and Quality of Tutorial Papers

To what extent do you agree or disagree with the following statements regarding assessment in tutorials	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
Students should do a peer-to-peer assessment within groups on an individual's contribution on their tutorial assignment.	15 48.4%	13 41.9%	1 3.2%	1 3.2%	1 3.2%
Students should be allowed to revise their tutorial papers after discussions before handing over for marking.	21 67.7%	5 16.1%	2 6.5%	3 9.7%	0 0.0%
All tutorial papers should be checked for text similarity or/and plagiarism before marking.	21 67.7%	9 29.0%	1 3.2%	0 0.0%	0 0.0%
Students should be allowed to access copies of all revised tutorial papers done by their colleagues	17 54.8%	12 38.7%	1 3.2%	0 0.0%	1 3.2%
Instructor/Lecturer should recommend tutorial papers that can be preserved for use as supplementary study materials by future students.	18 58.1%	11 35.5%	2 6.5%	0 0.0%	0 0.0%
Some select tutorial papers are of quality for publication as manuscripts for in a departmental, institutional or regional journal.	16 51.6%	14 45.2%	1 3.2%	0 0.0%	0 0.0%

Most of the lecturers agree that students should do a peer-to-peer assessment on group member's contributions with 48.4% and 41.9% strongly agreeing and agreeing respectively. Also 67.7% of lecturers strongly agreed that students should be allowed to revise their tutorial papers after class discussion before handing over

for marking. A similar number of lecturers, 67.7%, do strongly agree that all tutorial papers should be checked for plagiarism before marking.

Almost all lecturers agree that students should be allowed to access copies of revised tutorial papers done by their colleagues with 54.8% and 38.7% strongly agreeing and agreeing. However, the lecturer should recommend the papers that can be preserved for use as supplementary study materials where 58.1% and 35.5% strongly agreed and agreed. Toward this end, 51.6% and 45.2% of lecturers strongly agreed and agreed that some tutorial papers are of quality that can be considered for publication in a departmental, institutional and regional journal.

Students gave their opinions toward the assessment in tutorials, quality of tutorial papers and publishing of select papers as presented in Table 4.13. Almost all students confirmed that their tutorial question was within the scope of course outline where 67.9% strongly agreed and 27.5% agreed. This means that the tutorial topics were based on the course outline and therefore suitable in covering the topics in a unit.

The students' responses regarding discussions in class and lecturer's feedback show, 55.1% and 40.2% of students strongly agreed and agreed that discussions of tutorial papers in class were very useful. Also 55.6% and 38.9% strongly agreed and agreed that lecturer's comment on facts and issues during presentations were very essential.

Towards the quality of tutorial papers, 49.6% of students strongly agreed that students should be allowed to revise their tutorial papers before handing them over for marking. Respondents agreed that all tutorial papers were useful revision materials for the exam with 35.5% and 40.6% strongly agreed and agreed respectively, 53.8%

strongly agreed that students should be allowed to access copies of all revised tutorial papers.

Table 4.13 Students' Opinion on Quality, Assessment & Sharing of Papers

The extent to which you agree with statements	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
My /Our tutorial topic or question was within the scope of the course outline.	159 67.9%	64 27.5%	9 3.8%	2 0.8%	0 0.0%
Discussion of tutorial papers presented in the class was very useful.	129 55.1%	94 40.2%	6 3.4%	3 1.3%	0 0.00%
The lecturer's comments on facts and issues during paper presentations were very essential.	130 55.6%	91 38.9%	12 5.1%	1 0.4%	0 0.00%
Students should be allowed to revise their tutorial papers before handing over for marking.	116 49.6%	88 37.6%	19 9.8%	6 2.6%	1 0.4%
I used my tutorial paper to revise for exam.	95 40.6%	109 46.6%	15 6.4%	13 5.6%	2 0.8%
All tutorial papers were useful revision materials for the exam.	83 35.5%	95 40.6%	27 11.5%	23 9.8%	6 2.6%
Students should be allowed to access copies of all revised tutorial papers done by their colleagues.	126 53.8%	85 36.3%	17 7.3%	4 1.7%	2 0.8%
All post graduate students should have a tutorial learning experience during their study.	126 53.8%	66 28.2%	37 15.8%	5 2.1%	0 0.0%
Tutorial papers should be preserved for use as supplementary study materials by future students.	106 45.3%	92 39.3%	21 8.97%	7 2.99%	8 3.42%
Tutorial papers can be considered as a manuscript for publication in a departmental, institutional or regional journal.	78 33.3%	116 49.6%	28 11.97%	7 2.99%	5 2.14%

Students emphasised the usefulness of tutorial papers, 40.6% and 46.6% of the respondents indicated by strongly agree and agree that the used their tutorial papers to revise for exam. Indeed respondents 45.3% and 39.3% strongly agreed and agreed

that tutorial papers should be preserved as supplementary materials to be used for study by future students. Further, another 33.3% and 49.6% strongly agreed and agreed these papers could be considered as manuscripts in a departmental, institutional or regional journal.

While acknowledging that tutorial topics, presentations and papers were useful for revision and adding to knowledge, a respondent remarked that tutorial papers “should be used [as a] resourceful in exam revision” another said “tutorial papers should be kept for future use.” thus, a recommendation that “students to be allowed to share their work/copies with the rests.” Another respondent said “topics and presentations should be improved and published by lecturers and presenters”. And in emphasising on the quality of the papers, a lecturer remarked “some topics are handled exceedingly well by students” and suggests that the paper “should be good for use by other students as reference materials”.

Students recognise the importance of tutorials some respondents saying that tutorials “should be emphasized more for they help the students to have self-esteem”, another said “tutorial sessions should help students improve on presentation skills”. Another respondent said “tutorial topics and presentations are good way of learning.” while another recommended that “all postgraduate students should be exposed to tutorials. Learning in all the units done during coursework. Very important boost in concept understanding of the unit”. The researcher is of the view that tutorials present students with great opportunities to grow in academically and as researchers. Apart from gaining knowledge, they practice and gain additional skills such as researching, writing, presenting and defending opinions on a topic.

Both the lecturers and students were overwhelmingly in agreement that some select tutorial papers can be harnessed and preserved as study materials to be used by future students and as manuscripts that could be published in a departmental, institutional or regional journal. This is an important finding because it will motivate the students to research, help them gain skills in academic writing and the same time help in producing current and relevant study materials. Publishing academic work is a common practice in leading universities across the globe where universities publish and print books, journals and other learning materials.

According to Association of University Presses, universities publish works of scholarly, intellectual, or creative merit, often for a small audience including lecturers, researchers, students and librarian and the university community (Association of University Presses, 2022). Some notable examples are Cambridge University Press and Oxford University Press in United Kingdom, University of Ghana in West Africa, Stellenbosch University and University of Western Cape in South African and University of Dar-es-learn, Makerere University and University of Nairobi in East Africa. Kenyatta University is no exemption and it can formally establish a publishing department not only for online journals and books particularly textbooks. Therefore, with the assistance from the lecturer, who is an expert in the subject area, publishing of the manuscripts and journal articles would be an innovative way for the University to develop complimentary reference and study materials as students learn. Lecturers, as the experts in subject areas and quite familiar with the study content, moderate the tutorial sessions and are able to determine which papers can be published. They can play of a reviewer in the publication process as papers are published and therefore build an online collection of study materials that are relevant and focus on the units taught at the University.

In regard to assessment in tutorial it was established that it is an integral part in tutorials and occurs at different levels. Students can assess how members in their groups participated in their assignment, another level is during the class presentations and discussions, and the grading of tutorial papers by the lecturer. Ultimately, the tutorial paper is an important and verifiable outcome from each group.

4.3.6 Tutorial Teaching Process

The researcher established that tutorials are conducted in a systematic process at Kenyatta University. The process begins with introductions to the course and topics, setting tutorial questions for groups, researching and writing then presentations and assessment, see Figure 4.2.



Figure 4.2 Tutorial Teaching Process.

Source: Researchers' construct

Tutorial teaching process is initiated by the lecturer who introduces the course to students, provides reference materials and sets up tutorial questions. Students are then required to form groups and pick questions or topics to write on. Students then embark on researching and writing on the topics they picked; thereafter presentations and discussions are done in class on specified schedules; lastly it is the assessment and sharing of tutorial papers. The process is scheduled within the semester. Tutorials normally cover substantial areas of the course, otherwise the lecturer compliments through lecturing for topics not covered in the tutorials. The tutorial process at KU generally agrees with other writer who have reported on how tutorials

are conducted in leading universities. For example, Beck (2005) while reporting on the world famous ‘Oxford Tutorial’ describes the process as involving a period, usually a week, of intensive study, then preparation of some work, whether an essay or completion of a problem sheet, followed by the tutorial presentation. Wood (1988) describes tutorials as form of small-group teaching, ideally not more than 10 students per instructor. The writer points out that an important characteristic of tutorials is there should be active participation by all students. The writer has recommended a number of factors: the size of groups should be 5-8 students; groups should organize periodic face-to-face sessions; groups should have a leader; groups should engage in a purposeful activity; discussion to be done in orderly way in order to help develop skills like listening, speaking and arguing. The writer concludes that tutorials have greater potential than other teaching methods for effective teaching and skills acquisition.

4.4 Benefits and Challenges of Tutorials in Teaching and Learning

The second objective of the study was “to investigate from (a) lecturers (b) students the perceived benefits and challenges of tutorials in learning and teaching”. Noting that Tutorials is a form of pedagogical approach that incorporates small groups of students working together, researching on a topic, writing, presentation and class discussions moderated by the lecturer, the researcher sought feedback from both lecturers and students on the perceived benefits and challenges of tutorials.

4.4.1 Skills and Competences

Participation in tutorials help students gain a variety of skills and competences. The researcher obtained opinions from lecturers regarding these skills. Table 4.14 show lecturers’ responses.

Table 4.14 Skills and Competences by Lecturers

Skills and competencies gained through tutorials	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
Research skills.	26	5	0	0	0
	83.9%	16.1%	0%	0%	0%
Writing skills.	23	8	0	0	0
	74.2%	25.8%	0%	0%	0%
Information searching skills.	26	4	1	0	0
	83.9%	12.9%	3.2%	0%	0%
Presentation skills.	27	4	0	0	0
	87.1%	12.9%	0%	0%	0%
Referencing and citation skills.	19	12	0	0	0
	61.3%	38.7%	0%	0%	0%
Confidence in defending research opinions.	25	6	0	0	0
	80.6%	19.4%	0%	0%	0%
Collaboration with other students.	24	7	0	0	0
	77.4%	22.6%	0%	0%	0%
Plagiarism awareness.	20	9	2	0	0
	64.5%	29.0	6.5%	0%	0%

Majority of the lecturers 83.9% and 74.2 % of lectures strongly agree that students gain research skills and writing skills respectively. Another 87.1% strongly agree students enhance their presentation skills. Majority of lecturers, 83.9% strongly agree that through participating in tutorials, students enhance their information skills while 61.3% strongly agree tutorial enhance reference and citation skills respectively. Lecturers also think that tutorials help students gain confidence in defending their research opinions, 80.6% of the respondents strongly agree, 77.4% strongly agree that it enhances collaboration with other students and 64.5% strongly agree it increases plagiarism awareness. Another competence gained is the collaboration with other students, where 77.4% and 22.6% strongly agree and agree

that students are gain skills that enable them to collaborate with others in class. The responses from the students on the skills gained are shown in Table 4.15.

Table 4.15 Students Skills and Competences

Skills and competencies students gain in tutorials	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree	No Response
Research skills.	177 75.64%	53 22.65%	3 1.28%	1 0.43%	0 0.00%	0 0.00%
Information searching skills.	164 70.09%	63 26.92%	5 2.14%	0 0.00%	1 0.43%	1 0.43%
Writing skills.	140 59.83%	89 38.03%	2 0.85%	1 0.43%	2 0.85%	0 0.00%
Presentation skills.	161 68.80%	64 27.35%	4 1.71%	1 0.43%	0 0.00%	4 1.71%
Referencing and citation skills.	122 52.14%	95 40.60%	9 3.85%	7 2.99%	0 0.00%	1 0.43%
Confidence in defending research opinions.	146 62.39%	72 30.77%	14 5.98%	1 0.43%	0 0.00%	1 0.43%
Collaboration with other students.	134 57.26%	88 37.61%	9 3.85%	3 1.28%	0 0.00%	0 0.00%
Plagiarism awareness.	102 43.59%	96 41.03%	15 6.41%	10 4.27%	3 1.28%	8 3.42%

Majority of students 70% strongly agree that tutorials enhance various skills as can be observed in Table below. Most students, 75.64% students' respondents strongly agree that tutorials enhance research skill and 70.09% strongly agree on enhancement of information searching skills. These are essential skills need in academic world that the students get empowered in when they graduate. Almost equal number of students 68.80% strongly agree on the enhancement of presentation skills and 59.83% strongly agree that tutorials enhance writing skills. Writing skills are obviously needed to help in writing reports, letters, minutes or notes. Confidence

in defending research opinion was rated at 62.39% strongly agree. Indeed, such a skill can help them express and defend ideas well and also express themselves during debates and interviews. Collaboration with other students was rated at 57.26% strongly agreed. Further, respondents agree that tutorials enhance plagiarism awareness where 43.59% strongly agree and 41.03% agree. Other additional skills recorded included information skills, formatting skills, communication skills, classroom management skills, public speaking skills, publishing skills if such papers get published, teamwork, tolerance, critical thinking and computer skills.

Some comments made by students on skills gained by students while learning through tutorials were “students are able to bring out their ideas and opinions in the best way”, they gain skill on “organization of work during writing and presentation”, “helps student to gain, retrieve what was taught and confidence of gaining courage as a teacher in making for future betterment of the public at large.” Other comments were “respect other people opinions” and “enhances student and student relationship [and] lecturer and student relationship.”

Apart from gaining the scholarly knowledge on the curriculum, results are in agreement with views from various writers that students are able to gain academic skills researching, writing, referencing and information searching and lifelong skills and competences such as presentation skills, confidence in defending research, communication, collaborations and teamwork (Balan, 2018; Habók & Nagy, 2016; Palfreyman, 2008). These skills particularly the lifelong enrich the students as they prepare for life after campus which are indeed valued the potential employer. Planas-Lladó et al. (2021) has observed that teamwork is one of the top skills employers value when recruiting new members in their organizations.

4.4.2 Retention and Recall while Learning Through Tutorials

The researcher sought to find out if students could recall a tutorial topic presented in the class: by themselves, their group or other groups. The researcher determined this by requiring the respondents to list at least one topic they could recall that was presented by themselves or members from their group or other. The responses are presented in Table 4.16.

Table 4.16 Tutorial Topics Students Recalled

Topic Listing	Number of Recalled Topics No of Students (Topics)	Tutorial Paper Presented by		
		Respondent	Respondent's Group	Other Groups
1st	180	86 47.8%	90 50.0%	4 2.2%
2nd	119	40 33.6%	67 56.3%	12 10.1%
3rd	58	24 41.4%	26 44.8%	8 13.8%
4th	31	14 45.2%	13 41.9%	4 12.9%

The questionnaire had provision to list a 2nd, 3rd and 4th topic. Out of a total of 234 participants 180 i.e. 76.9% listed at least one topic, 50.8% listed at least two topics, 24.7% listed three while 13.2% listed four, only 23.1% failed to list any topic. This means that majority of students, 76.9% could recall at least a tutorial topic presented in class.

It was further observed that most of the tutorial topics listed were either presented in class by the respondent or by their group while just a few listed topics that had been presented by other groups in the class. Table 4.16 show who or which group had presented the listed topics: thus topics presented by the respondents, by the

respondents group or was presented by the other groups in the class. It was observed that 180 respondents who listed at least one topic, 47.8% listed a topic they presented, 50.0% a topic presented by their group and only 2.2% listed a topic by other groups.

For those who listed a second topic, 33.6% had presented that topic, 56.3% listed a topic presented by their group and 10.1% was present by other groups. A similar trend was observed for the third and fourth topic, where 41.4%, 44.8% and 13.8% listed a third topic presented by themselves, their group and by other groups respectively. Those who listed the fourth topic 45.2% had presented the topic, 44.8% listed a topic presented by their group and 12.9% was by other groups. These results show that when students participate in a tutorial group, they are able recall the topics they handled. The recall is better when the students presents. That means participation in tutorial presentation helps in retention and recall. This is in agreement with a remark by one of the lecturers who remarked that tutorials "... raise the bar of understanding study materials higher."

4.4.3 Challenges Facing Tutorials

Despite the many benefits of tutorials, there are however a number of changes faced. The researcher sought feedback from students and lecturers, the results are presented in Table 4.17.

Some of the challenges lecturers indicated where significant include that students get the opportunity to dominate on others with 32.2%, 22.6% and 45.2% indicated the challenge is extremely significant, very significant and significant respectively. Another challenge was the discussion being dominated by few members where 25.8%, 29.0% and 38.7% indicating it is extremely significant, very significant and

significant respectively. Other challenges included lack of reference materials, lack of skills for searching information resources, and tutorials encouraging laziness and aloofness among students.

Table 4.17 Lecturers' Opinion on Challenges in Tutorials

Significance of Challenges/Issues	Extremely Significant	Very Significant	Significant	No Opinion	Not Significant
Discussions being dominated by few members.	8 25.8%	9 29.0%	12 38.7%	1 3.2%	1 3.2%
Some students get opportunity to dominate on others.	10 32.2%	7 22.6%	14 45.2%	0 0%	0 0%
Difficulty in scheduling meetings for the groups.	10 32.3%	4 12.9%	7 22.6%	3 9.7%	7 22.6%
Tutorials can encourage laziness and aloofness among students.	8 25.8%	6 19.4%	7 22.6%	3 9.7%	7 22.6%
Lack of relevant reference materials needed for the topics.	8 25.8%	5 16.1%	5 16.1%	4 12.9%	9 29.0%
Lack of information searching skills.	8 25.8%	6 19.4%	9 29.0%	3 9.7%	5 16.1%

Students on the other hand gave their opinions on challenges faced in tutorials and the findings are presented in Table 4.18. Some of the challenges students thought were significant included discussions being dominated by few members with 21.8%, 33.8% and 24.4% indicating it extremely significant, very significant and significant respectively. Difficulty in scheduling meeting among group members was noted with 26.9%, 27.8% and 30.8% indicating it was extremely significant, very significant and significant respectively.

Table 4.18 Challenges of Tutorials by Students

How significant do the following challenges or issues hinder the effectiveness of tutorials?	Extremely Significant	Very Significant	Significant	No Opinion	Not Significant	No Response
Discussions being dominated by only a few members.	51 21.8%	79 33.8%	57 24.4%	24 10.3%	20 8.5%	3 1.3%
Tutorials can encourage laziness and aloofness among students.	49 20.9%	49 20.9%	57 24.4%	46 19.7%	31 13.2%	2 0.9%
Some students get the opportunity to dominate others	48 20.5%	66 28.2%	61 26.1%	32 13.7%	24 10.4%	3 1.3%
Difficulty in scheduling tutorial group meetings.	63 26.9%	65 27.8%	72 30.8%	16 6.8%	14 6.0%	4 1.7%
Lack of relevant reference materials on the topics.	53 22.6%	59 25.2%	63 26.9%	28 12.0%	28 12.0%	3 1.3%
Lack of information searching skills.	59 25.2%	56 23.9%	58 24.8%	29 12.4%	29 12.4%	3 1.3%

Other challenges highlight was lack of suitable references on topics and lack of skills for searching information resources on a topic. Students also pointed out other challenges as highlighted in the comments below:

“Students relying more on others”

“Time for doing tutorials is limited”

“Difficulty in keeping time is significant”

“Absenteeism”

“Without proper guidance the students tend to research ... beyond or out of given topic or subject”

“Inadequate moderation by the tutor”

“Tutorials give more chances to students who are fluent in English and skilled in presentation”

Lack of reference materials was a challenge to both students and lecturers. During the interviews some lecturers had expressed that university library did not have current books that would support the units they were teaching. This was noted from comments made by students who stated that there were no adequate reading materials from the library. A document review on the library book procurement revealed that the process that quite laborious and often lead to delays due to levels of approval and the procurement rules (Kenyatta University Library, 2017). Further the procurement of books often delays because the procedure must comply with public procurement regulations issued by the Kenya government to all public institutions (The Public Procurement and Disposal Act, 2015).

4.4.4 Suggestions on Tutorials

Students made some suggestions on how tutorials can be made more effective. First was to have tutorial groups that are not too large, they suggest a group size of not more than ten members was preferred, they want “...smaller groups that can be easily managed”. One suggested to “having tutorials with fewer members like 3-10 per group”.. “so that each group have adequate time to represent” and “each student to present his/her points in person”

Other suggestions made to improve tutorials is to have more tutorial session, adding more supervisors and ensuring that tutorial time is strictly observed. They suggest that “more tutorial sessions are needed [to] enhance supervision”. They have also

emphasized in supervision and suggest that “lecturers attend in good time” and that “lecturers should be there in time to give comments to students when presenting”. Others suggest to have “addition of instructors to student groups”.

4.4.5 Integrating ICT in Tutorials at the University

Students and lecturers made suggestions to integrate ICT in the activities and management of tutorials. It was observed that use of ICT in tutorial was not widespread although it was quite obvious that both students and lecturers are well exposed to eLearning technologies and often use the internet for communication, searching information and learning. They also use computer applications for typing, data analysis, presentations such as Powerpoint and various other ICT services. Therefore, integrating ICT in the tutorial activities and processes was important. Following are some of the comments, opinions and suggestions given by students and lecturers.

“Having an interactive platform between the tutor and the students frequently”

“Include educational videos in your tutorials”

“Giving necessary hyperlinks related to tutorials”

“Making recording on the tutorials for future reference”

“... include recording equipment so that tutors can be able to gauge themselves and areas they need to improve”

“Video conferencing and Skype during presentation and connect online and regular students”

“Monitoring group discussions online.”

“Having a system in a group to show level of participation”

“Have more enhanced technological support like ICT plugins, live webinars/classes on exchange programmes with other universities”

“Use of pictures or images to enhance the presentation of the tutorials”

Use of technology can enhance tutorial effectiveness and increase student learning experience. It can help resolve some challenges and facilitate organising tutorial presentations for future use. Recently use of technology has been used in to enhance teaching and learning methods, communication, course delivery, online storage of learning materials and course content creation (Bhaumik, 2012; Jayashanka et al., 2018; Mhouti et al., 2018; Mtebe, 2020)

4.4.6 Overall Opinion on Tutorials as a Teaching Pedagogy

The research asked the students and lecturers their overall opinions about tutorials as teaching method. The purpose was to obtain deeper understanding on the respondents’ views regarding this method. A thematic analysis was done on responses where an emergent coding approach was employed since the themes were not defined prior the study. Out of 234 students who participated in the survey, 176 made comments. Their comments were overwhelmingly in support of tutorials except five which the researcher considered were not in support. Students’ comments used keywords like good, very good, effective, very effective, useful, helpful and other terms that showed their positive opinions towards tutorials. These keywords were used for thematic analysis as presented in Table 4.19.

Table 4.19 Overall Opinions on Tutorials

Keywords	Frequency (Percent)	Sample Comments from Students
Good/ very good/ best	43 (24.4%)	<p>“It is a good method of teaching”</p> <p>“It’s a good method. It keeps the students engaged and alert. It enhances vital skills that help students cope with the change”</p> <p>“It is a good method since it encourages student-centred learning methods”</p> <p>“Tutorials are good since they encourage students to do more research hence enhancing their research skills”</p> <p>“It is a good teaching method. Enables a student to actively participate in the unit he/she is undertaking”</p>
Effective/ very effective	37 (21.0%)	<p>“Tutorials are effective in building scholarly ability among learners”</p> <p>“They are very effective”</p> <p>“Very effective and efficient because learners tend to engage in other effective learning approaches methods other than lecture questions and answer methods”</p>
Useful/ helpful/ important	36 (20.4%)	<p>“Tutorials enhances communication skills and research skills thus very useful”</p> <p>“Very useful”; “Very helpful”</p> <p>“This method is very important because it enhances the students understanding on a certain topic. I prefer tutorials than lecture methods”</p> <p>“It helps learners' enhance their communication skills.”</p>
Other terms in support	56 (31.8%)	<p>“Encourages mastery of concepts being taught”</p> <p>“Tutorial facilitate more learning”</p> <p>“Develop skills on research, group work, presentation and writing skills. Promotes interaction between lecturer and students”</p> <p>“It encourages student centred method of learning”</p> <p>“It’s a noble program that should be encouraged in all level in each School”</p>
Those not in support	4 (2.3%)	<p>“Not interesting”</p> <p>“I personally feel that tutorials are not good”</p>
Total	176 (100%)	

Respondents who used “Good”, “very Good” or “Best” to describe their overall opinion on tutorials were 24.4%; 21.0% used the words “very effective” or “effective” to state their opinion while 20.4% used words like useful, helpful or important in expressing their overall opinion about tutorials. Another set of respondents 31.8% used varied word in their statements for example tutorials “encourages masterly”, “facilitate more learning”, “promotes interactions”, “encourages student centred method of learning” and “should be encouraged in all level in each School”. Only 2.3% were not happy with tutorials: one commented that tutorials are “not interesting” and another said “I personally feel that tutorials are not good”. The overwhelming comments in support of tutorials show that students value tutorials and therefore having them in teaching will be a great benefit.

Some benefits were stated by the respondents. For example they said tutorials are “effective in building scholarly ability among learners”, “learners tend to engage in other effective learning approach methods other than lecture, question and answer methods”, “it encourages student-centred learning”, “encourage students to do more research hence enhancing their research skills”, “enables a student to actively participate in the unit he/she is undertaking”, “enhances communication skills and research skills thus very useful”, “[help] develop skills on research, group work, presentation and writing skills. Promotes interaction between lecturer and students” and “encourages student centred method of learning”.

Another student described the tutorials as “a noble program” and recommend that it “should be encouraged in all levels in each School” This means the University should not only encourage use of tutorials and but also enforce its application. The positive feedback from students should be considered by the University and purpose

to improve on their teaching methods by ensuring tutorials are widely used. Tutorials are learner-centered and encourage student active participation, collaboration and help students gain additional skills over the learning outcomes. Many writers have observed that the general trend in universities is to adopt teaching methods that are learner-centered and encourage student participation and collaboration teaching (Biggs & Tang, 2011; Elliott & Reynolds, 2014; Luís Konopka et al., 2015).

4.5 Development of Online Tutorial Management Platform

This section addresses objective 3 “to develop an online platform based on cloud computing for facilitating administration of tutorials in teaching”. The researcher used ASD approach to build the platform incrementally until the desired functionalities were realized. The development team, researcher and users engaged continuously during the study to ensure the process was done effectively. The following sections describe the study participants, functional requirements, user interfaces, system design, development team and the supporting cloud computing services. It also gives an overview of the final version of Tutmas platform including its features, user interfaces, statistics and reporting.

4.5.1 Participants during the Development of Tutmas Platform

The development of Tutmas platform was done progressively in three stages using ASD approach. Various participants were involved: the students who made the tutorial groups, lecturers and other technical staff and professionals from the university such as librarians and school administrators as summarized in Table 4.20.

Table 4.20 Participants at Tutmas Development Stages

Stage	Tutorial Class	Enrolled Students	Tutorial Groups	Max Students per Group	No of Lecturers	No of Technical Staff
1	ECT253 Creative Arts Education	51	9	7	1	2
	ECC800 General Educational Research Methods	32	9	5	1	2
	SCH803 Advanced Chemical Thermodynamics	3	3	1	1	1
2	PML010 Post Modern Library Attachment	35	5	7	1	2
	EFN204 Sociology of Education	57	19	5	1	1
	SCH415 Computer Applications in Chemistry	43	8	5	1	1
3	PML010 Post Modern Library Attachment	17	5	4	1	3

Tutorial classes that participated in the development of Tutmas had enrolled students who ranged from 3 to 57. Each class had one lecturer, at least one technical staff and the researcher. For example, in stage 1, three different classes were used: each class had a lecturer participated; the first class had 57 enrolled students who made 9 tutorial groups, the second class had 32 students who made 9 tutorial groups and the third one, a postgraduate class, had 3 students who made 3 groups. In the second stage one class had 35 enrolled students who made 5 groups, the other two had 57 and 43 enrolled students who made 19 and 8 tutorial groups respectively. In the final stage, a class of 17 enrolled students made 5 tutorial groups.

4.5.2 Functional Requirements of Tutmas System

The functional requirements for the online tutorial management platform had largely been determined during the survey on how teaching through tutorials is conducted at Kenyatta University (Section 4.3) and in section 4.4 that was on the benefits, challenges and suggestions on tutorials. The requirements are to ensure proper

management of tutorials. The main features for Tutmas platform should include class setup, group activities, assessment and access to learning resources as illustrated in Figure 4.3.

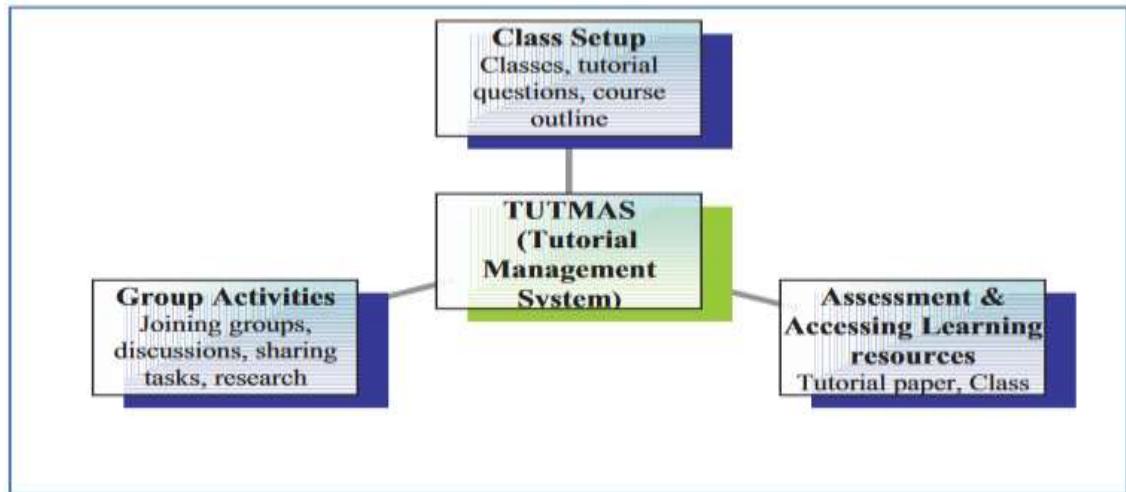


Figure 4.2 Fundamental Features for Tutmas Platform

4.5.3 User Interface Design

These are three user interfaces for the Tutmas platform:

- Student interface
- Lecturers interface
- Administrator interface

4.5.4 Tutmas System Design

The system design for Tutmas platform include the relationship between the key functions and the features as presented in Figure 4.4

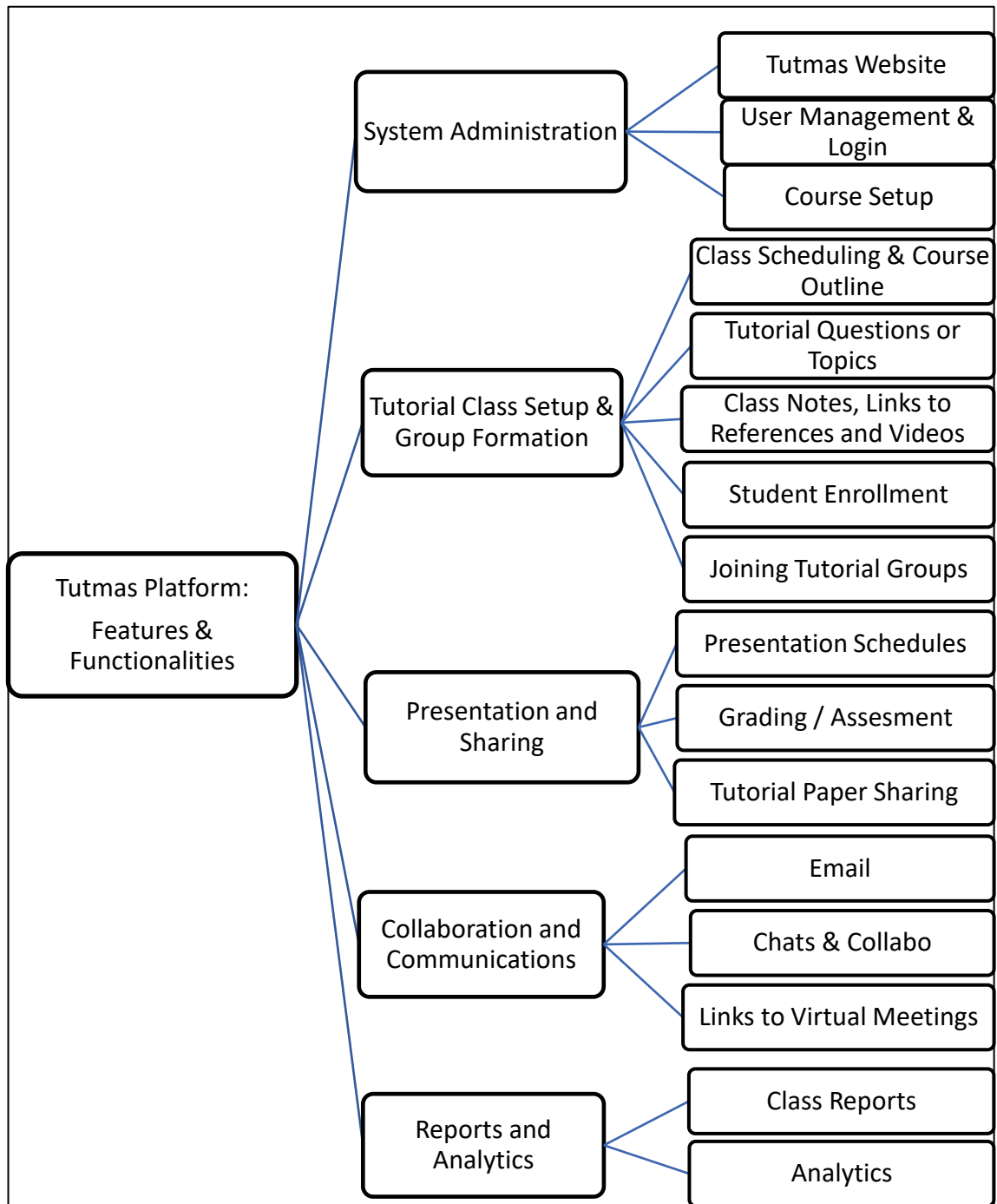


Figure 4.3 Tutmas Features and Functionalities

4.5.5 Software Development Team

The researcher also worked with a team of software developers who had the responsibility to develop the Tutmas platform and ensure it was accessible and operational from inception, through testing to final deployment. They were responsible for interpreting the user requirements into designs for coding as well as identifying a suitable cloud computing service providers to host and provide necessary technologies to ensure Tutmas was operational.

The team was also expected to continuously engage with the researcher on the requirements of the Tutmas platform, address feedback from students, lecturers and research assistance on the functionality issues and improve on user interface concerns. Some of the skills needed for the team were system analysis, coding, web programming, database administration, structured query language, cloud computing services and quality check skills. The critical outcome from the team was the Tutmas website <https://www.tutmas.com> that presented the platform for experimenting and evaluating the suitability of system in administration of tutorials in teaching.

4.5.6 Cloud Computing Services

A number of cloud computing services were used in the development and hosting of Tutmas platform. Some of the services by various providers are summarized in Table 4.21: Web hosting services by Amazon Web Services (AWS); Web development tools and database system by Heroku; and Tutmas domain name registration by Sasahost Ltd.

The cloud computing services were needed to run the Tutmas platform effectively in handling online learning and teaching activities in tutorial sessions. Sasahost

provided the mandatory Tutmas domain name registration and annual renewal and institutional document hosting at Kenpage Services site.

Table 4.21 Cloud Computing Service Providers

Provider	Services	Cumulative Annual Fee (\$/KSh)*
Amazon Web Services (AWS)	API & Web Hosting	\$ 298.32 (KSh 30,280.00)
Heroku Company	Postgres relational database Web development tools	\$ 84.00 (Ksh 8,530.00)
Sasahost Ltd	Tutmas Domain name registration	\$ 11.43 (Ksh 1,160.00)
	Tutorial paper hosting	\$ 45.71 (Ksh 4,640.00)
Total		\$ 141.14 (Ksh 44,610.00)

*Price in 2021; Exchange rate for \$ to KSh @ approx. 101.5

The other two providers AWS and Heroku Company were responsible for Tutmas web hosting and database management respectively. Their services were scalable and could be up-scaled whenever there was heavy traffic from students. However, throughout the period the AWS services operated below 2% despite having 3 active tutorial classes at the same time whose student numbers ranged from 17-57. This means that the potential for cloud computing was too big to be overloaded. University should consider using more of cloud computing services for most teaching and learning.

4.5.7 Development of Online Tutmas Platform

Tutmas online platform was developed in three incremental stages using the ASD approach. Initial stage was the development of the base system that had the primary functions. The base system features and functionalities were progressively enhanced, improved and tested in subsequent stages as illustrated in Figure 4.2.

Tutmas Platform Development Stages and Key Features		
Stage 1: Base System	Stage 2: Enhanced System	Stage 3: Final Release
Class Setup <ul style="list-style-type: none"> • Course outline • Setting tutorial topics/questions • Reference materials • Student registration in Tutmas. Group Setup <ul style="list-style-type: none"> • Enrolment in tutorial groups • Presentations scheduling • Communications • Access to Tutorial Papers Assessment	Enhanced group activities <ul style="list-style-type: none"> • Chatting • Sharing tasks ‘Collabo’ Assessment/Monitoring <ul style="list-style-type: none"> • Uploading class notes, • Uploading of images and pdf documents • Links to online books and journal articles 	Virtual Sessions <ul style="list-style-type: none"> • Group meetings links • Discussion and presentation Multimedia resources <ul style="list-style-type: none"> • Provision of video and audio recording. Academic Publishing <ul style="list-style-type: none"> • Manuscript/Journal formatting • Tutorial papers • Article publishing process

Figure 4.4 Tutmas Platform Development Stages

a) The Base System

The base system included the fundamental features Tutmas such as class setup, group setups, assessment and uploading of tutorial papers. Participants at this stage included three classes which had 51, 32 and 3 enrolled students and formed 9, 9 and 3 tutorial groups respectively.

b) Enhanced Platform

After the base system became operational, the next stage was development of an enhanced Tutmas platform that incorporated all requirements identified during testing, incorporate feedback and observations made, and improve on the user interfaces. Testing was done with three ongoing classes that had 35, 57 and 43 enrolled students who formed 2, 19 and 8 tutorial groups respectively.

The enhanced system addressed the challenges and incorporated opportunities and suggestions that could be accommodated. Eventually the functions included all the base system function; system administration and user management; uploading of

class notes and links to references, videos and recordings; enhanced student enrolment and tutorial group formation features; scheduling of presentations and discussion, assessment and online sharing of tutorial papers; collaborations and communication among the students, to and from the lecturers through chats, emails and virtual meetings; and system reporting and logs analysis.

Mhouthi et al. (2018) has explained that the typical features for E-Learning systems are to manage the learning experience, communicate intended learning experience and facilitate tutors' and learners' involvement. While Tan & Kim (2011) has grouped the functionalities of e-learning system into three categories; e-Learning (i.e. course content and collaborative learning); communications (email and notification); and administration (enrolment, registration and staffing). Thus, Tutmas platform, with its focus in supporting tutorial pedagogy in teaching and learning through the learner groups' management, presentation and discussion scheduling, content management and reporting can well be described as a LMS.

c) Final Release of the Online Tutmas Platform

The final release of Tutmas online system incorporated additional features such as providing access to multimedia resources such as video and recordings; academic publishing of tutorial papers as online manuscripts; and integrating virtual discussion meetings which became necessary in course of the study. For example, inclusion of virtual meeting was occasioned by advent of COVID-19 pandemic that restricted face-to-face meetings but rather encouraged use of virtual meeting. The participants during the incorporation and testing of virtual meeting feature were 17 students of Bachelor of Library and Information Science (BLIS) who were on attachment at the Post-Modern Library.

The students formed 5 tutorial groups under the supervision of their lecturer who was assisted by three librarians. Each group choose a topic on library services to write a paper on then had it presented and discussed virtually. This happened during the time of COVID-19 pandemic when face-to-face group discussions were restricted and everyone was required to keep social distance. The papers presented were later compiled and edited by the librarians into a manuscript. The groups' tutorial activities were managed and monitored through the platform whose details are presented Table 4.22.

Table 4.22 Virtual Presentations & Paper Publishing

Tutorial Group	Tutorial Topic	Group Size	Virtual Presentation	Hosting in Tutmas
1	Library's Circulation Services	4	Y	Y
2	Reference & Information Services	3	Y	Y
3	Library ICT	3	Y	Y
4	Information Literacy Services	3	Y	Y
5	Special Needs Services	4	Y	Y

Out of the 5 groups, 2 had 4 members while the others 3 members each. All groups did the presentations online as well as the discussions. Both the librarian and the lecturer did an assessment on the presentations. This demonstrated that tutorial groups can be enhanced with virtual presentations.

Later on, the librarians, as experts in library service and well exposed to publishing processes, assisted the groups to edit the papers had them published as an online manuscript hosted at the library's institutional repository. This was an important achievement that demonstrated that learners can be assisted with editorial and publishing services within the University to produce online study material for course

units. According the Association of University Presses, the mission of University Press include publishing of scholarly work often for a small audience of specialist as opposed to the commercial publishers who are concerned more on the potential market (Association of University Presses, 2022). It also important to note that new model in publishing especially in universities and research institutions is to involve libraries in the institutional publishing processes. Rao (2009) has observed that the role of university libraries is not only restricted to acquiring and disseminate of information resources but to facilitate publishing and hosting of electronic institutional publications. Therefore, the findings show that the library can help to publish and host selected quality tutorial papers as study materials.

4.6 Tutmas Functionalities and User Interfaces

4.6.1 User Interfaces

Tutmas is designed to operate at three user levels: student, lecturer and administrator. Each level is managed at the login where the user category is determined as per the profile. A login dialogue accessible at Tutmas website www.tutmas.com is shown in Figure 4.5.

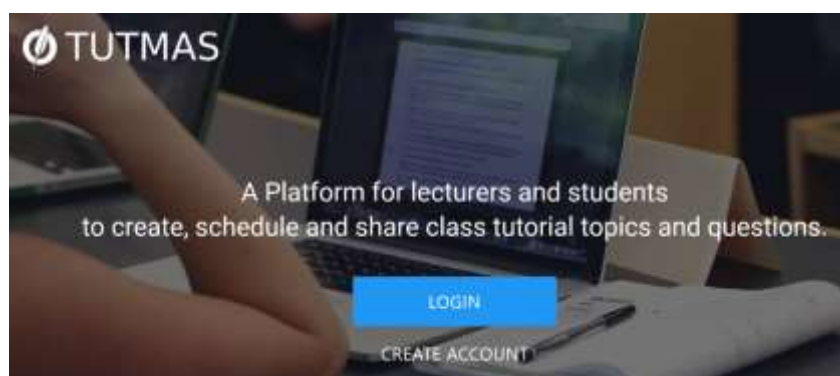


Figure 4.5 Tutmas Login

Users login with their email and password. After successful login, user are provided with respective interfaces that enable access to various features and functions associated with their certain rights and privileges to as shown in Table 4.23. It shows listing of Tutorial features to access to regular tutorial activities by the lecturer, student and system administrator. The lecturer has access to most of the function as the primary initiator of tutorial classes followed by students who is the beneficiary in tutorial sessions. The system administrator has restricted access to setup functions such listing unit codes and title, and introducing lecturers and other administrator as primary users in Tutmas.

Table 4.23 Tutmas User Category and Functions

Tutmas Feature or Function	Student	Lecturer	Administrator
Listing unit codes and titles		√	√
Introducing primary users			√
Course units setup and Schedule presentation		√	√
Links to reference material and other resources		√	√
Tutorial assignments for the units		√	
Enrolling in a class	√	√	
Joining tutorial groups	√		
Participating in group chats and ‘collabo’	√	√	
Accessing to course materials and class notes	√	√	√
Assessment and posting of grades		√	
Accessing submitted tutorial papers	√	√	
Viewing groups assessment/ grades	√	√	√
Viewing individual and group statistics	√	√	√
Posting virtual link for group meeting	√	√	√

Access to Tutmas features is through the appropriate interfaces that restrict or allow access. For example, a student can only access to activities relating to their class tutorial while a lecturer has access to more features including class information,

assessment and reports. Fig 4.6 shows the dash board for students and lecturer once they successfully login.

Student's Interface

Group / Question No.	Question	Year	Grade [20]	Presentation Date	Due Date	Submission Date	Group Members	Action
1	Discuss the centrality of a research proposal in educational research. Use appropriate evidence to justify your arguments.	11	[11/-]	Wednesday, Nov 21, 2018 (1:00 PM)	Monday, Nov 5, 2018	NOT SUBMITTED	+21	
2	Using relevant evidence discuss the qualities of effective research paper in the process of research in education.	12	[12/-]	Monday, Nov 12, 2018 (1:15 PM)	Monday, Nov 5, 2018	Thursday, Nov 15, 2018	+21	
3	Discuss various types of gaps of knowledge that can be filled by conducting research in education.	13	[13/-]	Monday, Nov 12, 2018 (1:20 PM)	Monday, Nov 5, 2018	Friday, Nov 16, 2018		View Submission
4	Examine the role of research methodology in research in education. Use appropriate literature to support your arguments.	-	[14/-]	Monday, Nov 12, 2018 (1:30 PM)	Monday, Nov 5, 2018	NOT SUBMITTED		Class Notes
5	Differentiate between a project and a thesis/ Using appropriate discuss possible reasons for selecting either a project or a thesis in research in education.	15	[15/-]	Monday, Nov 12, 2018 (1:40 PM)	Monday, Oct 29, 2018	Thursday, Nov 1, 2018		Class Timetable
6	Discuss qualities and components of effective research report in education. Use examples to support arguments given.	-	[16/-]	Monday, Nov 12, 2018 (1:50 PM)	Monday, Nov 5, 2018	NOT SUBMITTED		Group Chat
7	What are appendices in research? Discuss various forms that may be included in appendices in research report? Discuss qualities of effective appendices?	16	[17/-]	Monday, Nov 12, 2018 (2:00 PM)	Monday, Nov 5, 2018	Sunday, Nov 18, 2018		Collabo

Lecturer's Interface

#	Question	Topic	Grade	Presentation Date	Due Date	Submission Date
1	Give a brief report on your experiences at the Circulation Section, Post Modern ...	Circulation Services	0 [0/0/0]	Tue, 24th August 2021 - 10:40 am	Wed, 25th August 2021 - 02:00 pm	Thu, 26th August 2021 - 06:21 pm
2	Give a brief report on your experiences on the reference services at the Post Mo...	Reference Services	0 [0/0/0]	Tue, 24th August 2021 - 11:30 am	Wed, 25th August 2021 - 02:00 pm	Thu, 26th August 2021 - 10:33 am
3	Give a brief report on the library ICT services at the Post Modern Library	Library ICT	0 [0/0/0]	Tue, 24th August 2021 - 12:00 am	Wed, 25th August 2021 - 02:00 pm	
4	Give a brief report on information literacy services at Post Modern Library	Information Literacy	0 [0/0/0]	Tue, 24th August 2021 - 11:40 am	Wed, 25th August 2021 - 02:00 pm	
5	Give a brief report on the special needs services at the Post Modern Library	Special Needs	0 [0/0/0]	Tue, 24th August 2021 - 12:00 pm	Wed, 25th August 2021 - 02:00 pm	
6	Give a brief report on bibliographic control services at Post Modern Library	Bibliographic Control	0 [0/0/0]	Tue, 24th August 2021 - 12:30 am	Thu, 26th August 2021 - 02:00 pm	

Figure 4.6 Student's and Lecturer's Dash Board

Both students and the lecturers have a customised interface depending on the rights and privileges for a particular category. Both the lecturer and student are able to view all the tutorial questions and students assigned to particular groups, the due dates, presentation schedule for each assignment, which group has submitted their papers. However, it is only the lecturer can who add or edit these questions. Students are able to chat or assign tasks only within their group; however, the lecture has rights to all group chats and posted comments.

4.6.2 Tutmas Reports

These are reports available from the platform to monitor class activities, assess and evaluate and students' participation in tutorials. The reports are generated from Tutmas platform. They include status reports, class summary and statistical reports. Figure 4.7 for example show a sample class summary report.

Class summary report presents details about tutorial groups in a class such as number of groups in a class, group leaders and other members' information such as names and emails, topics to chosen by particular groups and class virtual meeting link. Also include in the report the tutorial question, date of presentation, the status about assignment whether submitted, due or/and uploaded. A link and file name for the submitted assignment.

Other reports available include statistics and analytics often generated from system logs provide evidence on students' interactions with Tutmas platform and the group activities within groups such as sharing of tasks, group meetings schedules, and communications and chats within the groups. Such reports show indicators to social constructivism.

CLASS GROUPS SUMMARY

PML010: Post Modern Library Attachment Program (Class ID: 53)

Virtual Meeting: meet.google.com/snz-btxb-pne
Duration: Mon Aug 23 2021 - Tue Aug 31 2021
Lecturer: Milkah Mathu

Group 1 : Circulation Services

Question: Give a brief report on your experiences at the Circulation Section, Post Modern Library
Presentation Date: 24 Aug 2021
Submission Date: 25 Aug 2021
Submission: [1629983267256_Skills_and_experience_in_circulation_section\[1\].pdf](https://tutmas.s3.amazonaws.com/class_data/53/group_data/154/submissions/1629983267256_Skills_and_experience_in_circulation_section[1].pdf)
([https://tutmas.s3.amazonaws.com/class_data/53/group_data/154/submissions/1629983267256_Skills_and_experience_in_circulation_section\[1\].pdf](https://tutmas.s3.amazonaws.com/class_data/53/group_data/154/submissions/1629983267256_Skills_and_experience_in_circulation_section[1].pdf))

1. Ale
2. Ed
3. Nic
4. Re

Group 2 : Reference Services

Question: Give a brief report on your experiences on the reference services at the Post Modern Library
Presentation Date: 24 Aug 2021
Submission Date: 25 Aug 2021
Submission: [GRP_2_REPORT_2.pdf](https://tutmas.s3.amazonaws.com/class_data/53/group_data/155/submissions/GRP%20REPORT%202021-809cdd1fb3a7230.pdf)
(https://tutmas.s3.amazonaws.com/class_data/53/group_data/155/submissions/GRP%20REPORT%202021-809cdd1fb3a7230.pdf)

1. De
2. Em
3. Vic

Group 3 : Library ICT

Question: Give a brief report on the library ICT services at the Post Modern Library
Presentation Date: 23 Aug 2021
Submission Date: 25 Aug 2021
Submission: [ICT GROUP THREE.pdf](#)

Figure 4.7 Class Summary Report

4.6.3 Virtual Meeting Integration with Tutmas Platform

The online platform was designed to accommodate virtual meeting from popular applications such as Zoom and Google Meet by adding a virtual meeting link. There is provision to have a link for the class or for a specific group. The link can be shared within Tutmas using “Group Chat” and/or “Collabo” interfaces so as to initiate an online discussion or meeting. The virtual link feature was added in Tutmas due to the increase in use of online teaching as a public health measure to minimize exposure the COVID-19 virus during the pandemic. The University up scaled the use of virtual lecture so as to minimize contacts and adhere to the guidelines on social distancing. During this period, it was not possible to do the

usual face-to-face tutorial group discussions as has been the practice hence virtual meeting link.

4.6.4 Academic Paper Publishing Practices

The study had earlier established that tutorial papers are of quality that can be published as manuscripts or journal article see Table 4.12 and Table 4.13. Further students stated that they had used tutorial papers for study and revision for examination. Therefore, the importance of tutorial papers as supplementary learning materials and potential publications cannot be over-emphasized. This necessitated a need to include a functionality that can handle the management of tutorial papers as published documents. The researcher therefore considered including functionality on academic journal publishing in Tutmas. Toward this end a background survey was undertaken on 124 journals that included 112 open access journals, 7 book series and 5 Kenyatta University online journals managed at the Library. The aim was to understand the best practice in publishing of open access journals and determine the readiness of Kenyatta University in handling online publishing. Figure 4.8 shows an overview on the requirements and processes in open journal publishing.

These findings demonstrate the publishing process for an article has four major steps that include: journal preliminaries for information such as journal title, ISSN, URL and information on its aim and scope; then author requirements include title of article, contents, formatting and article processing fee; the editorial process; and finally production which include hosting, indexing and promotion.

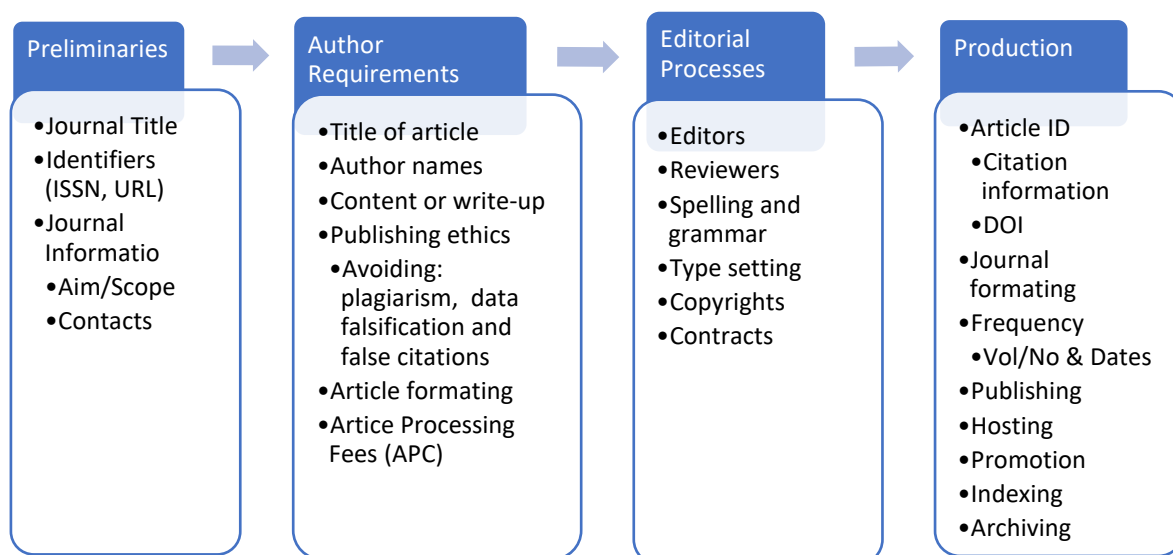


Figure 4.8 Open Journal Publishing Process. Source Researcher Construct

4.6.5 Library Support in University Publishing

The researcher further sought to find out the kind of support and/or avenues available to academic publishing by the University Library. It was found that Kenyatta University Library has facility for hosting, managing, sharing and preserving institutional online journals and other research publications from the University as described below:

a) Institutional Repository (IR)

The Institutional Repository contains organized digital collection of monographs, research papers and conference papers by Kenyatta University students, researchers and lectures as shown in Table 4.24.

The Kenyatta University institutional repository show the collections with the most documents uploaded are Masters theses, Research papers and PhD dissertations with 9442, 5518 and 1380 respectively. Conference/Seminar papers are 598 and Book and book chapters published by the staff and students are 266

papers. Other resources are reports, policies and multimedia resources. They are all accessible online which demonstrates University library can to assist in hosting tutorial papers that are recommended as future revision materials.

Table 4.24 Collections at Kenyatta University Institutional Repository

Community/Collection	No of Uploaded Documents
Master Theses and Dissertations	9442
Research Papers	5518
Doctor of Philosophy (PhD) Theses and Dissertations	1380
Conference /Workshop / Seminar Papers	598
Proposal Titles for Projects and Theses	297
Books, Book Reviews and Book Chapters	266
Policies/ Reports/ Newsletters/ Service Delivery Charters/Graduation Booklets	168
Public Lectures and Speeches	68
Undergraduate Projects	30
Conference proceedings/Post Graduate Books of Abstracts	20
Multimedia Resources	4

Source: KU Institutional Repository, <https://ir-library.ku.ac.ke/>, 2022 August

b) Open Journal System (OJS)

The online Journal Publications (OJS) is a platform for hosting journals from an institution. Towards the 2021 there were five journals hosted in the platform managed by the University Library as shown in Table 4.25.

Table 4.25 Kenyatta University Open Journal System (OJS)

No	Journal Title	Published Online	Remarks
1	East and Central Africa Medical Journal (ECAMJ). ISSN 2663-1059 (Online)	2018	Vol 4 No 1 (2020); Vol 3 No 1 (2017)
2	Msingi Journal ISSN 2663-1032 (Online)	2018	Vol 5 No 2 (2021), Vol 5 No 1 (2021); Vol 4 No 1 (2020); Vol 1 No 2 (2019), Vol 1 No 1 (2019); Vol 1 No 2 (2016); Vol 1 No 1 (2013)
3	Chemchemi International Journal of Humanities and Social Sciences ISSN 2663-0826 (Online)	2018	Vol 11 No 1 (2020)
4	Journal of African Theatre, Film and Media Discourse	2020	Vol 1 No 1 (2017)
5	African Journal of Pure and Applied Sciences (AJPAS). ISSN: 2710-0758	2020	Vol 2 No 2 (2021), Vol 2 No 1 (2021); Vol 1 No 1 (2020)

Source: Kenyatta University Journals, <https://journals.ku.ac.ke/>, 2021

The KU Online Journal System (OJS) started in 2018 with 3 journals namely East and Central Africa Medical Journal; Msingi Journal; and Chemchemi International Journal of Humanities and Social Sciences. Later the African Journal of Pure and Applied Sciences, and Journal of African Theatre, Film and Media Discourse were added in 2020. Most of the journals are consistently irregular with some year having no issue published. Only the African Journal of Pure and Applied Sciences that have managed to publish every year since 2020 when it was started.

Consistency and sustainability on journal publishing seems to be a major challenge at the University. However, this is not a new phenomenon in the country. Journal start-ups occasionally happen but sustaining production of subsequent issues has been a perennial problem for many years in region. Often there is much enthusiasm

to start a new journal but it soon fades away. The researcher recalls a discussion on journal start-ups in the country with one experienced librarian at the University of Nairobi some 30 year ago who remarked that the faculty are enthusiastic to start new journals however "... these journal start-ups have a high 'mortality rate'". The journals at the University may suffer this fate unless something is done to ensure that they do not remain dormant for long time. Probably by consulting widely and collaborating with more stake holders can address some challenges. The global trend where librarians are collaborating with faculty and printing press to enhance publishing services have been able ensure regular online publishing (Bonn & Furlough, 2015; Richard et al., 2009). Hahn (2008) also observes that library support in scholarly journal publishing is beyond hosting and can range from consultation on a variety of publishing practices and decisions to preservation, metadata generation and copyright management.

The University Library therefore can give support in ensuring that a journal or other periodical publication of recommended tutorial papers is maintained in online journal system for future reference.

4.7 Experimentation and Evaluation of the Tutmas Platform

This section addresses the fourth objective: to (a) experiment and (b) evaluate the effectiveness of the online tutorial platform in teaching and learning. The aim of experimenting was to validate compliance of the online platform against the requirements of tutorial administration in teaching and learning. The requirements were determined following a survey on how tutorials are conducted, and determining the challenges faced, perceived benefits and opportunities in tutorial method of teaching. Other requirements were identified progressively during the design and

development of Tutmas platform. The researcher created a checklist of test cases and scenarios that programmers, research assistants and students used in the testing and experimenting the sprint cycles and features of the online tutorial platform.

Evaluation, on the other hand, aimed at determining the suitability and efficacy of the platform in the administration of tutorials in teaching and learning against the applicable technologies and the user experience. While noting that lecturers and students are to be involved in the evaluation and experimentation, it is important to note that both activities were not mutually exclusively. In the context of ASD results on the feedback, observations and user experiences while experimenting could as well be useful data for evaluation. However, some qualitative evaluations such as the user interface experiences and applicable technologies were exclusive.

Participants in the experimentation and evaluation of Tutmas platform included mainly students and lectures from the three tutorial classes: EFN204 (Sociology of Education), SCH415 (Computer Applications in Chemistry) and PML010 (Attachment to Post Modern Library) that had an enrolment of 54, 42 and 17 respectively. Others were members in the development team and research assistants.

The purpose of experimentation in this research was basically to confirm that the platform was doing what it is expected – meeting the requirements for management and administration of tutorials in teaching.

4.7.1 Overview on the Checklist of Test Cases and Scenarios

A test case is set of actions executed to verify a particular feature or functionality of the system: it contains test steps, test data, pre-condition and post condition developed for specific test scenarios to verify any requirement. While a test scenario

is any functionality that can be tested, it is often a collection of test cases which assist in testing a system. The test cases were aligned to the system functionalities and therefore the checklist was an important guide to research assistants to ensure comprehensive testing and confirmation of proper functioning of the platform was done before an update version of the system was released for use.

4.7.2 Tutmas Compliance with Tutorial Activities

One fundamental activity in tutorials is the commencement of tutorial class where the sole responsibility is with the lecturer who identifies the topics or questions against which tutorial groups are formed. To facilitate commencement of tutorial class, the lecturer is to expected to update tutorial class information thus the unit code & name, class period, maximum number of students in a group, set and upload tutorial and give a presentation schedule. Primary details about the commencement of the three classes are shown in Table 4.26.

Table 4.26 Commencement of Tutorial Classes

Tutorial Class Name	Tutorial Questions	Tutorial Groups	Students Enrolled in Tutmas	Students Joined Tutorial Group	
				No	%
EFN204 Sociology of Education	25	19	54	51	94.4%
SCH415 Computer Applications in Chemistry	8	8	42	42	100%
PML010 Post Modern Library Attachment	6	5	17	17	100%

All students had enrolled in their respective classes and joined a tutorial group apart from the students in EFN204 which had 94.4% joining tutorial groups although the

lecturer had given excess tutorial questions (25) against the 19 groups that were formed in that class. This data is derived from the platform logs and show success rate on having all students enrolling in classes that means compliance in monitoring commencement of tutorial classes. For students who have not joined a tutorial group may imply they have not identified a question and therefore a follow up can be done early in the semester. A select set of other tutorial activities that were experimented in Tutmas are presented in Table 4.27 that gives a summary along with the Tutmas features and the verifiable data derived for the platform.

Table 4.27 Tutmas Functionalities and Key Indicators

Tutorial Activity or Function	Tutmas feature description	Key indicators
Tutorial groups formation	Tutorial questions Joining tutorial groups Group leader(s)	Class tutorial groups: EFN203, 19 groups formed SCH415, 8 groups formed PML010, 5 groups formed
Group participation	Group chats & 'collabo' postings	Messages posted by the group members
Group presentations	Presentation schedule Tutorial paper submission	Presentation dates and evaluations for each group.

The tutorial activities list are the tutorial group formation where data on the number of groups formed is given as 19, 8 and 5 groups. Another activity is group participation where the key indicator is messages posted on the Group chat and Collabo features. The other activity is group presentations where a schedule is given and evaluation scores posted. The data posted is principally quantitative as the indicator for Tutmas features in support of tutorial activities in the three classes EFN203, SCH415 and PML010.

4.7.3 Tutorial Paper Submission and Sharing

Towards the conclusion of tutorial classes, groups are expected to submit their paper on the platform for grading. The submitted papers are used during class presentation and discussion where each member can access a copy once they are logged in. After presentations, students are given a chance to re-submit final paper after making corrections. This copy is then accessible to the entire class to use as study or revision material. Table 4.28 shows how various groups submitted the groups' paper for final sharing.

Table 4.28 Tutorial Paper Submissions

Tutorial Class	Tutorial groups	Paper Submissions		Revised Paper (Resubmission)	
		No	%	No	%
EFN204 Sociology of Education	19	19	100%	18	94.7%
SCH415 Computer Applications in Chemistry	8	8	100%	8	100%
PML010 Post Modern Library Attachment	5	5	100%	5	100%

All tutorial groups in the 3 classes submitted their tutorial papers in preparation for the class presentation and discussions. In the event that after discussions a group needed to correct the paper, Tutmas allowed for resubmission. All groups revised their paper and resubmitted apart from EFN204 where 94.7% revised and re-submitted. The platform is able to track the submission activities where the verification data is available which can help avoid later cases of missing tutorial marks. It is also important to note that resubmission of revised tutorial papers is group collective effort to incorporate revisions and therefore the high rate of resubmission is an indicator for teamwork and collaboration within a group.

4.7.4 Evaluation on ICTs for Tutmas

An important aspect for evaluation was on the ICTs users need to in order to operate Tutmas. As a cloud based platform, Tutmas rely heavily on internet technology and device. The researcher sort to find out how users access to the internet and what kind of online channels they use to communicate among themselves. Table 4.29 shows the responses from students in relation to their experience on Tutmas platform.

Table 4.29 Tutorial Paper Submissions

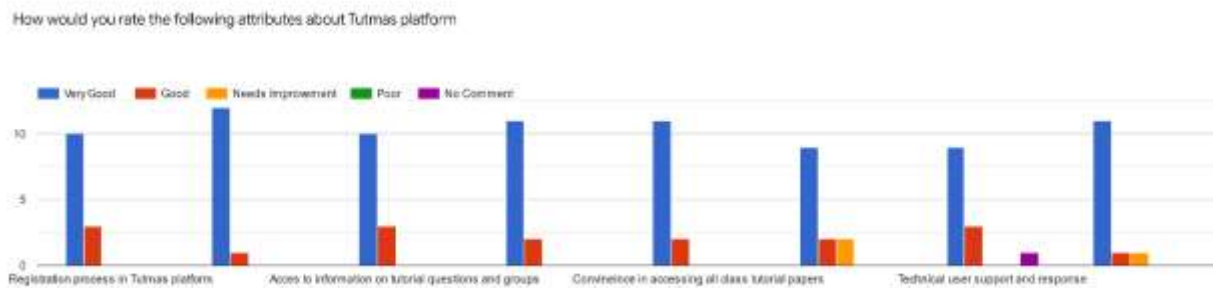
Description	Respondents	Percent
The devices students often use to access Internet		
Smartphones	47	59.5%
Personal Computers	17	21.5%
Laptops	12	15.2%
Tablets	3	3.8%
Total	79	100%
Where students often access to the Internet		
Computer Labs (University's)	22	28.6%
Hotspots provided at the University	20	26.0%
University Library	19	24.7%
While at Home	13	16.9%
Others (e.g., Cyber Cafe)	3	3.9%
Total	77	100.0%
Communication channels to reach out to group members		
WhatsApp (Messaging Application)	31	42.5%
SMS	19	26.0%
Face-to-face conversation	14	19.2%
Phone calls	8	10.9%
Email	1	1.4%
Total	73	100.0%

Most students, 59.5%, often use Smartphone to communicate among themselves, 21.5% use personal computers provided at the University and 15.2% use laptops. To

access the internet students use University’s computer labs (28.6%), hotspots provided at the University (26.0%) and the University Library (24.7%). In regard to the channels of communication student use to reach group members to plan on tutorial activities, it was found that majority 42.5% use WhatsApp messaging application and 26.2% use SMS..

4.7.5 Evaluation on Tutmas User Interface

A quality evaluation was done on the Tutmas platform user interfaces. This was done with the PML010 class that had experienced the final release version which had all the planned features. The students were to rate the Tutmas features using a five-point Likert’s scale: very good, good, needs improvement, poor and no comment. The features evaluated were: registration process in Tutmas platform; user interface friendliness; access to information on tutorial questions and groups; collabo facility for group leader to share and assign tasks to members; convenience in accessing all class tutorial papers; scheduling of group presentations; technical user support and response; and induction or training on use of Tutmas platform as shown in Figure 4.10.



All the attributes were rated at very good by most of the respondents. Six attributes were rated very good by 76.9% of the respondents while the other two attributes

evaluated that included scheduling of group presentations and technical user support were rated very good by at 69.2% of the respondents. Such positive rating on user interface is expected in ASD approach because it encourages continuous engagement with customers and the system programmers are able to fix bugs as system is developed (P. Jain et al., 2018; Meso & Jain, 2006). The research supports that Agile software methodology should be used while doing software development for learners because they are active and promptly give feedback.

4.7.6 Virtual Tutorial Presentations

An evaluation on students' experiences on virtual presentation while being managed through Tutmas platform was done with 15 participants who were students on industrial attachment at the University Library. They were students in Bachelor of Library and Information Science degree programme. The students formed discussion group of 3 to 4 students and select a topic relating specific services in the library. They were expected to discuss their experiences and write a paper which was to be presented to the class. A schedule of presentation was update in the Tutmas platform against each group's profile. The students did the presentations under the supervision of their lecturer assisted by librarians who were supervising them. The presentations and discussions were done online under the supervision. After the discussions the groups edited their paper and had them uploaded in the platform where everyone could access. Out of 15 students 13 gave their feedback on their experiences during the virtual tutorial sessions. Responses were captured through an online questionnaire are shown in Figure 4.9.

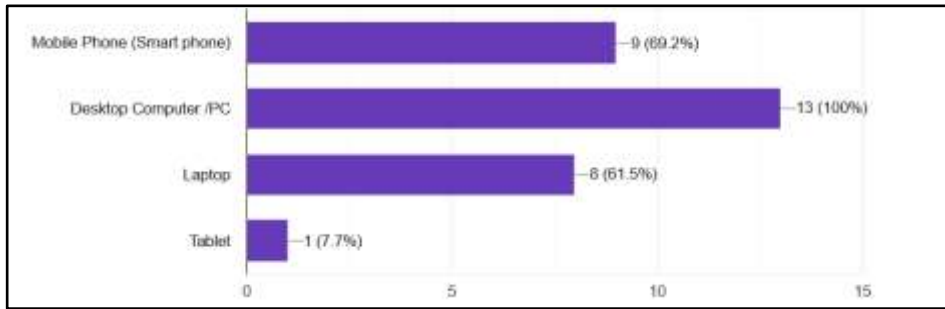


Figure 4.9 Devices Used to Access Tutmas Platform

All respondents had used computers at the University’s personal to access the Tutmas platform, 69.2% had used mobile phones and 61.5% used laptops. These results show that institutional facilities were needed by the students to access online platform though use of personal gadgets such as mobile phones and laptops was notably high.

In regard to the mode of messaging students the results are shown in Figure 4.10.

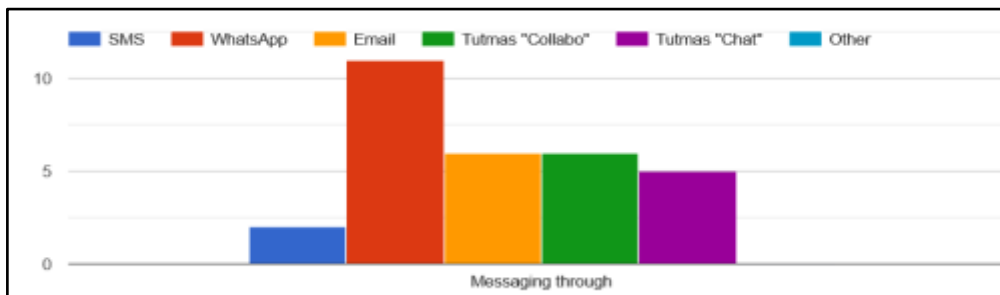


Figure 4.10 Mode of messaging to communicate among your group members

These results show that students preferred WhatsApp messaging at 84.6% i.e. 11 out of 13 respondents; while Tutmas’ ‘collabo’ facility and emails were next preferred avenues for messaging at 46.1%.

Overall rating on learning experience in Tutmas platform is shown in Figure 4.11.



Figure 4.11 Overall Experience and Skills Enhancement

Students overwhelmingly rated Tutmas learning experience as excellent (61.5%) and very good (30.8%) and satisfactory (7.7%). They further commented on the platform that it encouraged them to advance in other skills such as presentation, collaboration and communication skills. Following are some of their comments:

Presentation skills... one will need in future when on is in front of a panel.

I have improved my communication skills since Tutmas required time to time communication with my group members.

Group collaboration skills - through Tutmas group members are able to collaborate their efforts.

Improves team work and sharing of task among members through collabo.

Tutmas assisted us as a group in completing some activities given and also enhanced our research skills and communication skills.

It was a good experience, making the attachment period as interactive, I got equipped with some skills such as presentation skills, which am sure will help me in future. The best part is having the papers we came up with

available even for the groups in future making us feel that what we did was worthwhile.

It improved my communication skills in the course of discussion using Tutmas collabo. Tutmas is effective platform to give room for e-communication. Lastly, Tutmas improves my writing skills/typing skills when typing responses during group

Following comments and feedback on Tutmas evaluation and experimenting, the platform has been rated well and therefore is suitable in managing tutorial in teaching and learning in the University.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter covers the summary, conclusions, recommendations and suggestions for further studies. The ultimate goal of the study was to develop an online model to enhance tutorial management in teaching and learning using cloud computing technology. The model is named Tutmas which is an acronym for tutorials management system. The development of the online model was based on the requirements determined through a comprehensive survey on how tutorials are conducted at Kenyatta University. Also, the requirements of the platform considered the perceived benefits, challenges and suggestions from both students and lecturers on how tutorials can be improved in teaching and learning. The platform's efficacy was tested in three classes where students gave feedback on their experience with Tutmas.

5.2 Summary of the Study Findings

The summary of the findings is presented as per the study objectives:

5.2.1 How Tutorials are Conducted at Kenyatta University

The first objective was to establish how teaching through tutorials is conducted at Kenyatta University. The study established that teaching at the University using tutorials is conducted in a systematic process with a set of activities that begin with introductions to course topics, through students enrolling in tutorial groups, research, writing, presentation, assessment to sharing of the tutorial papers. Both students and

lecturers highly regard tutorial as a very good teaching approach that enhances learning experience.

5.2.2 Perceived Benefits and Challenges in Tutorials

The second objective was to investigate from lecturers and students the perceived benefits and challenges of tutorials in learning and teaching. The study established that there are many academic, social and personal skills and competences gained while studying using tutorials. Some of the gains are research skills; writing skills; information searching skills; presentation skills; referencing and citation skills; confidence in defending research opinions; collaboration with other students; and plagiarism awareness. Other skills and competences expressed by students were information skills, formatting skills, communication skills, classroom management skills, public speaking skills, publishing skills if such papers get published, teamwork, tolerance, critical thinking and computer skills.

An important observation with tutorials was that student demonstrated a reasonable level of recall where they could easily list topics presented in class. It was observed that there was a high recall for topics presented by an individual. Therefore, tutorials should be encouraged at all degree levels in the University. Indeed, the study established that tutorials should be introduced to students as soon as they join the University, as first year undergraduates.

There are however some challenges associated with tutorials such as: some students getting the opportunity to dominate on others; discussions being dominated by few members; tutorials encouraging laziness and aloofness among some students; difficulty in scheduling meetings among group members; lack of relevant reference materials on the topics; lack of skills to search for relevant and appropriate

information resources; and lack of appropriate skills in using institution's online learning systems.

Both the lecturers and students were of the view that some of the tutorial papers were of quality that can be published or preserved and hosted in an online repository for future reference as study or reference materials for the unit. Such an initiative can go a long way to increase access to reference materials sooner. Such a repository is one of the functionalities in Tutmas platform.

Both students and lecturers gave suggestions on how tutorials can be improved for example having more sessions per semester; having tutorial groups that are not too big, it was suggested a group of between 3-10 members. Others had suggested integrating ICTs such as recording presentations, using PowerPoint for presentations; having virtual presentation; storing final papers in an online repository and using electronic communications. The researcher observed that WhatsApp was the mostly preferred and widely used by students to communicate with one another.

5.2.3 Development of a Cloud Computing Tutorial Management System

The third objective was to develop an online tutorial management system (Tutmas) based on cloud computing for facilitating administration of tutorials in teaching. Tutmas was built through ASD approach that is now recommended for faster and more effective method since it continuously works with the intended users. Tutmas design requirements were determined through a survey on how tutorials are conducted at Kenyatta University.

The researcher also considered the opinions given by lecturers and student on the benefits, challenges and suggestions. This helped design the base platform that was

progressively enhanced to what could be considered as a LMS due to the availability of the basic features of LMS such as enrolment of students, setup of classes, setup of courses and uploading of reference materials, assessment, statistics and reporting. However, Tutmas enhanced system has a range of functions for facilitating the management of tutorials. Some of these functions include: lecturer ability to setup tutorial classes, upload questions to groups, include list of reference materials, links to online resources and upload study electronic documents. The lecturers were able to schedule presentations and continuously monitor group activities such as sharing of tasks and group chats. Students were able to form their groups, share out tasks and communicate using the platform. They were also able to share the final copies of the tutorial papers on the platform.

Tutmas used the cloud computing services development and deployment. Thus, the development team exclusively used online software development tools for coding, web design, database and website hosting. These services were provisioned after subscribing to cloud service providers who included Amazon Web Services (AWS), Heroku and Sasahost Ltd. The users needed to have internet access to access the system. For example, the students were able to access Tutmas using their mobile phones, laptops and computer provided at the University as long as they had internet connection. Tutmas which was accessible at <https://www.tutmas.com/>, operated in three levels: student, lecturer and administrator.

5.2.4 Experiment and Evaluate the Effectiveness of Tutmas

The last objective was to experiment and evaluate the effectiveness of the online tutorial platform in teaching and learning. This was meant to evaluate the efficacy of the Tutmas platform in the management of tutorials. Three tutorial classes

participated in the experimentation and evaluation and provided feedback the effectiveness of the functionalities and positive user experience. Some of the feedback was triangulated by the system logs which provided verifiable evidence on the activities. For example, the creating of tutorial groups could be verified in the database and so was evidence in online communication, scheduling of tutorial presentations and sharing of the tutorial papers to all students. The tutorial papers were uploaded in the system and could be accessible online by any member of the class. Tutmas had integrated the use Google Meet as a feature for virtual meeting. One class participated in online tutorial presentation during the time of COVID-19 when face-to-face discussions could not be done and everyone was required to keep social distance.

Further feedback was given by the students on the overall experience on the platform and majority gave a high rating and recommended Tutmas as suitable in managing tutorial in teaching and learning in the University.

5.3 Conclusions of the Study

The study has established that tutorials are very useful to students in acquiring and retaining knowledge as well as acquiring other skills such as research, communication, writing and presentations which have lifelong value to the students. Therefore, tutorials should be encouraged in all academic programs in the University. Since the purpose of the study was to improve the management of tutorials in teaching and learning by developing an online application model based on cloud computing technology, it was therefore timely to have undertaken this study. Over the last few years there have been tremendous improvement in use of internet among students due to its widespread availability and proliferation of

affordable internet access gadgets such as mobile phones and laptops. Further the University has use of blended learning where teaching has incorporated use of virtual technology. It is therefore significant to this study that aimed at enhancing use of tutorials through cloud computing technology.

The researcher used both action research in education and agile system development methodology while developing Tutmas platform. The two methods are related in approach since they are iterative, cyclic and incremental. They methods also closely engage the subjects under study. Agile system development methodology combines iterative design and incremental developmental model and is the most appropriate approach to accommodate the dynamism in cloud computing technology, changes in user expectations and requirements for learning delivery system during the development process. On the other hand, action research has been used to improve educational systems, it normally has four steps that start with planning then action, observation and finally reflection before implementation of the concept. Action research in education involves educators as practitioners to conducting systematic enquiries to improve on teaching and learning. The two methods are based on cyclic and iteration approach which meant they were appropriate in ensuring delivery of an online platform to improve the management of tutorials in learning.

The study has demonstrated that solutions to improve teaching and learning can be made through research based on local experiences and needs as opposed to when solutions are introduced from experiences of others. Cloud computing is much cheaper to implement and sustain than the server-based systems currently being used at Kenyatta University. The technology is also scalable whereby to increase its capacity it will only require increasing the subscriptions whereas in the client-server

system it would require replacement of equipment and re-tooling of the ICT staff. The university, therefore should re-focus on ICT adoption strategies and consider shifting or building local automation solutions that are based on cloud computing technology.

5.4 Recommendations of the Study

This study makes the following recommendations in relation to the research objectives:

- a) That the University upscale use of tutorials in all academic programmes to ensure that every student undertakes at least two tutorials per year.
- b) Tutorials in the University be improved to a standard that encourage effective participation by students. Thus, a tutorial group should be no more than 10 students and that classes with too many students be split to ensure each tutorial group has an opportunity to present in class.
- c) The lecturers should recommend quality tutorial papers from the presentations so that they can be harnessed, formatted and edited so that they can be made accessible to students as revision and study materials.
- d) Each School at the University should establish a tutorial papers repository developed through Tutmas tutorial management platform that will be updated periodically.
- e) University considers migration to teaching and learning systems that are cloud-based. The process should be handled scientifically combining ASD approach and action research methodology.

5.5 Suggestions for Further Research

The researcher aimed at improving teaching and learning in group tutorials by integrating cloud computing technology. The result was Tutmas platform for managing tutorials which had functions comparable to popular LMS. Development of Tutmas was through action research and ASD which means that further development and improvement of its functionalities and features can continue with the students and lecturers at the University. Particularly on other areas such as student enrollment at the University, grading and academic progression. Thus, the researcher recommends further development of Tutmas platform to manage other aspects of teaching, learning and administration such as student enrolment and finance, content development, grading and student's clearance to become a locally developed LMS - a product of Kenya and indeed Kenyatta University.

Other emerging areas that can be explored include the following:

- i) Experiment and evaluate Tutmas tutorial management platform beyond Kenyatta University including other universities, TIVET institutions and CBC classes.
- ii) Explore the impact of integrating emerging technologies such as:
 - o Incorporate automatic plagiarism check for the final tutorial papers before they are made available to members of the class, and
 - o Artificial Intelligence (AI) technologies such as digital assistance and chat agents that focus on teaching and learning.
- iii) An empirical study should be undertaken to establish the effectiveness of online group discussions as compared to face-to-face discussions as practiced in tutorials at the University.

References

- Adams, D. J. (2009). Current Trends in Laboratory Class Teaching in University Bioscience Programmes. *Bioscience Education*, 13(1), 1–14. <https://doi.org/10.3108/BEEJ.13.3>
- Agus Herlambang, B., Muhtarom, M., & Saifuddin Zuhri, M. (2022). Analysis of Edu-Smart Learning Management System Software. *5th International Conference on Education and Social Science Research (ICESRE)*, 183–191. <https://doi.org/10.18502/kss.v7i19.12440>
- Aken, A. (2008). *CHUNK: An Agile Approach to the Software Development Life Cycle*. July 2015. <https://doi.org/10.1080/15332860802250385>
- Al-Mawee, W., Kwayu, K. M., & Gharaibeh, T. (2021). Student's perspective on distance learning during COVID-19 pandemic: A case study of Western Michigan University, United States. *International Journal of Educational Research Open*, 2, 100080. <https://doi.org/10.1016/j.ijedro.2021.100080>
- Alfares, N. (2017). Benefits and Difficulties of Learning in Group Work in EFL Classes in Saudi Arabia. *English Language Teaching*, 10(7), 247–256. <https://doi.org/10.5539/elt.v10n7p247>
- Almarghani, E. M., & Mijatovic, I. (2017). Factors affecting student engagement in HEIs - it is all about good teaching. *Teaching in Higher Education*, 22(81), 940–956. <https://doi.org/10.1080/13562517.2017.1319808>
- Alturki, U. T., Aldraiweesh, A., & Kinshuck, D. (2016). Evaluating The Usability And Accessibility Of LMS “Blackboard” At King Saud University. *Contemporary Issues in Education Research (CIER)*, 9(1), 33–44. <https://doi.org/10.19030/cier.v9i1.9548>
- Araka, E., Maina, E., Gitonga, R., University, K., Oboko, K. R., & Kihoro, J. (2021). University Students' Perception on the Usefulness of Learning Management System Features in Promoting Self-Regulated Learning in Online Learning. In *International Journal of Education and Development using Information and Communication Technology (IJEDICT)* (Vol. 17).
- Association of University Presses. (2022). *About University Presses*. <https://corepublishingsolutions.com/custom-publishing-solutions/university-presses/>
- Balan, A. (2018). Reviewing the effectiveness of the oxford tutorial system in teaching an undergraduate qualifying law degree: A discussion of preliminary findings from a pilot study. *Law Teacher*, 52(2), 171–189. <https://doi.org/10.1080/03069400.2017.1332952>
- Balwant, P. T., & Doon, R. (2021). Alternatives to the conventional “Oxford” tutorial model: a scoping review. *International Journal of Educational Technology in Higher Education*, 18(29), 18–29.

<https://doi.org/10.1186/s41239-021-00265-y>

- Barbosa, A., Silva, D., Carolina, A., De, K., Bispo, A., Goncalves Rodriguez, D., Ialyson, F., & Vasquez, F. (2018). Problem-based learning: A proposal for structuring PBL and its implications for learning among students in an undergraduate management degree program Article information. *Revista de Gestão*, 25(2), 160–177. <https://doi.org/10.1108/REGE-03-2018-030>
- Bates, M. S., Phalen, L., & Moran, C. (2016). Online professional development. *Http://Dx.Doi.Org/10.1177/0031721716629662*, 97(5), 70–73. <https://doi.org/10.1177/0031721716629662>
- Beaty, K., Kochut, A., & Shaikh, H. (2009). Desktop to cloud transformation planning. *IPDPS 2009 - Proceedings of the 2009 IEEE International Parallel and Distributed Processing Symposium*, 1–8. <https://doi.org/10.1109/IPDPS.2009.5161236>
- Beck, R. J. (2005). *Towards a Pedagogy of the Oxford Tutorial*.
- Bhaumik, P. K. (2012). Use of ICT in the classroom teaching of management. *Vision*, 16(4), 245–252. <https://doi.org/10.1177/0972262912460180>
- Biggs, J., & Tang, C. (2011). Teaching for quality learning at university. In *Innovations in Education and Teaching International* (Vol. 50, Issue 4). <https://doi.org/10.1080/14703297.2013.839332>
- Bonn, M., & Furlough, M. (2015). *Getting the Word Out: Academic Libraries as Scholarly Publishers* (M. Bonn & M. Furlough (Eds.)). Association of College and Research Libraries (ACRL). https://www.ala.org/acrl/sites/ala.org.acrl/files/content/publications/booksanddigitalresources/digital/9780838986981_getting_OA.pdf
- Bora, U. J., & Ahmed, M. (2013). E-Learning using Cloud Computing. *International Journal of Science and Modern Engineering*, 1(2), 9–13.
- Boyde, J. (2014). *A Down-To-Earth Guide To SDLC Project Management: Getting your system / software development life cycle project successfully across the line using PMBOK adaptively* (2nd ed).
- Bremner, N., Sakata, N., & Cameron, L. (2022). The outcomes of learner-centred pedagogy: A systematic review. *International Journal of Educational Development*, 94(May), 102649. <https://doi.org/10.1016/j.ijedudev.2022.102649>
- Bruner, J. S. (1961). *The process of education*. Harvard University Press.
- Buyya, R., Calheiros, R. N., Son, J., Dastjerdi, A. V., & Yoon, Y. (2014). Software-Defined Cloud Computing: Architectural elements and open challenges. *Proceedings of the 2014 International Conference on Advances in Computing, Communications and Informatics, ICACCI 2014*, 1–12.

<https://doi.org/10.1109/ICACCI.2014.6968661>

- Cantabella, M., López, B., Caballero, A., & Muñoz, A. (2018). Analysis and evaluation of lecturers' activity in Learning Management Systems: Subjective and objective perceptions. *Interactive Learning Environments*, 26(7), 911–923. <https://doi.org/10.1080/10494820.2017.1421561>
- Choudhary, S. K., Jadoun, R. S., Mandoriya, H. L., & Kumar, A. (2014). Latest development of cloud computing technology , characteristics , challenge , services & applications. *IOSR Journal of Computer Engineering*, 16(6), 57–68. www.iosrjournals.org
- Christensson, P. (2011). SaaS Definition. In *TectTerms* (p. 1). TechTerms Sharpened Productions. <http://techterms.com/definition/saas>
- Clark, J. S., Porath, S., Thiele, J., & Jobe, M. (2020). *Action Research*. New Prairie Press. <https://newprairiepress.org/ebooks/34>
- Collins Online Dictionary*. (2020, March). <https://www.collinsdictionary.com/>
- Commission for University Education. (2014). *Universities Standards and Guidelines* , 2014 (Issue October). <http://www.cue.or.ke/index.php/downloads/category/16-standards-and-guidelines>
- Conforto, E. C., Salum, F., Amaral, D. C., da Silva, S. L., & de Almeida, L. F. M. (2014). Can Agile Project Management be adopted by industries other than software development. *Project Management Journal*, 45(3), 21–34. <https://doi.org/10.1002/pmj.21410>
- Connolly, T. M., Stansfield, M., & Hainey, T. (2007). An application of games-based learning within software engineering. *British Journal of Educational Technology*, 38(3), 416–428. <https://doi.org/10.1111/j.1467-8535.2007.00706.x>
- Contributing to seminars and tutorials* (Learning Development Series). (2009). <http://www2.le.ac.uk/offices/ld/resources/study/seminars-tutorials>
- Crawford, L. M. (2019). Conceptual and theoretical frameworks in research. *Research Design and Methods: An Applied Guide for the Scholar-Practitioner*, 35–48. https://uk.sagepub.com/sites/default/files/upm-binaries/105274_ch03_14.pdf
- CUE. (2014). *Commission for Universities Education Standards and Guidelines* (Issue June, pp. 1–134).
- Dai, J. (2012). Application of cloud computing in Campus Network cased on IaaS. In *Recent Advances in CSIE: Vol. LNEE* (Issue 126, pp. 167–172). Springer-Verlag. www.springerlink.com
- David, M., & Sutton, C. D. (2004). *Social research: the basics*. Sage Publications.

- De Oliveira, V. C., Mota, A. D. A., & Mota, L. T. M. (2013). Impacts of application usage and local hardware on the throughput of computer networks with desktop virtualization. *American Journal of Applied Sciences*, *10*(1), 117–122. <https://doi.org/10.3844/ajassp.2013.117.122>
- Denscombe, M. (2010). *The good research guide: for small-scale social research projects* (4th ed). McGrawHill.
- Dinh, H. T., Lee, C., Niyato, D., & Wang, P. (2013). A survey of mobile cloud computing: architecture, applications, and approaches. *Wireless Communications and Mobile Computing*, *13*, 1587–1611. <https://doi.org/10.1002/wcm.1203>
- Dougiamas, M., & Taylor, P. C. (2003). *Moodle: Using Learning Communities to Create an Open Source Course Management System*.
- Elletson, Harold. (2019). eLA Survey: Feeling good but more action needed. In H. Elletson & R. Stromeyer (Eds.), *The eLearning Africa Report 2019* (pp. 76–83). ICWE.
- Elliott, C. J., & Reynolds, M. (2014). Participative pedagogies, group work and the international classroom: an account of students' and tutors' experiences. *Studies in Higher Education*, *39*(2), 307–320. <https://doi.org/10.1080/03075079.2012.709492>
- Estacio, R. R., & Raga, R. C. (2017). Analyzing students online learning behavior in blended courses using Moodle. *Asian Association of Open Universities Journal*, *12*(1), 52–68. <https://doi.org/10.1108/AAOUJ-01-2017-0016>
- Ferrance, E. (2000). *Themes in education: action research*. Northeast and Islands Regional Educational Laboratory, Brown University. www.lab.brown.edu
- Foster, E. (2014). *The NTU tutorial system guidance for implementation* (Issue 2). http://www.ntu.ac.uk/adq/document_uploads/teaching/137782.pdf
- Fraenkel, J. R., & Wallen, N. E. (2009). How to Design and Evaluate Research in Education. In *McGraw-Hill Higher Education* (7th ed., Issue 0). McGraw-Hill.
- Gall, M. D., Gall, J. P., & Borg, W. R. (2014). *Applying Educational Research: How To Read, Do, and Use Research To Solve Problems of Practice* (7th Editio). Pearson.
- Garcia, R. E., Abaratigue, A. M., & Alcantara, N. V. (2021). Integration of learning management system as an aid in teaching: An assessment. *European Journal of Educational Research*, *10*(4), 1907–1918. <https://doi.org/10.12973/EU-JER.10.4.1907>
- Gaston, A., & Duschinsky, R. (2020). Students' experiences of the Cambridge supervision system: performance, pedagogy and power. *British Journal of Sociology of Education*, *41*(8), 1218–1234.

<https://doi.org/10.1080/01425692.2020.1806038>

Goldberg, M. W., & Salari, S. (1997). *An Updated Overview of WebCT (World-Wide-Web Course Tools) - a Tool for the Creation of Sophisticated Web-Based Learning Environments*.
<https://www.cs.ubc.ca/wccce/program97/murray/murray.html>

The Public Procurement and disposal Act, 145 (2015). www.kenyalaw.org

Gray, D. E. (2009). *Doing research in the real world* (2nd ed). Sage Publications.

Gunderson, D. E., & Moore, J. D. (2008). Group Learning Pedagogy and Group Selection. *International Journal of Construction Education and Research*, 4(1), 34–45. <https://doi.org/10.1080/15578770801943893>

Habók, A., & Nagy, J. (2016). In-service teachers' perceptions of project-based learning. *SpringerPlus*, 5(1), 1–14. <https://doi.org/10.1186/s40064-016-1725-4>

Hahn, K. L. (2008). *Research Library Publishing Services*. Association of Research Libraries. <http://files.eric.ed.gov/fulltext/ED500889.pdf>

Hanjura, A. (2014). *Heroku Cloud Application Development*. Packt Publishing, Limited.

Hassanien, A. (2006). Student experience of group work and group assessment in higher education. *Journal of Teaching in Travel and Tourism*, 6(1), 17–39. https://doi.org/10.1300/J172v06n01_02

Henn, M., Weinstein, M., & Foard, N. (2009). *A Critical Introduction to Social Research* (2nd ed, Vol. 18). SAGE Publications. <https://books.google.com/books?id=qEQ2b-ip8DMC&pgis=1>

Hillis, P., & Munro, B. (2005). ICT in history education -Scotland and Europe. *Social Science Computer Review*, 23(2), 190–205. <https://doi.org/10.1177/0894439304273268>

Hirsh, Å., Nilholm, C., Roman, H., Forsberg, E., & Sundberg, D. (2022). Reviews of teaching methods— which fundamental issues are identified? *Education Inquiry*, 13(1), 1–20. <https://doi.org/10.1080/20004508.2020.1839232>

Hopkins, D. (2014). *A teacher's guide to classroom research* (5th ed.). Open University Press.

Jain, A., & Pandey, U. S. (2013). Role of cloud computing in higher education. *International Journal of Advanced Research in Computer Science and Software Engineering*, 3(7), pp 966-972. www.ijarcsse.com

Jain, P., Sharma, A., & Ahuja, L. (2018). The Impact of Agile Software Development Process on the Quality of Software Product. *2018 7th International Conference on Reliability, Infocom Technologies and*

Optimization: Trends and Future Directions, ICRITO 2018, Dec, 812–815.
<https://doi.org/10.1109/ICRITO.2018.8748529>

Jayashanka, R., Hewagamage, K. P., & Hettiarachchi, E. (2018). Improving Blended Learning in Higher Education Through the Synergy between Learning Design and Learning Analytics. *2018 IEEE 18th International Conference on Advanced Learning Technologies (ICALT)*, 227–228.
<https://doi.org/10.1109/ICALT.2018.00120>

Jones, T. W. (1997). Methods of Teaching and Learning. In H. Pain, M. Knottenbelt, & M. Ramscar (Eds.), *A Manual for Course Organisers* (pp. 70–78). CTLA, University of Edinburgh.

Julisch, K., & Hall, M. (2010). Security and control in the cloud. *Information Security Journal: A Global Perspective*, 19(6), 299–309.
<https://doi.org/10.1080/19393555.2010.514654>

Kamardeen, I. (2014). Adaptive e-tutorial for enhancing student learning in construction education. *International Journal of Construction Education and Research*, 10(2), 79–95. <https://doi.org/10.1080/15578771.2012.756437>

Kamarudin, S., Ahmad Khalili, A. H., Abd. Aziz, Z. F., Kamarudin, K. A., & Wahab, A. N. A. (2022). Exploring of Potential of Cloud Computing for Small and Medium Enterprises. *Indonesian Journal of Information Systems*, 4(2), 98–108. <https://doi.org/10.24002/ijis.v4i2.5487>

Kaur, G., & Chawla, S. (2014). Cloud E Learning Application : Architecture and Framework. *SSRG International Journal of Computer Science and Engineering (SSRG-IJCSE)*, 1(4), 1–5. www.internationaljournalsssrg.org

Keahey, K. (2009). Cloud computing for science. In *SSDBM* (p. p478). Springer-Verlag.

Kember, D., & McNaught, C. (2007). *Enhancing university teaching*. Routledge.

KENET. (2019). *Annual Community Newsletter*. <https://vlab.ac.ke>

Kenya. ICT Authority. (2014). *The Kenya National master plan: towards a digital Kenya 2013/14 - 2017/18*.

Kenyatta University. (2014). *Kenyatta University Calendar 2014 - 2017*. Kenyatta University. http://ku.ac.ke/images/stories/docs/ku_academic_calendar_2014-2017.pdf

Kenyatta University Library. (2017). *Procedure for Acquisition of Library Information Resources through purchase*. Kenyatta University Library.

Kenyatta University Library Catalogue. (2020). <https://maktaba.ku.ac.ke/>

Khan, P. M., & Beg, M. M. S. S. (2013). Extended decision support matrix for

selection of sdlc-models on traditional and agile software development projects. *International Conference on Advanced Computing and Communication Technologies, ACCT*, 8–15. <https://doi.org/10.1109/ACCT.2013.12>

Kiilo, T., & Kutsar, D. (2012). Educational Action Research Exploring constructivist social learning practices in aiding Russian-speaking teachers to learn Estonian : an action research approach. *Educational Action Research*, 20(4), 587–604. <https://doi.org/10.1080/09650792.2012.727649>

Kirstein, M., & Kunz, R. (2015). Student-centred approach to teaching large classes: Friend or foe? *Meditari Accountancy Research*, 23(2), 222–246. <https://doi.org/10.1108/MEDAR-06-2013-0025>

Koshy, E., Koshy, V., & Waterman, H. (2010a). *Action Research in Health Care*. SAGE Publications Ltd. <https://uk.sagepub.com/en-gb/afr/action-research-in-healthcare/book233457#description>

Koshy, E., Koshy, V., & Waterman, H. (2010b). What is Action Research. In *Action Research in Health Care* (pp. 1–24). Sage Publications. <https://doi.org/10.4135/9781848607934.n33>

Koshy, V. (2010). *Action Research for Improving Educational Practice: A Step-by-Step Guide* (2nd ed). Sage Publications. <https://uk.sagepub.com/en-gb/afr/action-research-for-improving-educational-practice/book233428>

Kotkamp, E. (2009). Digital objects in e-learning environments The case of WebCT. In M. van den Boomen, S. Lammes, A. Lehmann, J. R. Schäfer, & M. T. Schäfer (Eds.), *Digital Material Book: Tracing New Media in Everyday Life and Technology*.

Kriflik, L., & Mullan, J. (2007). Strategies to improve student reaction to group work. *Journal of University Teaching & Learning Practice*, 4(1). <http://ro.uow.edu.au/jutlp/vol4/iss1/3>

Kulshrestha, T., & Kant, A. R. (2013). Benefits of Learning Management System (LMS) in Indian Education. *International Journal of Computer Science & Engineering Technology*, 4(8), 1153–1164.

Kumar, R. (2014). *Research methodology: a step-by-step guide for beginners* (4th ed). SAGE Publications Ltd.

Laal, M., & Ghodsi, S. M. (2012). Benefits of collaborative learning. *Procedia: Social and Behavioral Sciences*, 31, 486–490. <https://doi.org/10.1016/J.SBSPRO.2011.12.091>

Lawlor, J., Conneely, C., & Tangney, B. (2010). Towards a pragmatic model for group-based, technology-mediated, project-oriented learning—an overview of the B2C model. *Technology Enhanced Learning*. http://link.springer.com/chapter/10.1007/978-3-642-13166-0_84

- Liao, J., Wang, M., Ran, W., & Yang, S. J. H. (2014). Collaborative cloud: a new model for e-learning. *Innovations in Education and Teaching International*, 51(3), 338–351. <https://doi.org/10.1080/14703297.2013.791554>
- Luís Konopka, C., Adaime, M. B., & Mosele, P. H. (2015). *Active Teaching and Learning Methodologies: Some Considerations*. 6, 1536–1545. <https://doi.org/10.4236/ce.2015.614154>
- Manro, S., Singh, J., & Manro, R. (2011). Cloud computing in education: make India better with the emerging trends. In *High Performance Architecture and Grid Computing: International Conference, HPAGC 2011, Chandigarh, India, July 19-20, 2011*. (pp. 131–139). Springer-Verlag.
- Masud, A. H., & Huang, X. (2012). A Novel Approach for Adopting Cloud-based E-learning System. *2012 IEEE/ACIS 11th International Conference on Computer and Information Science*, 37–42. <https://doi.org/10.1109/ICIS.2012.10>
- Masud, M. A. H., & Huang, X. (2012). An E-learning System Architecture based on Cloud Computing. *World Academy of Science, Engineering and Technology*, 62, 74–78.
- McNiff, J., & Whitehead, J. (2009). *Doing and writing action research*. Sage.
- Mertler, C. A. (2012). *Action research: improving schools and empowering educators* (4th ed). Sage Publications.
- Mertler, C. A. (2017). Introduction to Action Research. In *Action Research: Improving Schools and Empowering Educators* (p. 14p). Sage Publications, Inc.
- Mertler, C. A. (2021). Action Research as Teacher Inquiry: A Viable Strategy for Resolving Problems of Practice. *Practical Assessment, Research, and Evaluation*, 26(19), 12p.
- Meso, P., & Jain, R. (2006). Agile software development: adaptive systems principles and best practices. *Information Systems Management*, 23(3), 19–30. <https://doi.org/10.1201/1078.10580530/46108.23.3.20060601/93704.3>
- Mhouti, A. El, Erradi, M., Nasseh, A., & Technol, E. I. (2018). Using cloud computing services in e-learning process: Benefits and challenges. *Education and Information Technologies*, 23(2), 893–909. <https://doi.org/10.1007/s10639-017-9642-x>
- Mijatovic, I., Cudanov, M., Jednak, S., & Kadijevich, D. M. (2013). How the usage of learning management systems influences student achievement. *Teaching in Higher Education*, 18(5), 506–517. <https://doi.org/10.1080/13562517.2012.753049>
- Mills, D., & Alexander, P. (2013). Small Group Teaching: A Toolkit for Learning. *Higher Education Academy*, March, 1-9.22-35.

https://www.heacademy.ac.uk/sites/default/files/resources/Small_group_teaching_1.pdf

- Misra, A., & Misra, S. C. (2014). Conceptual modeling for knowledge management to support agile software development. *Knowledge Engineering Review*, 29(4), 496–511. <https://doi.org/10.1017/S0269888914000198>
- Morgan, J. H. (2013). Re-Inventing the Tutorial in an Internet World: An Enhancement of an Old English Tradition. *Journal of Alternative Perspectives in the Social Sciences*, 5(3), 522–532. <https://www.academia.edu/download/36200474/JHM-article-Reinventing-Tutorial.pdf>
- Mpungose, C. B. (2021). Lecturers' reflections on use of Zoom video conferencing technology for e-learning at a South African university in the context of coronavirus. *African Identities*, 21(2), 266–282. <https://doi.org/10.1080/14725843.2021.1902268>
- Mtebe, J. S. (2020). Examining user experience of eLearning systems implemented in two universities in Tanzania. *Interactive Technology and Smart Education*, 17(1), 39–55. <https://doi.org/10.1108/ITSE-05-2019-0025>
- Mulinge, M., & Arasa, N. (2017). The Growth of University Education in Kenya. In *The Status of Student Involvement in University Governance in Kenya*. CODESRIA. <https://doi.org/10.2307/j.ctvh8r378.10>
- O'brien, R. (2001). An Overview of the Methodological Approach of Action Research. In R. Richardson (Ed.), *Theory and Practice of Action Research*. Universidade Federal da Paraíba. <http://www.web.ca/~robrien/papers/arfinal.html>
- Okai, S., Uddin, M., Arshad, A., Alsaqour, R., & Shah, A. (2014). Cloud computing adoption model for universities to increase ICT proficiency. *SAGE Open*, 4(3), 1–10. <https://doi.org/10.1177/2158244014546461>
- Palfreyman, D. (2008). *The Oxford Tutorial: Thanks, you taught me how to think* (D. Palfreyman (Ed.); 2nd ed.). OxCHEPS. <https://www.amazon.com/Oxford-Tutorial-David-Palfreyman/dp/0954743377>
- Pishva, D., Nishantha, G. G. D., & Dang, H. A. (2010). A survey on how blackboard is assisting educational institutions around the world and the future trends. *International Conference on Advanced Communication Technology, ICACT*, 2, 1539–1543.
- Planas-Lladó, A., Feliu, L., Arbat, G., Pujol, J., Suñol, J. J., Castro, F., & Martí, C. (2021). An analysis of teamwork based on self and peer evaluation in higher education. *Assessment and Evaluation in Higher Education*, 46(2), 191–207. <https://doi.org/10.1080/02602938.2020.1763254>
- Pocatilu, P., Alecu, F., & Vetrici, M. (2010a). Measuring the efficiency of Cloud

- Computing for e-learning Systems. *WSEAS Transactions on Computers*, 9(1), 42–51.
- Pocatilu, P., Alecu, F., & Vetrici, M. (2010b). Using Cloud Computing for E-learning Systems. *8th WSEAS International Conference on DATA NETWORKS, COMMUNICATIONS, COMPUTERS*, 9(1), 54–59.
- Puustjärvi, J., & Puustjärvi, L. (2012). Exploiting cloud computing in competence management: a pharmacy case. In *IAIT* (pp. 148–158). Springer-Verlag.
- Ramnath, V. (2010). *The level of adoption and effectiveness of software development methodologies in the software development industry in South Africa* (Issue November). University of Pretoria.
- Rao, M. K. (2009). Academic Publishing: Role of University Libraries in the Scholarly Communication System. *Library Vendor/Publisher Interface*, 389–395. http://crl.du.ac.in/ical09/papers/index_files/ical-66_123_237_1_RV.pdf
- Rashid, N., & Khan, S. U. (2018). Agile practices for global software development vendors in the development of green and sustainable software. *Journal of Software: Evolution and Process*, 30(10). <https://doi.org/10.1002/smr.1964>
- Regmi, K. (2012). Review of Teaching Methods -Lecturing and Facilitation in Higher Education (HE): A Summary of the Published Evidence. *The Journal of Effective Teaching*, 12(3), 61–76.
- Retna, K. S., Chong, E., & Cavana, R. Y. (2009). Tutors and tutorials: students' perceptions in a New Zealand university. *Journal of Higher Education Policy and Management*, 31(3), 251–260. <https://doi.org/10.1080/13600800902974336>
- Rezaei, A. (2018). Effective Groupwork Strategies: Faculty and Students' Perspectives. *Journal of Education and Learning*, 7(5), 1. <https://doi.org/10.5539/jel.v7n5p1>
- Richard, J., Koufogiannakis, D., & Ryan, P. (2009). Librarians and Libraries Supporting Open Access Publishing. *Canadian Journal of Higher Education*, 39(3), 33–48. <http://ojs.library.ubc.ca/index.php/cjhe>
- Rosander, M., & Chiriac, E. H. (2016). The purpose of tutorial groups: social influence and the group as means and objective. *Psychology Learning & Learning*, 15(2), 155–167. <https://doi.org/10.1177/1475725716643269>
- Saleh, A. M., Shabila, N. P., Dabbagh, A. A., Al-Tawil, N. G., & Al-Hadithi, T. S. (2015). A qualitative assessment of faculty perspectives of small group teaching experience in Iraq. *BMC Medical Education*, 15(1), 13. <https://doi.org/10.1186/s12909-015-0304-7>
- Sammour, G., Schreurs, J., Zoubi, A. Y., & Vanhoof, K. (2008). Knowledge management and eLearning in professional development. *WSKS*, 19, 178–183.

- Schwenck, C. M., & Pryor, J. D. (2021). Student perspectives on camera usage to engage and connect in foundational education classes: It's time to turn your cameras on. *International Journal of Educational Research Open*, 2–2, 100079. <https://doi.org/10.1016/J.IJEDRO.2021.100079>
- Sharma, S. K., Goyal, N., & Singh, M. (2014). Distance Education Technologies : Using E-learning System and Cloud Computing. *International Journal of Computer Science and Information Technologies*, 5(2), 1451–1454.
- Shivananda, N. B., Sridevi, V., Sahu, P., Subbaramaiah, N., Telang, L., Goudappala, P., Halappa Kariappa, C., Sharma, A., Maanasa, S. K., & Nayak, A. S. (2021). Students' engagement and perceptions of small group tutorial classes among undergraduate medical students. *Journal of Advances in Medical Education & Professionalism*, 9(1), 18. <https://doi.org/10.30476/JAMP.2020.86925.1280>
- Simmon, E. (2018). Evaluation of Cloud Computing Services Based on NIST SP 800-145. In *NIST Special Publication 500-322*. <https://doi.org/10.6028/NIST.SP.500-322>
- Simons, M. (2006). Global software development: a hard problem requiring a host of solutions. *Communications of the ACM*, 49, 32–33.
- Singh, U., & Baheti, K. P. (2017). Role and Service of Cloud Computing for Higher Education System. *International Research Journal of Engineering and Technology*, 04(11), 708–711. www.irjet.net
- Sorensen, K., & Glassman, N. R. (2011). From Desktop to Cloud: A Primer on Internet-Based Computing for Librarians. *Journal of Electronic Resources in Medical Libraries*, 8(3), 243–255. <https://doi.org/10.1080/15424065.2011.601991>
- Spiegel, S. A., & et al. (1995). *Perspectives from Teachers' Classrooms: Action Research*. (S. A. Spiegel, A. E. Collins, & J. Lappert (Eds.)). Science FEAT (Science for Early Adolescence Teachers).
- Tan, W. K., Macdonald, D., & Rossi, T. (2009). *Asia Pacific Journal of Education Educational action research in Singapore : to prove or improve ? August 2015*. <https://doi.org/10.1080/02188790903100333>
- Tan, X., & Kim, Y. (2011). Cloud computing for education: a case of using Google Docs in MBA group projects. *2011 International Conference on Business Computing and Global Informatization*, 641–644. <https://doi.org/10.1109/BCGIn.2011.169>
- Tapper, T., & Palfreyman, D. (2011). The Tutorial System: The Jewel in the Crown. In T. Tapper & D. Palfreyman (Eds.), *Higher Education Dynamics* (Vol. 34, pp. 95–115). Springer, Dordrecht. https://doi.org/10.1007/978-94-007-0047-5_6
- The eLearning Africa report 2013. (2013). In *International Conference on ICT for*

Development, Education and Training. 9th. May 28-30, 2014 Kampala, Uganda. ICWE. www.elearning-africa.com

The Kenya National ICT Masterplan April 2014: 2013/14 - 2017/18. (2014).

Thuku, J., Ayot, H., Ondigi, S., & Maina, E. (2019). Cloud Based Tutorial Management System to Enhance Student Participation in Learning. *2019 IST-Africa Week Conference, IST-Africa 2019.* <https://doi.org/10.23919/ISTAFRICA.2019.8764858>

UBC News Digest. (2004). Computer scientist wins \$100,000 award for popular course software. *UBC News Digest*, 1. <https://news.ubc.ca/2004/09/27/archive-media-releases-2004-mr-04-103/>

Uden, L., & Beaumont, C. (2006). The Tutorial Process. In *Technology and Problem-Based Learning* (pp. 140–170). IGI Global. <https://doi.org/10.4018/978-1-59140-744-7.ch007>

Vaccarino, F., Comrie, M., Culligan, N., & Sligo, F. (2006). *Action Research Initiatives: The Wanganui Adult Literacy and Employment Programme.*

van den Hurk, M. M., Dolmans, D. H. J. M., Wolfhagen, I. H. a. P., vMuijtjens, A. M. M., & van der Vleuten, C. P. M. (1999). Impact of Individual Study on Tutorial Group Discussion. *Teaching and Learning in Medicine*, 11(4), 196–201. <https://doi.org/10.1207/S15328015TLM110403>

Wanner, T., & Palmer, E. (2015). Personalising learning: Exploring student and teacher perceptions about flexible learning and assessment in a flipped university course. *Computers and Education*, 88, 354–369. <https://doi.org/10.1016/j.compedu.2015.07.008>

Watson, W. R., & Watson, S. L. (2007). An argument for clarity: What are learning management systems, what are they not, and what should they become? *TechTrends*, 51(2), 28–34. <https://doi.org/10.1007/s11528-007-0023-y>

Webb, N. M. (2009). The teacher's role in promoting collaborative dialogue in the classroom. *British Journal of Educational Psychology*, 79(1), 1–28. <https://doi.org/10.1348/000709908X380772>

What is Cloud Computing. (2022). https://aws.amazon.com/what-is-cloud-computing/?nc1=f_cc

Wheelan, S. A. (2009). Group Size, Group Development, and Group Productivity. *Small Group Research*, 40(2), 247–262. <https://doi.org/10.1177/1046496408328703>

Wood, E. J. (1988). Tutorials and small group teaching. *Biochemical Education*, 16(1), 13–16. [https://doi.org/10.1016/0307-4412\(88\)90007-6](https://doi.org/10.1016/0307-4412(88)90007-6)

Wu, W.-S. (2008). The application of Moodle on an EFL collegiate writing

environment. *Journal of Education and Foreign Languages and ...*, 7(June), 45–56. <http://www.chu.edu.tw/~wswu/publications/papers/journals/06.pdf>

Zhang, R. (2020). The impacts of cloud computing architecture on cloud service performance. *Journal of Computer Information Systems*, 60(2), 166–174. <https://doi.org/10.1080/08874417.2018.1429957>

APPENDICES

Appendix I - INSTRUCTOR'S QUESTIONNAIRE

INSTRUCTOR'S QUESTIONNAIRE

The purpose of this questionnaire is to help understand how tutorials are conducted during teaching and to investigate how instructors perceive the benefits and challenges of tutorials. In this study on "*a model to enhance tutorial management in teaching and learning using cloud computing*", the term **tutorial** refers to the learning approach where a student or a group of students are given different topics to research on and write papers. The papers are then presented in class for discussion and critiquing under the guidance of the instructor. The instructor thereafter assesses the tutorial papers before they can be shared out among the students.

Several statements about your experience and activities while you teach through tutorials are listed in the sections below. Please respond to each statement as honestly as possible. Your response is highly appreciated and will be treated with utmost confidentiality.

A. Personal Details

Name: _____ (Optional) Institution: _____

B. Teaching using Tutorials

1. To which group of students do you give tutorials?

Undergraduate: Masters: PhD: Other (please state): _____

2. How often do you give tutorial questions in the units you teach?

Always ____ Sometimes ____ Rarely ____ Never ____

C. Preparing for Tutorials

3. The following are some preparations needed by students before they write the tutorial paper. How important would you rate the following. Kindly tick (✓) against your choice:

<i>Tutorial Preparation Activity</i>	<i>Very Important</i>	<i>Important</i>	<i>No Opinion</i>	<i>Not Important</i>
a) Students should be provided with course outline and topics.				
b) The lecturer should provide a background on all tutorial questions or topics.				
c) Tutorial questions, presentation schedule and submission due dates should be given early in the semester.				
d) Students should be given a list of reference books and journals to use.				
e) Students should be provided with guidelines on format and layout of the tutorial paper.				
f) Students should have competences on referencing and citation.				
g) Students should be allowed to choose their preferred tutorial topics or questions.				
h) Allowing students to choose members of their tutorial groups, where groups have two or more members.				
i) Each group should nominate a tutorial group leader.				
Suggest any other important activity in preparation for tutorials				

D. Class Presentations

4. Kindly tick against the code given to indicate whether you *strongly agree (SA)*, *agree (A)*, *have no opinion (N/O)*, *disagree (D)* or *strongly disagree (SD)* with the following statements on class presentations.

<i>To what extent do you agree or disagree with the following statements regarding class presentations.</i>	<i>SA</i>	<i>A</i>	<i>N/O</i>	<i>D</i>	<i>SD</i>
a) A group should designate a main presenter.					
b) Presentations should be done using PowerPoint or similar software.					
c) Class members should be allowed to critique, comment or seek clarifications on the presentations.					
d) Discussions should be moderated by the lecturer or his/her representative.					
e) Attendance records should be monitored continuously.					
f) The class size (no of students) during presentation has no significant influence on the effectiveness of presentations.					
Kindly give further suggestions on the preparedness and conduct of class presentations.					

E. Quality and Assessment of Tutorial Papers

5. Kindly tick against the code given to indicate whether you *strongly agree (SA)*, *agree (A)*, *have no opinion (N/O)*, *disagree (D)* or *strongly disagree (SD)* with the following statements on quality of papers.

<i>To what extent do you agree or disagree with the following statements regarding quality and assessment of papers.</i>	<i>SA</i>	<i>A</i>	<i>N/O</i>	<i>D</i>	<i>SD</i>
a) Students should be allowed to revise their tutorial papers after discussions before handing over for marking.					
b) All tutorial papers should be checked for text similarity or/and plagiarism before marking.					
c) Students should do a peer-to-peer assessment within groups on individual's contribution on their tutorial assignment.					
d) Students should be allowed to access copies of all revised tutorial papers done by their colleagues					
e) Instructor/Lecturer should recommend tutorial papers that can be preserved for use as supplementary study materials by future students.					
f) Some select tutorial papers are of quality that can be considered as manuscripts for publication in a departmental, institutional or regional journal.					
State other indicator for improved quality and assessment of tutorial papers.					

F. Skills & Competences Acquired

6. To what extent do you agree or disagree that teaching through tutorials help the student to enhance skills and competencies listed below.

<i>Skills and competencies gained through tutorials</i>	<i>Strongly Agree</i>	<i>Agree</i>	<i>No Opinion</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
a) Research skills.					
b) Writing skills.					
c) Information searching skills.					
d) Presentation skills.					
e) Referencing and citation skills.					
f) Confidence in defending research opinions.					
g) Collaboration with other students.					
h) Plagiarism awareness.					
Any other skills or competencies. Kindly explain briefly.					

G. Challenges

7. In your opinion how significant do the following challenges or issues hinder the effectiveness of tutorials? (Please respond to all using the key *ES-Extremely Significant, VS-Very Significant, S-Significant, NO-No Opinion, NS-Not Significant*).

<i>Significance of Challenges/Issues</i>	<i>ES</i>	<i>VS</i>	<i>S</i>	<i>NO</i>	<i>NS</i>
a) Some students getting the opportunity to dominate on others.					
b) Discussions being dominated by few members.					
c) Tutorials encouraging laziness and aloofness among some students.					
d) Difficulty in scheduling meetings among group members.					
e) Lack of relevant reference materials on the topics.					
f) Lack of skills to search for relevant and appropriate information resources.					
g) Lack of appropriate skills in using institution's online learning systems.					
Kindly give any other challenges or issues					
Please give suggestions on how tutorials can be made more effective.					

H. Strategies

8. What category of learners should regularly use tutorial teaching approach?
Undergraduates []; Masters []; PhDs []; Other _____
9. Would you recommend tutorial teaching approach be introduced to undergraduates? Yes ___ No ___ .
10. In your opinion at what year of study should undergraduates be introduced to tutorials?
1st year []; 2nd year []; Final / 3rd year []; No opinion []

What is your overall opinion about tutorials as teaching method?

I. Piloting the Platform

If you would wish to have your questions in the platform for piloting kindly provide the following:

Unit Code & Title: _____

Email: _____

(A link with simple instructions to post your questions will be sent to you. The students will be guided on enrolling in your class and using the platform)

Sign: _____ Date: _____

Thank you

Appendix II - STUDENT QUESTIONNAIRE

STUDENT QUESTIONNAIRE

The purpose of this questionnaire is to help understand how tutorials are conducted during learning and investigate how students perceive the benefits and challenges of tutorials. In this study on “*a model to enhance tutorial management in teaching and learning using cloud computing*”, the term **tutorial** refers to the learning approach where a student or a group of students is given a topic to research on and write a paper. The paper is then presented in class for discussion and critiquing under the guidance of the instructor. The instructor thereafter assesses the tutorial papers before it can be shared out among the students.

Several statements about your experience and activities while you learned through tutorials are listed in the sections below. Please respond to each statement as honestly as possible. Your response is highly appreciated and will be treated with utmost confidentiality.

A. Personal Details

Name: _____ (Optional) Email: _____ (Optional)

Institution: _____ Degree Enrolled: UG [] ; Masters [] ; PhD []

Sex (M/F): _____ Age: 20-25 [] ; 26-35 [] ; Over 35 [] .

B. Tutorial Participation

1. Have you ever participated in a class tutorial session as a student? Yes ___ / No ___.

If “Yes” to the above, continue to question No. 2, otherwise proceed to question No. 5.

2. At what level(s) have you encountered learning through tutorials?

Undergraduate: ___ Masters: ___ PhD: ___ Other (please state): _____

3. How long ago did you last participate in class tutorials?

1-2 years ___ , 3-5 years ___ , Over 5 years ___ .

4. If you recall, kindly list a few tutorial topics you or your colleagues presented in class.

Tutorial Topic	Presented by		
	Myself	My Group	Others

5. The following are some preparations needed before writing the tutorial paper. How useful would you rate the following. Kindly tick (✓) against you choice:

Tutorial Preparation Activity	Extremely Useful	Very Useful	Useful	No Opinion	Not Useful
a) The lecturer giving a background on all tutorial topics.					
b) Students being provided with library reference books, journals and databases to use on the tutorial topics.					
c) Having the guidelines on format and layout of the tutorial paper.					
d) Allowing students to choose members of their tutorial groups, whenever the group has two or more members.					
e) Student’s competence on referencing and citation.					

6. The following table lists some tutorial activities. Please indicate how you rate the importance of these activities in making tutorials effective by ticking against your choice:

<i>Tutorial Activity</i>	<i>Extremely Important</i>	<i>Very Important</i>	<i>Important</i>	<i>No Opinion</i>	<i>Not Important</i>
a) Requiring students to use online information resources when researching on their tutorial topic or question.					
b) Requiring students to make their tutorial presentations in class.					
c) Allowing discussions on papers presented in class.					
d) Having the tutorial paper checked for text similarity or/and plagiarism before marking.					
e) The lecturer sanctioning tutorial papers that could be shared among other students.					
f) Requiring group members to do a peer-to-peer assessment on individual's contribution on a joint tutorial paper.					
State other activities, you think are necessary in making tutorials more effective.					

C. Tutorial Topics & Presentations

7. Kindly tick against the code given to indicate whether you *strongly agree (SA)*, *agree (A)*, *have no opinion (N/O)*, *disagree (D)* or *strongly disagree (SD)* with the following statements.

<i>To what extent do you agree or disagree with the following statements regarding topics, presentations and papers in tutorial sessions.</i>	<i>SA</i>	<i>A</i>	<i>N/O</i>	<i>D</i>	<i>SD</i>
a) My /Our tutorial topic or question was within the scope of the course outline.					
b) Discussion of tutorial papers presented in the class was very useful.					
c) The lecturer's comments on facts and issues during paper presentations were very essential.					
d) Students should be allowed to revise their tutorial papers before handing over for marking.					
e) I used my tutorial paper to revise for exam.					
f) All tutorial papers were useful revision materials for the exam.					
g) Students should be allowed to access copies of all revised tutorial papers done by their colleagues.					
h) Tutorial papers should be preserved for use as supplementary study materials by future students.					
i) Tutorial papers can be considered as a manuscript for publication in a departmental, institutional or regional journal.					
j) All post graduate students should have a tutorial learning experience during their study.					
Any further comment on tutorial topics and presentations					

D. Sharing of Tutorial Papers Content

8. To what extent do students use the following methods in sharing the content of their tutorial presentations?

<i>Means of Sharing Content of Tutorial Papers</i>	<i>Often Used</i>	<i>Occasionally Used</i>	<i>No Opinion</i>	<i>Never Used</i>
a) Making photocopies of tutorial papers, i.e. Xeroxing.				
b) Making notes during tutorial presentation.				
c) Sharing copies of tutorial papers through emails				
d) Sharing the papers through mobile applications such as WhatsApp				
e) Taking photos of screen shots or pages using mobile phone.				
f) Copying files to external storage such as flash disks or CDs.				
g) Downloading final tutorial papers from an online repository.				
Kindly describe other means used by students to share tutorial papers				

E. Skills & Competences Acquired

9. To what extent do you agree or disagree that teaching through tutorials help the student to enhance skills and competencies listed below.

<i>Skills and competencies gained through tutorials</i>	<i>Strongly Agree</i>	<i>Agree</i>	<i>No Opinion</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
a) Research skills.					
b) Writing skills.					
c) Information searching skills.					
d) Presentation skills.					
e) Referencing and citation skills.					
f) Confidence in defending research opinions.					
g) Collaboration with other students.					
h) Plagiarism awareness.					
Any other skills or competencies. Kindly explain briefly.					

F. Challenges

In your opinion how significant do the following challenges or issues hinder the effectiveness of tutorials? (Please respond to all using the key *ES-Extremely Significant, VS-Very Significant, S-Significant, NO-No Opinion, NS-Not Significant*)

<i>Significance of Challenges/Issues</i>	<i>ES</i>	<i>VS</i>	<i>S</i>	<i>NO</i>	<i>NS</i>
a) Some students getting the opportunity to dominate on others.					
b) Discussions being dominated by few members.					

<i>Significance of Challenges/Issues ... contd.*</i>	<i>ES</i>	<i>VS</i>	<i>S</i>	<i>NO</i>	<i>NS</i>
c) Tutorials encouraging laziness and aloofness among some students.					
d) Difficulty in scheduling meetings among group members.					
e) Lack of relevant reference materials on the topics.					
f) Lack of skills to search for appropriate information resources.					
Kindly give any other challenges or issues					
Please give suggestions on how tutorials can be made more effective.					

* Response key *ES-Extremely Significant, VS-Very Significant, S-Significant, NO-No Opinion, NS-Not Significant*)

G. Strategies

10. Have you ever facilitated training using tutorials approach? Yes ___ / No ___.

11. If Yes to the above what category of learners have you used tutorials approach in training?

Undergraduates []: Postgraduates []: Staff []: Other _____

12. Would you recommend that tutorials are introduced to undergraduates? Yes ___ / No ___.

13. If yes to the above, at what year of study should undergraduates be introduced to tutorials?

1st year []: 2nd year []: Final / 3rd year []

What is your overall opinion about tutorials as teaching method?

Sign: _____

Date _____

**The end.
Thank you.**

Appendix III - Tutmas Student Questionnaire

Tutmas Student Questionnaire

This questionnaire is aimed at getting your views on how the modern and accessible technology can be used to improve administration of group tutorials at the University. Your response is highly appreciated and the information will be used for research in improving Tutmas as a platform for management of group tutorials in teaching and learning. You are most welcome to participate. Thank you.

1. Name (optional): _____ Gender (M/F): _____
2. Programme Enrolled: *Diploma/ Undergraduate/ Masters/ PhD.*
3. Year of Study (1/2/3/..): _____

The following questions may require multiple responses, please tick (✓) against what applies in your circumstances. You are further requested to rank top three choices where rank 1 indicates highest priority or most preferred, 2 next priority, 3 less priority, etc

4. What kind of device(s) do you often use to access the Internet? Please tick (✓) against device that apply and rank your preference: rank 1 - most used, 2- less used, etc)

Access device	Does Apply?	Rank	Brief comment on why the choice of the device(s)
Desktop computer / PC			
Laptop			
Smartphone			
Ipad / Tablet			
Other (specify)			

5. Where do you often access the Internet? Please tick (✓) against choices that apply to you. Rank three most preferred areas in the columns provided. Thus rank 1 being the most preferred, 2 the next preferred, 3 less preferred.

Where Internet is Accessed	Does Apply?	Rank	Why your choice?
University Library			
University Computer Labs			
Hotspots in the University			
At Home			
At Cyber Café			
Other (specify)			

6. Which channels of communication do you reach out to the group members? Please tick (✓) against choices that apply to you and rank the top 3 preferred with rank 1 most used, 2 and 3 less used.

Communication Channel	Does Apply?	Rank	Why your choice?
Face to face communication			
Phone call			
Sms			
Email			
Whats App			
Facebook			
Other			

7. How important are the following activities in tutorial groups? Please tick what apply.

Tutorial Activity	Very Important	Important	Not Important	No Opinion
Face to face group discussions				
Online discussions in forums / chats				
Sharing tasks among group members				

8. How have you accessed to other groups presentations/papers?

- Downloading from Tutmas platform _____
- Papers/presentation emailed to you _____
- Making photocopies _____
- Not applicable _____
- Other specify _____

9. What challenges have you encountered while using Tutmas platform?

10. What are your suggestions to improve Tutmas platform?

Thank you for your participation.

Appendix IV - Approval of Research Proposal



KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 810901 Ext. 57530

Website: www.ku.ac.ke

Internal Memo

FROM: Dean, Graduate School

DATE: 27th September, 2016

TO: Mr. John K. Thuku
C/o Department of Educational Comm. & Technology
Kenyatta University

REF: E83/10862/06

SUBJECT: APPROVAL OF RESEARCH PROPOSAL

This is to inform you that Graduate School Board at its meeting of 21st September, 2016 approved your Research Proposal for the Ph.D. Degree, entitled "A Model to Enhance Tutorial Management in Teaching and Learning Using Cloud Computing".

You may now proceed with your Data collection, subject to clearance with the Director General, National Commission of Science, Technology & Innovation.

As you embark on your data collection, please note that you will be required to submit to Graduate School completed supervision Tracking Forms per semester. The form has been developed to replace the progress Report Forms. The Supervision Tracking Forms are available at the University's Website under Graduate School webpage downloads.

Thank you.

A handwritten signature in blue ink, appearing to read 'Reuben Muriuki'.

REUBEN-MURIUKI
FOR: DEAN, GRADUATE SCHOOL

c.c. Chairman, Department of Educational Communication & Technology

RM/cao

Appendix V – Request to Collect Data at KU



KENYATTA UNIVERSITY

OFFICE OF DEPUTY VICE-CHANCELLOR, RESEARCH, INNOVATION AND OUTREACH

Ref: KU/DVCR/RCR/VOL.3/231

Mr. John Thuku,
KENYATTA UNIVERSITY

P. O. Box 43844 - 00100
Nairobi, Kenya
Tel. 254-20-810901 Ext. 026
E-mail: dvc-rio@ku.ac.ke

29th June, 2017

Dear Mr. Thuku,

RE: REQUEST TO COLLECT RESEARCH DATA AT KENYATTA UNIVERSITY

This is in reference to your letter dated 21st June, 2017 requesting for authorization to collect research data at Kenyatta University towards completing your PhD study titled "*A Model to Enhance Tutorial Management in Teaching and Learning Using Cloud Computing*".

I am happy to inform you that the Vice-Chancellor has approved your request to collect data. It has been noted that your data will be collected mainly from the Department of Computing and Information Technology.

Yours Sincerely,

Prof. F. O. Cravenir
Deputy Vice-Chancellor
Research, Innovation & Outreach
cc. Vice-Chancellor
Chairman, Department of Computing & Information Technology

Appendix VI - Research Permit

THIS IS TO CERTIFY THAT:
MR. JOHN KIIRU THUKU
of KENYATTA UNIVERSITY, 0-100
Nairobi, has been permitted to conduct
research in Nairobi County

Permit No : NACOSTI/P/17/56893/17260
Date Of Issue : 14th June, 2017
Fee Recieved : Ksh 2000

on the topic: A MODEL TO ENHANCE
TUTORIAL MANAGEMENT IN TEACHING
AND LEARNING USING CLOUD
COMPUTING

for the period ending:
13th June, 2018




.....
Applicant's
Signature

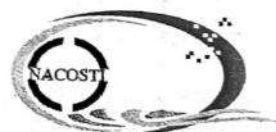

.....
Director General
National Commission for Science,
Technology & Innovation

CONDITIONS

1. You must report to the County Commissioner and the County Education Officer of the area before embarking on your research. Failure to do that may lead to the cancellation of your permit.
 2. Government Officer will not be interviewed without prior appointment.
 3. No questionnaire will be used unless it has been approved.
 4. Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries.
- You are required to submit at least two(2) hard copies and one (1) soft copy of your final report. The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice



REPUBLIC OF KENYA



National Commission for Science,
Technology and Innovation

RESEACH CLEARANCE
PERMIT

Serial No.A **14353**

CONDITIONS: see back page

Appendix VII - Tutmas User Guide

TUTMAS: Tutorial Management System Students Guide

Getting Started

Login at www.tutmas.com



Create Account

Incase you are not registered with Tutmas, create an account by clicking on the “*Create Account*” button on the login page and choose *Student*.




- Fill in the details in the form including:
 - Name, email and preferred password.
 - Your lecturer will provide you with the Class ID and Enroll Key.
- Check the terms and conditions button then submit.
 - User signup confirmation message will appear on the screen.
 - Login link and credentials are sent to your email.
- Proceed to login at www.tutmas.com.

Student Home Page



Click on the Unit to see tutorial questions assigned along with the group members, presentation date, submission deadline, grade or score and additional option under the Action menu.

Action Menu

- Action menu  is found at the left, marked with three vertically aligned dots.
- It gives additional functionalities such as Submit Assignment, View Assignment, Class Notes, Group Chat and Collabo.

ECCE010 - General Educational Research Methods
Lecturer: Priscilla Nkomo

Question	Question	Task	Group ID	Preparation Date	Due Date	Submission Date	Group Members	Action
1	Discuss the validity of a research proposal in educational issues in an appropriate context to justify your response.			Mon Aug 20, 2019 12:22 PM	Monday, Nov 5, 2018	Nov 5, 2018	10	
2	Using relevant citations discuss the qualities of effective concept paper in the process of research in education.			Mon Aug 20, 2019 12:22 PM	Monday, Nov 5, 2018	Nov 5, 2018	10	Submit Assignment
3	Discuss various types of gaps in knowledge that can be filled by conducting research in education.			Mon Aug 20, 2019 12:22 PM	Monday, Nov 5, 2018	Nov 5, 2018	10	View Submission
4	Assess the role of research methodology in research in education. Use appropriate citations to support your arguments.			Mon Aug 20, 2019 12:22 PM	Monday, Nov 5, 2018	Nov 5, 2018	10	Class Notice
5	Identify the researcher's interest and a model using appropriate theories, provide reasons for selecting either a group or a theory to research in education.			Mon Aug 20, 2019 12:22 PM	Monday, Nov 5, 2018	Nov 5, 2018	10	View Discussion
6	Discuss quality and competence of effective research in education. Use appropriate citations to support your arguments.			Mon Aug 20, 2019 12:22 PM	Monday, Nov 5, 2018	Nov 5, 2018	10	Group Chat
7	What are approaches to research? Identify and discuss their strengths and weaknesses.			Mon Aug 20, 2019 12:22 PM	Monday, Nov 5, 2018	Nov 5, 2018	10	Custom
8	Discuss the role of research methodology in research in education. Use appropriate citations to support your arguments.			Mon Aug 20, 2019 12:22 PM	Monday, Nov 5, 2018	Nov 5, 2018	10	Upload Manuscript Paper

Action Menu

Joining Groups

- Join a tutorial group, click on the “Join Group” icon against the question.
- Leave a tutorial group or view members click on “Group Members” icon, .

Uploading Assignment

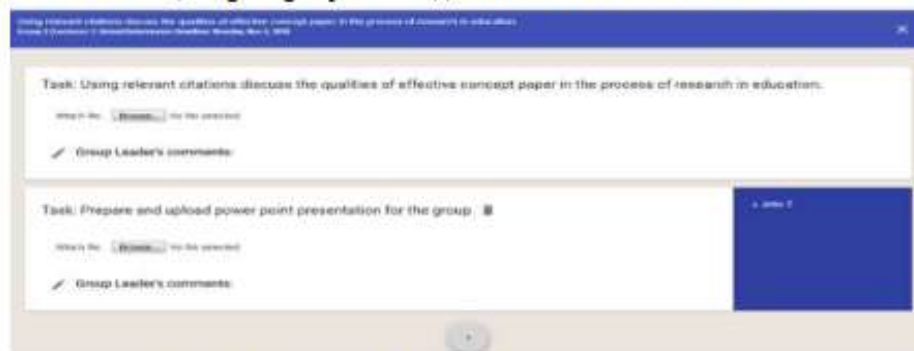
- Click on the *Action menu*.
- Choose “Submit Assignment”. NB it is only group leaders who can upload/submit.
- Browse to select the tutorial paper file, then *Submit*.

The tutorial paper will thereafter be available to all i.e. group members as well as class members.

Collabo

Use Collabo to use list shared tasks among group members e.g. who is to prepare the power point presentation for the group.

- Click on “New Task” button. NB To be done by group leaders in a group.
- Describe the task, assign to group member(s) and then submit for notification. See below.



- Once the task is finished, those assigned can upload the file.
 - Open “Collabo” through the *Action menu*,
 - Identify the task, click on *Browse* to upload the file.

NB: Final tutorial paper should be uploaded by the group leader as illustrated in “Uploading Assignment” earlier.