ADAPTIVE LEARNING MANAGEMENT SYSTEM BASED ON LEARNER'S PRIOR KNOWLEDGE AND PERFORMANCE

A THESIS SUBMITTED TO THE GRADUATE SCHOOL OF APPLIED SCIENCES OF NEAR EAST UNIVERSITY

By
MACMILLAN TAFADZWA NYAMUKONDIWA

In Partial Fulfillment of the Requirements for The Degree of Master of Science in Information Systems Engineering

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Approval of Director of Graduate School of Applied Sciences

Prof. Dr. Nadire Çavuş

We certify this is satisfactory for the award of the degree of Masters of Science Information Systems Engineering

Examining Committee in Charge:

Assist.Prof.Dr. Boran Şekeroğlu	Committee Chairman, Department of Information Systems Engineering, NEU
Assist.Prof.Dr. Kaan Uyar	Supervisor, Department of Computer Engineering, NEU
Assist.Prof.Dr.Ümit ilhan	Department of Computer Engineering, NEU
Assist.Prof.Dr. Erkut İnan İşeri	Department of Electrical and Electronic Engineering, NEU
Assist.Prof.Dr. Elbrus Imanov	Department of Computer Engineering, NEU

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Name, Last name:
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To my parents…

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ABSTRACT

Technology has contributed a lot in the field of learning and with advancements that are assisting in improving the experience of learners. Several e-learning platforms have emerged, which enable instructors and learners to create and access content anywhere through the Internet. Moreover, learning management systems have advanced to providing personalized content based on learner styles. They have been focusing on providing learning content based on the learner's preferences. This study therefore focused on developing a question and answer web based platform that allows instructors to create content and provide personalized learning material to learners, based on the students' prior knowledge and practice performance. It realizes the importance of testing prior knowledge base to determine each learner's starting point to their learning paths and to test their procedural prior knowledge which influences application of higher order of cognitive problem solving skills. Moreover, in realizing that students have different learning paths, the system adapts to each learner's capabilities and provides a gradual learning process and adaptive content that is based on each student's average performance in a particular course. The practice questions are categorized in the three categories; beginner, intermediate and advanced. As soon as the student enrolls to a class, they ate tested on their prior knowledge and practice questions are given, based on the prior test, and from there onwards the system adapts to the learner's practice performance to give them appropriate content. This allows tracking of learners' course performance and further drill down to specific topics so as to assist students in their specific weak areas. The web based application was developed on a PHP and MySQL environment. To further improve the system in the future, it was recommended that multimedia study material be incorporated and to increase the system's intelligence by using artificial neural networks.

Keywords: Adaptive; e-learning; Performance; Prior Knowledge

ÖZET

Teknoloji, öğrenme alanında ve öğrenenlerin deneyimini geliştirmede yardımcı olan ilerlemelerde çok katkıda bulunmuştur. Eğitmenlerin ve öğrencilerin Internet üzerinden herhangi bir yerde içerik oluşturmasına ve bunlara erişmesine olanak sağlayan çeşitli e-öğrenme platformları ortaya çıkmıştır. Ayrıca, öğrenme yönetim sistemleri, öğrenci stilleri temelinde kişiselleştirilmiş içerik sağlamaya ilerlemiştir. Öğrencilerin tercihlerine göre öğrenme içeriği sağlamaya odaklanmışlardır. Bu nedenle bu çalışma, öğretmenlerin öğrencilere önceden bilgi ve uygulama performansına dayalı olarak içerik oluşturmalarını ve kişiselleştirilmiş öğrenim materyalleri sunmalarını sağlayan bir soru ve cevap web tabanlı bir platform geliştirmeye odaklanmıştır. Her öğrencinin başlangıç noktalarını öğrenme yollarına belirlemek ve daha yüksek bilişsel problem çözme becerilerinin uygulanmasını etkileyen prosedür öncesi ön bilgilerini test etmek için ön bilgi tabanının test edilmesinin önemini fark eder. Ayrıca, öğrencilerin farklı öğrenme yollarına sahip olduklarını fark edersek, sistem her öğrencinin yeteneklerine uyum sağlar ve her öğrencinin belirli bir dersteki ortalama performansına dayanan kademeli bir öğrenme süreci ve uyarlanabilir içerik sağlar. Uygulama soruları üç kategoride kategorize edilir; acemi, orta ve ileri düzey. Öğrenci bir sınıfa girer girmez, önceki bilgileri üzerinde testler yaptılar ve önceki testlere dayanarak uygulama soruları veriliyordu ve buradan itibaren sistem uygun bir içerik sağlamak için öğrencinin uygulama performansına adapte oluyor. Bu, öğrencilerin kurs performansının izlenmesini sağlar ve belirli zayıf alanlara öğrencilerin yardımcı olması için belirli konulara daha ayrıntılı bir şekilde inceler. Web tabanlı uygulama PHP ve MySQL ortamında geliştirilmiştir. Gelecekte sistemi daha da iyileştirmek için multimedya çalışma materyalinin kullanılması ve yapay zeka ağları kullanılarak sistemin zekasının artırılması önerildi.

Anahtar Kelimeler: Uyarlanabilir; e-öğrenme; Performans; Ön bilgi

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LIST OF ABBREVIATIONS

DB:	Database
E-LEARNING	Electronic Learning
IDE:	Integrated Development Environment
LMS:	Learning Management System
PHP:	Hypertext Preprocessor
OOAD:	Object Oriented Analysis and Design
UI:	User Interface
URL:	Uniform Resource Locator

CHAPTER1
INTRODUCTION

Chen and Zheng (2008) defined an adaptive learning system as a platform which enables learning that is customized for an individual student. It takes into account individual students' differences and customizes content for each student. Adaptive learning has advanced from the traditional online learning platforms where tutors upload content and students access the generic learning material without taking into account of their personal preferences.

Different studies have focused on this field for a while and a lot of advancements have been made. The research has trended since the 1900s where different approaches and concepts in adaptive learning systems were investigated till to date. The approaches are summed up into 4 as follows;"macro-adaptive", "aptitude-treatment interaction", "micro-adaptive" and the recent "constructivist-collaborative" approach (Modritscher, 2013). The approaches progressed from adaptivity as a whole and focusing on a few major components of instruction, to an adaptivity learning system that can be implemented in a practical learning process and encompassing modern pedagogical teaching approaches which include constructivism and collaboration amongst students (Lennon et al, 2003).

Back in the days, adaptivity mainly focused on the retrieval of content by an individual student and enabling it to test procedural skills without any intelligence and inference; therefore people could not realize its benefits over a human teacher. Currently, adaptive learning systems have taken learning as an active process that should engage students by utilizing the computer system's intelligence to present content, make decisions and reason to determine how each student can be helped to improve their learning experience (Andressen et al, 1999).

1.1 Motivation

The motivation behind this thesis work is to enhance students learning process by, outlining individual contrasts or differences regarding prior knowledge, performances, learning style, their preferences, and coordinating these with fitting personalized content.

1.2 Problem Statement

The development of the web led to advances in telecommunication and technology. Numerous instructive organizations offer online-courses.E-learning has increased enormous ubiquity since students from all around the globe can participate regardless of their physical distance. Despite the fact that Learning Management System (LMS) give a helpful learning platform, they don't address individual differences in learning. A vital issue emerges here as highlighted by Jonassen (David, 1993); people vary in their capacity to process data, construct meaning from it, or apply it to new circumstances.

In-addition, teaching and learning has been rigid in following a syllabus to teach students. They have to follow chapter by chapter to complete a course or subject and a generic teaching approach is used to all students despite their different learning style and abilities. Learning is not personalized to each student, rather they are taught as a class and that may result in assuming that all students are in the same path, yet some may be behind. Learner is not given the ability to learn at his own pace and in his own learning style since teaching is generic and some e-learning materials do not adapt according to the learner. Also, it is rare for teachers to note the particular areas or topics were each student is lacking and need more attention.

1.3 The Aim of the Study

The goal of this research is to develop anadaptive learning system that tests the student’s prior knowledge and performance. Prior knowledge should determine every learner’s path in the learning process and assist them to identify their specific areas of weaknesses. It seeks to enhance the leaners’ learning experience by matching appropriate content to each individual learner.

1.4 Objectives of the Study

1. To develop a system that matches learning content to learners according to their practice performance.

2. To determine each student's learning path by testing the learner's prior knowledge. This should be done by giving students a prior test that can be taken once and record their scores which can be used to determine the type of content each student should be given.
3. To enable instructors to create content and assess learners through timed exams.
4. To allow both instructors and learners to track student's progress and performances in subject and specific topic areas so that instructors will know the exact areas to assist learners.
5. To create students' learning profile from the system data so as to know how a student can be assisted and derive reasons for student's poor or high performance.

1.5 Scope and Limitation

The concentration of the studyis to explore and research on the Adaptive Learning system idea, using it to improve students learning process by, outlining their individual differences in terms of prior knowledge, performances, learning style, preferences, and matching these with suitable personalized contents. Due to time limit of the project this Research Work will focus on question based content used for practice. The learning content is only used for practice and assessment and is limited to text content.

1.6 Importance of the Study

The focus of adaptive learning systems is to provide different needs of students while they go through their learning process. The system's intelligence is the back bone of adaptive systems, which enable them to adapt to different learner preferences and abilities. From the fact that students have different learning paths, an adaptive learning system comes handy to meet each student's different learning abilities.

This study investigates ways of improving students' knowledge by taking into account different learners' abilities and learning paths. It seeks to provide mechanisms that assist students by matching content depending on what they already know and build them from there. The research helps instructors to realize the importance of prior knowledge in building a student's achievement path. It also thrusts on the significance of quality prior

knowledge base and how it is as equally essential as the students' styles of learning in determining the adaptive-ness of the learning system.

1.7 Thesis Structure

This study is comprised of five chapters which are summarized as follows:

Chapter 1: It gives the background, aims, objectives and direction of the study.

Chapter 2: The second chapter looks at the related studies to this research to determine the gaps and contribution of this study.

Chapter 3: This chapter outlines how the system was to be developed and the tools associated.

Chapter 4: The implementation chapter describes how the proposed system works by demonstrating using screenshots.

Chapter 5: it sums up the whole research study by outlining how the set objectives were met, discussion, and future work.

CHAPTER 2
LITERATURE REVIEW

Learning can be defined as a general terminology utilized for a lifelong change in our day to day conduct (Gagne, 1985). It is the improvement of new abilities, understanding, or states of mind as we communicate with the data and environs. Learning happens when a lifelong difference in conduct happens. In this manner, we are not discovering some new information but rather conceivably returning to the old data. It likewise should be a lifelong change in conduct so we can apply and utilize this data on request, for example, finishing a task or taking a test (Kemp, 1994).

Various instructive intellects see the idea of education differently. Behaviorists view learning as the only change in conduct; cognitive scholars take knowledge acquisition as a procedure and collaborative learning, scholars regard education as collaboration or perception in a community with other people (Meria et al, 1991). They allexpect that "instruction will realize learning" and, in view of this statement, instructors utilize speculations as direction to outline successful guideline to achieve most extreme learning (Driscol, 2002). Three areas in which learning happens as defined by (Bloom, 1956): they are psychomotor, affective and cognitive. Bloom’s learning types are in the s cognitive area, every one expanding on the past one. This comprises knowledge synthesis, analysis, evaluation, application and comprehension (Bloom, 1956). Learning is moderately lifelong difference in conduct because of experience. Learning is an interior practice done by students, while, instruction is an outward occurrence. Instructional outline is considered as a procedure that directs and controls learning toward foreseeable conclusions.

The planner tries to conquer the learning deficiency and to create an arrangement indicating the instructional occasions and content that instructs how learners learn.

2.1 Learning Styles

For adaptation to occur there's need to understand more about the student. This helps to provide specific needs of the learners if time is taken to study their preferences. Students have unique ways of learning, retaining information and perception of things. They have different processes in their learning because of their different rational abilities, personalities and prior knowledge. Hence, they all learn in different ways. This therefore defines the learning styles theory which looks at different preferences of learners and how they process information in the learning process.

The theory mentions that one generic type of tutoring does not fit all individual learners because of their differences in the way they perceive and decode information. Therefore, learning should be offered in ways by considering each individual's needs and how they learn. Instructors should find ways of investigating individual learners' preferences (Gulbahar, 2002).

Table 2.1: Definition of related terms in relation to learning styles (Catherine, 1999)

S/N	Terminology	Meaning
1	Preferences in learning	Favoring one strategy for instructing over another
2	Strategies in learning	Using an action plan to gain attitudes, knowledge or skills
3	Learning Style	Using a different and habitual way of gaining knowledge
4	Cognitive strategy	Utilizing an arrangement of processing and organizing information.
5	Cognitive style	Constant and precise and method of sorting out and preparing information

2.2 Common Learning Style Models

The goal of learning style models is to classify students based on their preferred learning style. Below are 5 commonly used learning style models.

1. Type Indicator - Myers-Briggs
2. Model ofLearning Style - Kolb's

3. Learners’ Typology- Mumford’s and Honey
4. Felder-Silverman
5. Dunn, Price, Dunn

2.2.1 Type Indicator - Myers-Briggs

It describes every student based on themake-up of their personality. It classifies individuals centered on **thinking, behavior and emotion**.

Individuals are classified as follows:

1. **Introverted (I) or Extroverted (E):**
   The extroverted-introverted dimension deals with the orientation of a person i.e. how he behaves. Extroverts draw their strength from the physical and social environment around them, for example, individuals and things, while introverts focus on their inward emotions and like to think alone.
2. **Sensing (S) or Intuitive (N):**
   The sensing-intuitive dimension focuses on the way a person sees information. Sensors perceive data using senses for example, sight, hearing, smell or taste, while the instinctive depend on their internal gut and instinct.
3. **Thinking (T) or Feeling (F):**
   The thinking-feeling dimension centers around the way a man likes to decide things i.e. making a decision. In thinking, there is use of logic and facts to draw conclusions, while feeling takes into consideration other people involved and personal concerns.
4. **Judging (J) or Perceiving (P):**
   People who love to judge fancy structured and decided lifestyles while the perceiving persons fancy a flexible lifestyle and tend to go with the natural flow.

2.2.2 Kolb’s Model

According to Kolb's, this theory represents a spiral where, instant experiences lead to interpretations and thoughts. These thoughts areused and converted to theoretical ideas and suggestions aimed at a particular activity. The individual would then be able to effectively explore and test various alternatives regarding them, which thus empowers the formation of new encounters. Kolb's model four-stage cycles are:

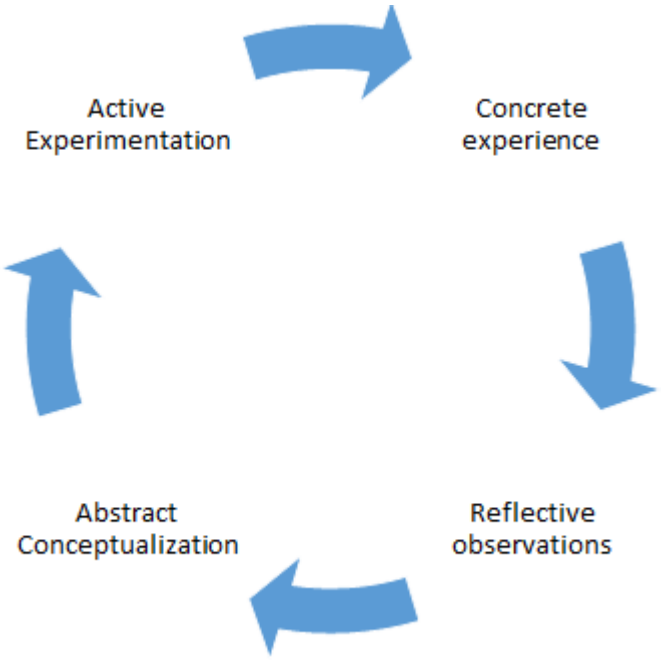

Figure 2.1: Kolb' learning cycles

Kolb identified the following learning styles:

- Divergers (CE/RO) take things differently. They watch distinctive circumstances, and accumulate data to make conclusions. They are sensitive, imaginative and generally interested in people.
- Assimilators (AC/RO) deal withconcepts and ideas rather than people. They exceed expectations at comprehension and arranging an extensive variety of data. These individuals favor conceptual ideas and sound hypotheses.
- Accommodating (CE/AE) learning style act on gut instinct rather than logical analysis. They depend on other individuals' perception and investigation.

2.2.3 Honey and Munford Learning Style Model

This model is based on the theory that Kolb experimented on, where their learning styles were recognizedcentered on Kolb's learning styles which are Pragmatist, Activist, Reflector and Theorist

1. **Activists** tend to test and experiment with new things. They are amenable i.e. openly minded individual who learn effectively by including themselves in exercises with other individuals.
2. **Theorists** are individuals that favor ideas and certainties. They jump at the chance to investigate and orchestrate. They are excited about basic theories, assumptions, models, principles and systems thinking.
3. **Pragmatists** are eager about investigating with hypotheses, thoughts and strategies to check whether they work together. They emphatically look out differentopinions and agree the main open door to explore different pathsabout applications. They have a tendency to be anxious with ruminating and open-finished talks. They like settling on reasonable choices and tackling issues.
4. **Reflectors** they stay hind, to consider on meets and watch them from alternate points of view. They gather information, both direct and from others, and want to consider it completely before arriving at a conclusion. The exhaustive buildup and analysis of information about occasions and encounters, is the same so they removesuccessful influentialassumptions for any duration that is plausible.

2.2.4 Felder Silverman'smodel(FSLSM)

It classifies learners based on eight dimensions listed below:

1. Verbal/Visual
2. Sequential /Global,
3. Intuitive /Sensing,
4. Reflexive /Active,

Learners are classified according to certain preferences.

Reflexive /Active:

Learners are groupedaccording to how they choose to learn. Students who are activeare interested in interacting with their peers and choose to engage in dialogues with other people. Theyare likely to be the kind of people who experiment, while Reflexive learners like to graft as individuals or in lessercrowds. They are interested in circumstances that enable them to ponder and mirror on what they learn. They are also known as theoreticians.

Intuitive /Sensing:

Learner choices are determined by how they process information in their minds. This is either by, gathering actualities or through the oblivious utilization of one's gut or creative energy. Sensing learners incline toward experimentation and realities. They are OK with the standard method for getting things done.

Verbal/Visual:

It depends in way individuals get data. Learners who are visual process information best better when given things that are tangible like pictures, charts and graphs, while learners who are verbal want to examine and hear what others think.

Sequential /Global:

Sequential learners advance directly in learning, while learners who are global learn in leaps. They favor review while global learners are keen on learning that is sequential.

2.2.5 Dunn's Model

Dunn (1999) defined learning style as every learner's method to think, understand and process new and old complex data. Theysuggestedthat every individual has a natural and formative arrangement of learning attributes that are one of a kind. They additionally recommended that enhancements in efficiency and learning will come when guideline is given in a way that profit by a person's learning qualities.

This style is founded on the following categories:

1. Environmental
2. Sociological
3. Psychological
4. Emotional
5. Physiological

2.3 Adaptive Learning

Enabling students to take different paths in learning, by considering their preferences is referred to as the adaptivity in learning. It aims to meet individual learner's needs by being flexible in the leaner's situations. The methodologies of instruction, processes and

procedures advancing flexible learning are referred to instructions that are adaptive (Corno, Snow, 1989).

In (Glaser, 1977), creators mentionbasic elements that relate to adaptivity, to be specific, giving an assortment of contrasting options to learning and numerous objectives from which to pick, endeavoring to use and create capacities that an individual conveys to the options for his or her learning and to change in accordance with the learners specific gifts, qualities, and shortcomings, and endeavoring to fortify a person's capacity to meet the requests of accessible instructive openings and create abilities vital for accomplishment in the mind boggling world

2.3.1 History of Adaptive Learning Systems

Web-based Adaptive and Intelligent Educational Systems (AIES) get their features from two kinds of AIES: adaptive hypermedia systems and intelligent tutoring systems (ITS) (Brusilovsky, 1999).

2.3.1.1 Intelligent Tutoring Systems

They are created with the use of Artificial Intelligence strategies and procedures. It gives the student arranged outline and substantially more academic information executed in the framework (Ong, 2000). The advantages of personalized instruction are substance of ITS, which utilizes artificial knowledge to customize learning.

So as to give clues, instructional and directional input to students, thesystems regularly depend on differenttypes of information, sorted out into isolated programming units (see Figure 2.2). Subject matter expertise is represented by the expert model and furnishes the system with instructions. This information allows the system to know the kind of person it is instructing. It is the instructor model that knows how to teach, by making use of the instructional methodologies utilized by means of the user interface UI (Ong, 2000).

An expert model is a computer representation of a domain expert’s subject matter knowledge and problem-solving ability. This information empowers the ITS to contrast the

student's activities and determinations and those of a specialist with a specific end goal to assess what the client does and doesn't know

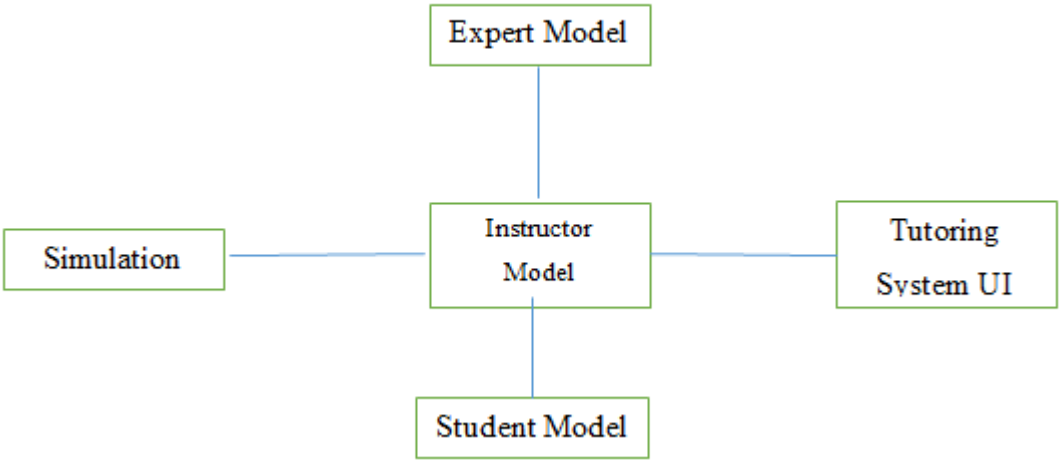

Figure 2.2:ITS Components

The student model assesses every student's progress in order for it to decide his or her insight, perceptions, and thinking abilities. The tutoring system can screen a student's grouping of activities in order for it to gather the student's comprehension.

In view of its information of an individual's skills and shortcomings, learner styles and member skill levels, the instructor model chooses the best suitable instructional mediation. For instance, if a learner was evaluated a fledgling in a specific system, the instructor module may demonstrate some well-ordered exhibits of the strategy before requesting that the client play out the methodology on his or her own. It might likewise give input, clarifications, and instructing as the member plays out the reproduced method. As a student picks up skill, the instructor model may choose to show progressively difficult situations. It might likewise choose to take a rearward sitting arrangement and let the individual investigate the reenactment unreservedly, interceding with clarifications and training just upon ask. Furthermore, the instructor model may likewise pick themes, reenactments, and illustrations that address the client's fitness holes. (zdemir, 2000) propose an insightful specialist to direct students all through the content. The system capacities as an individual

right hand to help educators to create course educational programs and to assist learners explore through the content. The educator produces educational modules through a UI, the educational modules is spoken to by an applied system and stored in the database. The concepts in a course are viewed by learner through a user interface that intelligent UI having the educational modules produced.

2.3.1.2 Adaptive Hypermedia Systems

Brusilovsky(2000) referred adaptive hypermedia as ansubstitute to the generic of tutoring approach. There is a prototypical of objectives, inclinations and learning of every individual client, which is utilized amid the client's association with the framework so it adjusts the hypertext to address the need of the client. Brusilovsky expressed that the adaptive instructive hypermedia was motivated by the zone of insightful coaching systems and was intended to join the upsides of a shrewd mentoring framework (ITS) and an instructive hypermedia (Brusilovsky, 2000), This blend of ITS and instructive hypermedia constitutes the adaptive hypermedia systems.

2.4Examples of Adaptive Educational Systems

In this area, adaptive learning systems that give adaptively as per learning styles are presented. The adaptive systems examined depend on learning style models they execute, and adaptive highlights used to distinguish the learning styles.

2.4.1 CS383

CS383 (Carver, 1999) is the primary adaptive framework that consolidates Felder-Silverman's learning style show (FSLSM). CS383 executes detecting/instinctive, visual/verbal, and consecutive/worldwide measurements of FSLSM. The framework powers students to continually settle on decisions. This encourages dynamic students who turn out to be effectively engaged with the learning procedure. Intelligent students are in like manner, encouraged by the computer based nature of the material.

Students can stop and reflect anytime amid their examinations, and contemplate the significance of the material displayed. Along these lines dynamic/intelligent is expelled from thought leaving, detecting/instinctive, visual/verbal, and consecutive/worldwide

measurements. Adaptive is given by displaying lesson media components like illustrations, advanced motion pictures, hypertext and sound records to every student in an arranged rundown. Students learning styles are then controlled by noting a progression of twenty-eight questions. At the point when a student signs in to start a lesson, the student is given the alternative of investigating the course material as indicated by their learning style or without their learning style.

2.4.2 IDEAL

It is an intelligent agent assisted system that incorporates dynamic learning by supporting highly interactive learning. In this framework, learning styles and foundation information are utilized for choosing and sorting out learning material for singular students. Perfect is actualized utilizing the pervasive Internet, Web, advanced library, and multi-specialist advances.

Student demonstrating is utilized to adjust to the necessities and learning of individual students. In IDEAL, a student display is construed from the execution information utilizing a Bayesian conviction organizes. The framework likewise fuses another way to deal with course content association and conveyance by, creating brilliant instructional segments which are incorporated into an extensive variety of courses.

2.4.3 MASPLANG

MASPLANG (Pena, 2004) is a multi-specialist acquainted with conveys adaptive qualities to the USD e-learning condition (a Course Management System). For student demonstrating, the learning style is dictated by applying FSLSM Index of learning style poll.

The student demonstrating in MASPLANG includes two components: the student display, which permits the distinctive highlights of the students (i.e. information, inclinations and so on.) to be considered in the learning procedure and the User specialist, which is the student director that distinguishes the student targets, and updates the student demonstrate.

Through the student's association with the framework, the student's information and learning style are resolved.

As per a student's activity, the framework gives adjustment by choosing content as indicated by the student's learning style.
Student help is fabricated utilizing Information and Assistance operators. The associate operators give help to students by, enlisting student activities to recognize designs for customizing the introduction of the learning content and, the route apparatus for students. The data operators influence the student to feel great when he/she does the learning exercises; an energized, life-like character (the SMIT specialist) has been intended to show the fortification data and the customized ready messages.

There are two Information operators. The first is the User operator intended to keep up the student demonstrate, and the second is the Pedagogic specialist who assesses the instructive choice decides that are implanted in the academic model of the course.

2.4.4 LSAS

The Learning Style Adaptive System (LSAS) (Bajraktarevicis) a framework that consolidates worldwide and consecutive learning styles. The Felder-Solomon Learning Style Questionnaire was utilized to gauge the learning style inclinations of students. To give adaptive, two distinctive introduction style-UI layouts were utilized. The framework gives a contrasting option to the, one size fits all way to deal with improvement of online instructive course product, by making learning materials to provide food for individual learner preferences. For students with worldwide learning style preferences, pages contained components, for example, a list of chapters, synopsis, charts, diagram of data and so forth. For successive students, the pages contained little lumps of data, content just pages with forward and back catches.

2.4.5 INSPIRE

It joins offering student’s customized bolster as well as direction in a separation picking up setting. In light of the learning objective that the student chooses, the framework produces

lesson designs custom-made to the necessities, inclinations and information level of every individual student by making utilization of data about the student assembled through their association.

In INSPIRE, students with various learning styles see distinctive introductions of the instructive material. The principle objective is to help learners by following their favored method for considering. Along these lines, all students are furnished with similar learning modules. Nonetheless, the technique and request of the diverse portrayals that they incorporate is adjusted. For instance Reflectors tend to gather and break down information before making a move, along these lines illustration situated substance are proposed, permitting investigation of information before making a move. Activists are more disposed towards experimentation and test, consequently exercises intended for instance PC reenactment are proposed, hence furnishing them with the important data (illustrations and hypothesis).

2.4.6 TANGOW

In World Wide Web, TANGOW consolidates two measurements of FSLSM, specifically the sensing/intuitive and the sequential/global dimensions. Adjustment is acknowledged by altering the request of tasks and the request of components inside the tasks. Course fashioners can manufacture the default order of tasks using, ANY, XOR, AND, andOR,rules. For a consecutive learning style, every one of ANY rule was supplanted by AND rules with a specific end goal to, give a more organized way through the learning material. Interestingly, for a worldwide learning style, all AND rules were changed to ANY rules. As to sensing and intuitive learning style dimension, the request inside the task is changed. For sensing learners, the case is exhibited to start with, trailed by the clarification. Then again, for intuitive learners, the clarification is indicated to start with, trailed by the illustration.

2.4.7 AHA!

AHA! (Adaptive Hypermedia Architecture) (Paul, 2001) is an open source broadly useful adaptive hypermedia framework (AHS) for e-Learning. AHA! does not give any survey to

distinguish the learning styles. Rather, an enlistment shape is given where the fused learning styles are depicted and students can physically express their learning style preferences. Adjustment in AHA! depends on various properties related with ideas. AHA! performs adjustment by, adaptive link hiding or link annotation.. These outcomes sequestered from everything the inadmissible or undesired connections. Content adjustment in AHA! utilizes the restrictive consideration of pieces method. There are two approaches to utilize this method in AHA! with installed sections or with objects. Inserted parts show up inside a page, and are incorporated if a related reasonableness articulation assesses to genuine.

AHA! incorporates author tools, for example, Concept Editor, Graph Author, Form Editor and Test Editor among numerous others. Courses are displayed as substance in html and xhtml. It likewise gives a design model to decide the coveted look and feel of a course.

CHAPTER 3
PROPOSED SYSTEM CONCEPTUAL FRAMEWORK

In this study, a summary of tools utilized and the system architecture for the proposed system is discussed. The system framework describes the components that make up the proposed system and how they work together to match the student's profile with the learning material. This is done by assessing the prior knowledge base of the student and use to provide a starting point for the suitable learning content for the student. Adaption then comes when the content is based on how the student is performing throughout the learning process.

The system framework includes learner profile, course content profile, adaptive engine and the assessment of the learner's knowledge. The system is built on the idea that the effectiveness of the adaptiveness is highly reliant on how much we know about the student and how much the available content materials suits to the student profile. Therefore, the matching process is between the performance of the learner and the course content.

3.1 Overview of the System

The proposed system is developed in PHP development language for it to be accessible online. It is based on the student or learner's prior knowledge and performance for it to adapt to the learner and provide personalized content. The system admin creates all system users which are the students and teachers and assign them to their respective classes. When all the classes, users and subjects are created by the admin, the teacher adds content (questions) into the database which is later accessed by the students.

Furthermore, students are required to take a prior test before accessing any other content when they login. This is to allow the system to gather prior knowledge base of the student, which is later used to determine the starting point on the mock tests for practicing. From there, the system adapts to the learner based on the performance of each mock test and the student can take as many mock as possible to enhance their knowledge through practice,

whereas prior is taken only once. The proposed system components and architecture is shown below in Figure 3.1

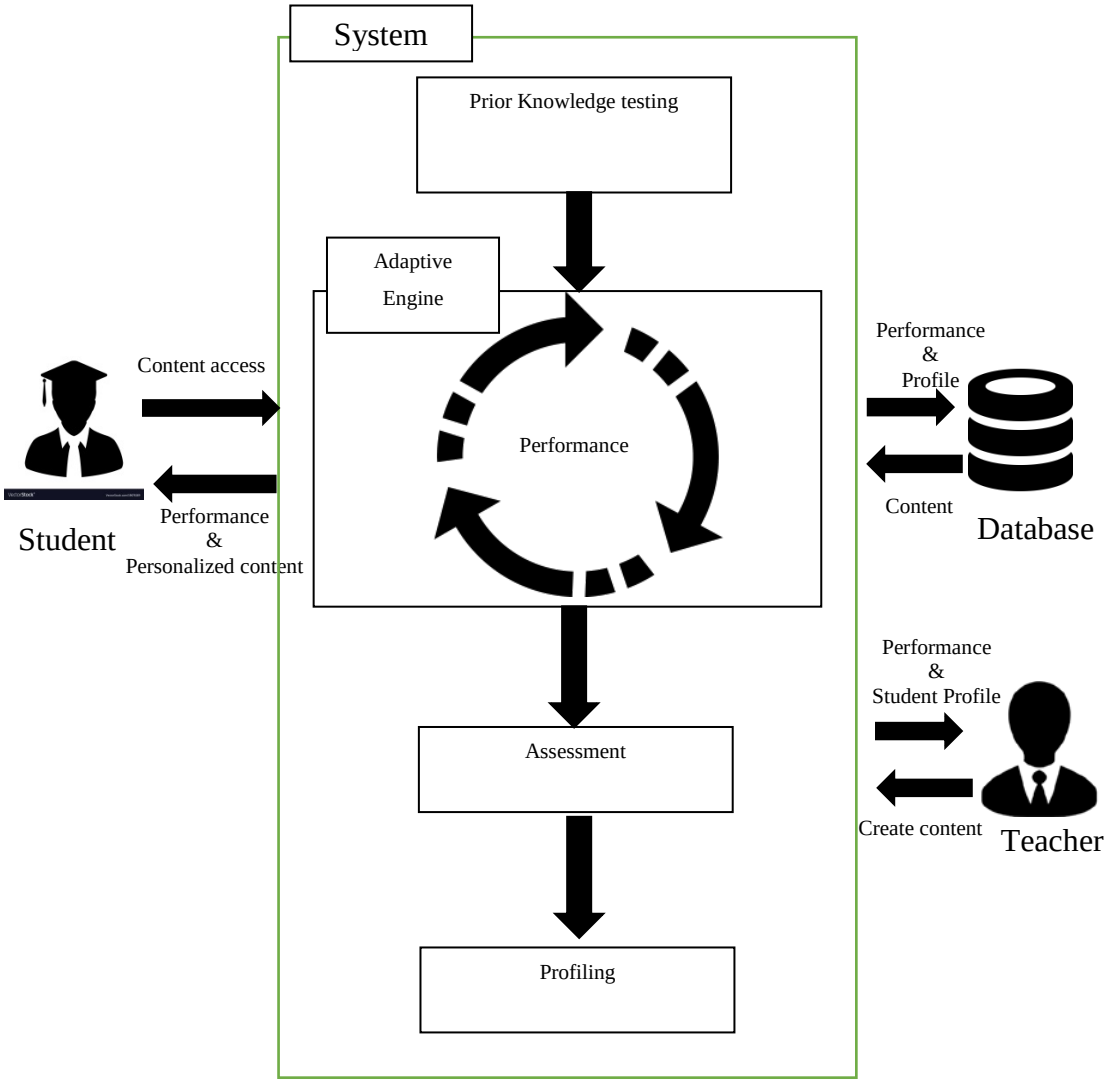

Figure 3.1: System Components and Architecture

The proposed system has three users which are described as follows:

Table 3.1: System users and roles

User	Role
Admin	Responsible for managing system users (creating users and adding them into the database) and creating classes. Assigns teachers to their respective classes Assigns subjects to respective classes.
Teacher	Creates topics and questions for subjects created by the admin. Assesses student performance and progress for each subject and respective topics
Student	Takes prior, mock and full test set by the teacher. Views their subject and topic performance and progress.

3.2 System Components

These are the different parts of the system that enable it to perform its functions. They work hand in glove with each other to provide personalized learning content to students. These are explained below

3.2.1 User interface

It allows the users to interact with the system, where they create and access content and results from the system. The user interface or front end is developed using PHP, html and javascript. The user interface is in form of web pages which can be accessed online, if the system is hosted on a live server.

3.2.2 Prior knowledge test

This refers to the knowledge that the student has before embarking on a new course. It is aimed at assessing what the level of understanding that the student has on a particular course or area so that the teacher can know where to start and develop that student from the knowledge that he already has. Prior knowledge helps to impact on students' achievement and explore the knowledge they would have gained during their learning process (Hilikari

et al, 2008). It is also defined as a hierarchical and multidimensional entity that consists of different types of skills and knowledge and is dynamic in nature.

Prior knowledge is helpful in that it influences learning and student's achievement.. The amount and quality of prior knowledge has a positive influence on the process of acquiring knowledge and the ability to apply higher order of cognitive problem solving skills. It is also emphasized that prior knowledge helps in creating a learning environment that actively constructs knowledge and skills thereby developing an integrated knowledge framework. It is vital to consider student's prior knowledge so that there's a match between the student's actual knowledge and the instructor's expectations of the student's knowledge.

Furthermore, to enhance the level of high quality learning, prior knowledge allows instructor to note the actual the areas a student may need support, thereby allowing personalized tutoring which aims at targeting individual student specific learning styles and abilities. There are two types of prior knowledge

Table 3.2: Types of prior knowledge

Declarative knowledge	**Procedural knowledge**
• Knowledge of facts and meaning	• The student has integration of knowledge and understanding of relations between concepts at high level.
• Knowing about or surface learning	• Knowing how rather than knowing what.
• Rote learning or knowledge telling Simple tasks	• Higher order cognitive skills
	• This type of knowledge enables student achievement because they already know 'how' and can apply knowledge
• No application of knowledge	

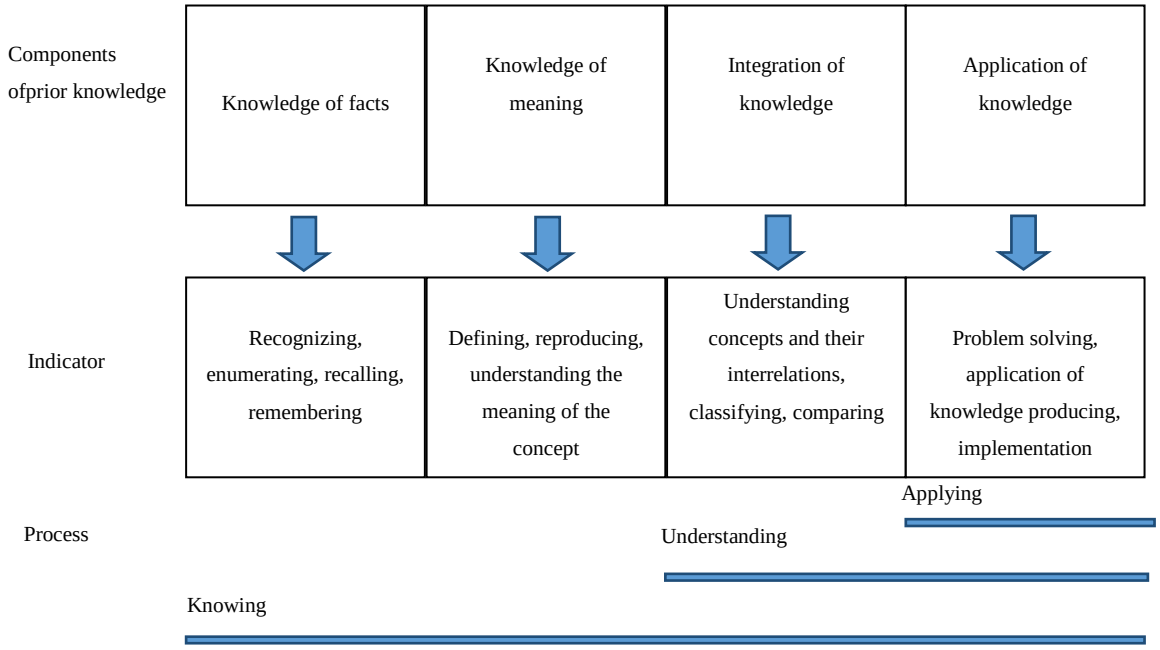

Figure 3.2: Prior Knowledge Model. (Hailikari, et al, 2007.)

Therefore, this study aims at testing procedural knowledge of the student's prior knowledge base. It seeks to focus on how well the student knows rather than what they know. This is done by assessing the student with an advanced prior test so as to determine how well they know in respect to a particular course. This therefore tests the student's prior knowledge base on procedural knowledge.

Let's take an example of a classroom of different students at different levels taking a particular course. It can be a course taken by master and phd students. Within this class there might be students who did this similar course in their previous level of study and there might be students who are learning about thee course for the first time. Basically what this means is that the class will be comprised of students who are at different levels of proficiency in that course; some who may know it very well and some who are beginners. However, despite these aspects the lecturer still has to start from the beginning of the course.

3.2.3 Adaptive engine

This refers to the aspect of matching the learner's performance to personalized content. The component uses performance to determine the appropriate content for the learner. In this study, students are assessed on how well they are progressing in their learning process through practice or mock tests. After determining the level prior knowledge base, the study aims at looking at the provision of learning material that best suits a particular student based on the prior knowledge assessment. After determining the level of prior knowledge base, the content provided to the student should best match his capabilities and provide personalized learning content. The proposed system allows the student to practice on a particular course and the course content is provided based on their performance during practice. The system adapts to how to how the student is progressing and provide content specifically for that student depending on how the student is performing.

The performance of the student is determined at the end of each mock test which is iterative. This means that a student can take as many mock as he wants to improve his knowledge skills. Each time a student finishes taking a mock test, his results are recorded and the next mock test content is depended on those results, but they will be aggregated to determine the student's average performance. This is calculated as:

$$\text{Performance} = \frac{\sum mp}{N}$$

Where $\sum mp$ is the summation of mock test results as a percentage and N is the number of mock tests taken by the student.

Furthermore, student's performance is divided in two; subject and topic performance. This helps too drill down and analyze how a student is performing in a particular subject and further determine the specific topics in which that student needs support. All performance results are shown as aggregated percentages of the total number of mock tests taken by the student.

3.2.4 Assessment

The system allows teachers to assess student by set full test questions which are the same for every student taking the class. This is to assess whether the students have grasped the concepts on a particular subject.

3.2.5 Profiling

Student modeling is vital to give adaptive guideline. Every student needs a personal and tailored structure that defines his or her performances and abilities. Modeling students individually helps to know them better and provide customized learning content. Learners profile can be referred to, as the information about a particular student. In this study, a learner profile is made up of the following aspects:

- Student's progress
- Number of practices he did on the mock test
- Subject and topic performances
- Assessment results of the full test

Learner profiles help instructors to know about their students so as to assist them individually and improve their learning to those who will be struggling in certain areas. Students who are doing well in certain areas can be asked to assist those who are struggling. Also, the teacher will know how to structure and create content and determine how he can assist his students.

Furthermore, with the learner profile, the proposed system takes advantage of the data to best match each student's personalized content and to adapt to their level of proficiency and gradually improve their knowledge than to give all students generic content.

3.2.6 Database

This can be referred to as the knowledge base of the system. It is where all the data is stored and retrieved. User data and learning material is retrieved and saved in the database. The interaction between the data and the users is facilitated by the user interface component. It is comprised of the learner profile and content profile.

3.3 Course Content Profile

It defines the type of content and how it is categorized in the database. This study uses question based content which has multiple choice answers. The teacher or instructor's duty is to create content for the students where he adds questions which are categorized under three categories; Beginner, Intermediate and Expert skill levels. All questions fall in a particular subject and under a specific topic. Also, each question has five choices for answers (A, B, C, D, E) where the teacher sets the correct answer. The figure below shows how each question is categorized.

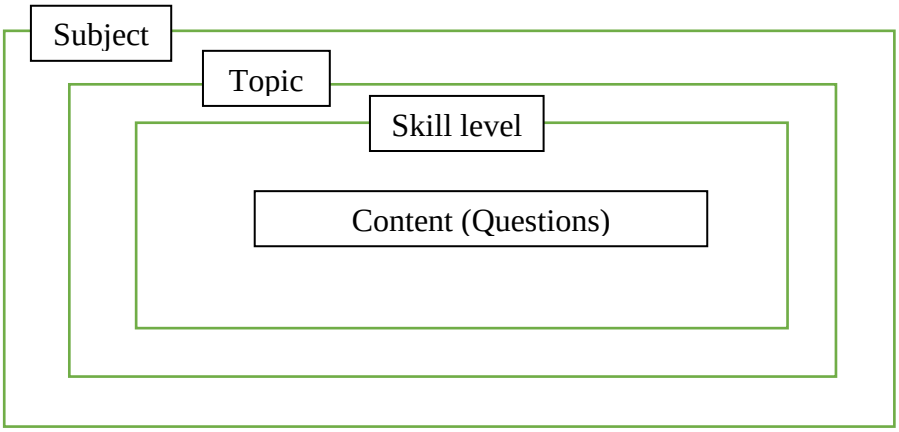

Figure 3.3: Categorization of learning content

Furthermore, the content that the system provides to the student is depended on the performance and prior knowledge of the student. The preliminary stage of the system is that the student should take a prior test to determine his level of proficiency in that subject, from there the system directs the student to the relevant mock tests depending on the prior knowledge results score. The content skill level performance is categorized as follows:

- Beginner = 49% or less
- Intermediate = 50% to 69%
- Expert = 70% or more

3.4 Learner's Profile

This refers to the information about a particular student. In this study, a learner profile made up of the following aspects:

- Student’s progress
- Number of practices he did on the mock test
- Subject and topic performances
- Assessment results on the full test

Learner profiles help instructors to know about their students so as to assist them individually and improve their learning to those who will be struggling in certain areas. Students who are doing well in certain areas can be asked to assist those who are struggling. Also, the teacher will know how to structure and create content and determine how he can assist his students. Furthermore, with the learner profile, the proposed system takes advantage of the data to best match each student’s personalized content and to adapt to their level of proficiency and gradually improve their knowledge than to give all students generic content.

3.5 Tools

A concise rundown of tools utilized as a part of this thesis work is given below:

1. PHP (version 5.6.31) IDE and HTML components are used to design the user interface. This allows the development of a web based system that can be accessed anywhere.
2. JavaScript (JS) is a scripting language, basically utilized on the Web. It is utilized to upgrade HTML pages and is ordinarily discovered implanted in HTML code. JavaScript is a translated language. Accordingly, it doesn't need to be compiled like every other programming language. JavaScript renders pages in an intuitive and dynamic mold. This allowing the pages to exhibit special effects, detect a user’s browser, accept variable text, react to events, validate data, create cookies, etc.
3. Xampp version 3.2.2
4. Database: The system was developed using MySQL database with the following tables:

Users table: This table is used to store all system users; teachers, students and admins. Teachers and students are assigned to their respective classes and saved in this table respectively. Also, this table is used to login into the system by checking the provided

credentials and the stored ones. Each user group is assigned a different access level as follows:

Table 3.3: User group access levels

User group	**Access level**
Admin	1
Teacher	2
Students	3

Subjects table: All the subjects created by the admin are stored in this table with the subject name and a new unique ID for each subject

Test results table: When the student takes a test, be it mock, prior or full test, all marks or scores are stored in this table. It contains the following fields: id, student username, exam type, number of questions asked, score (in percentage), date subject and topic.

Performance table: This table is mainly used to store topic scores for each test, identified by a unique random code.

Questions table: All the set questions are stored in this table categorized under a particular topic, subject and skill level. Also, each question is assigned to the respective teacher who created it.

Answers table: answers to the set questions are saved in this with their respective answer symbols and question id (to show which question the answer is assigned to).

Student Class table: All subjects which were created by the admin are saved in this table.

Correct questions table: This table stores the correct questions which the student got when the student took a test.

CHAPTER 4
IMPLEMENTATION

This chapter examines the usage of the system, describes the web interface, Http web server and MySQL database. It also discusses about the different roles of users and available features, research design.

4.1 System Requirements

The proposed system requires the following to implement it:

1. Web browser
2. Server (local host or hosted online)
3. PHP
4. MySQL database

4.2 System Servers

The system was developed and tested on a Local host server with the use of Xampp application which has apache(server) and MySQL(Database). These enable the communication between the user requests and the php compilers.

4.3 System Interface

The Web interface is a PHP application that shows information to the end users in HTML format.

4.3.1 Login Page

Every user is prompted to enter the login details, which are the username and password, provided by the admin. The login page is shown below:

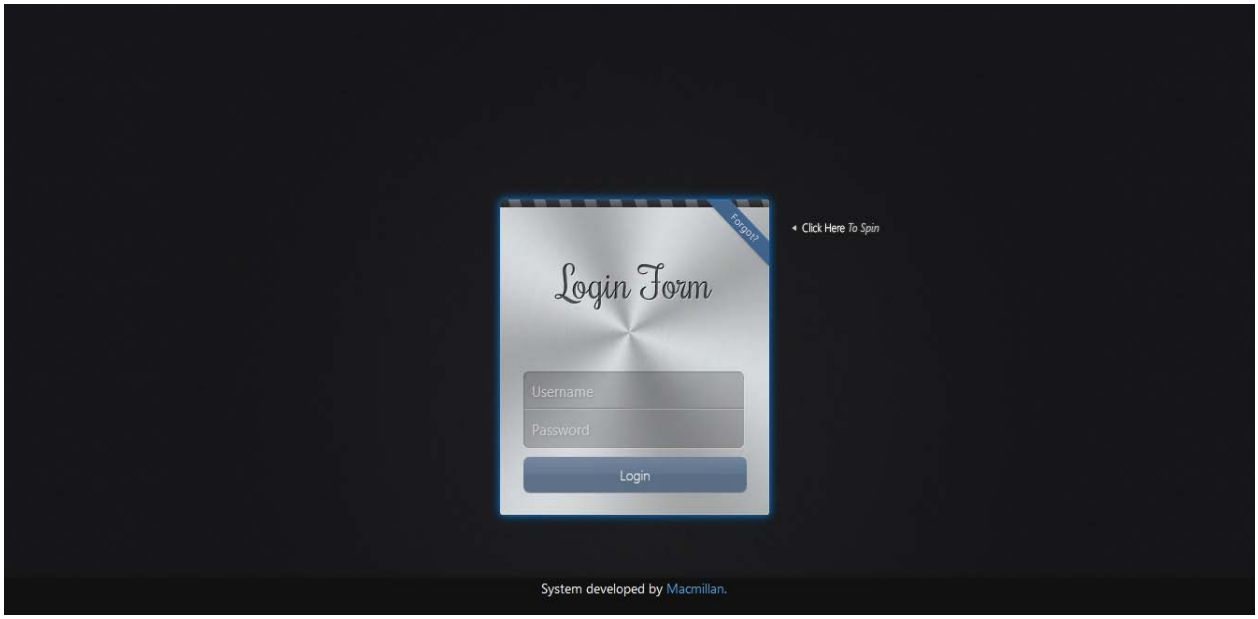

Figure 4.1: Login page for all users

After logging in, each user is directed to their respective landing pages where they choose options provided.

4.3.2 Admin pages

On this landing page the admin creates classes to assign teachers and students when creating users.

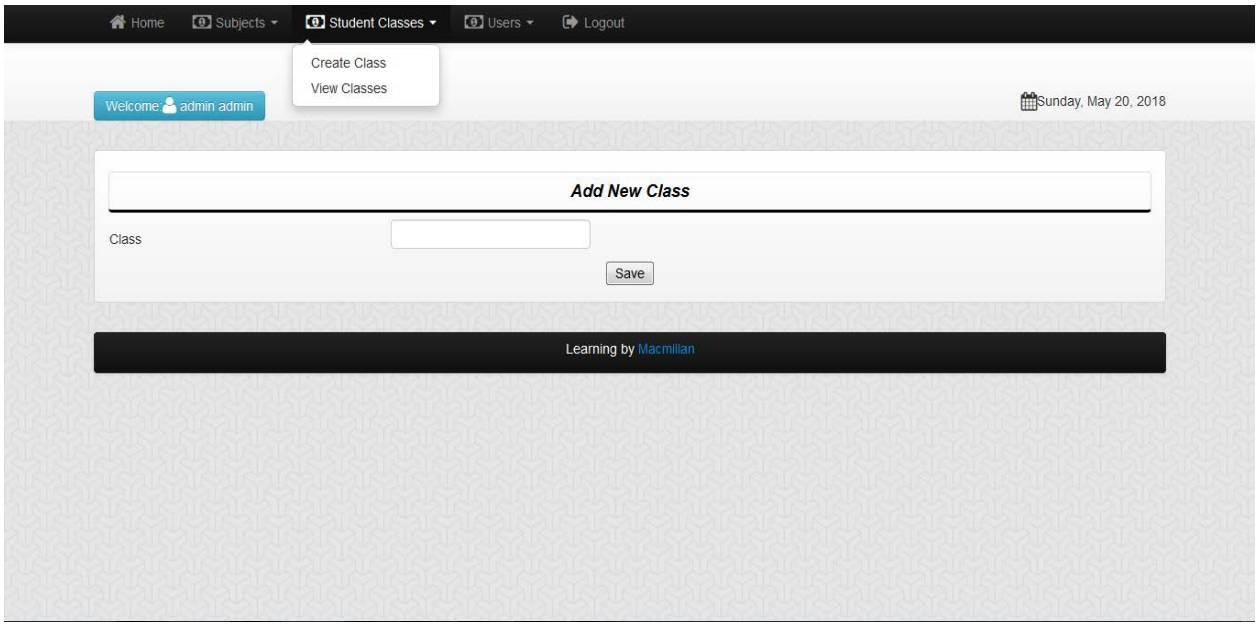

Figure 4.2: Admin add new class

Figure 4.3 below shows an admin page where users are created by the admin. This includes teachers and students. Teachers and students are assigned to their respective classes when their user accounts created.

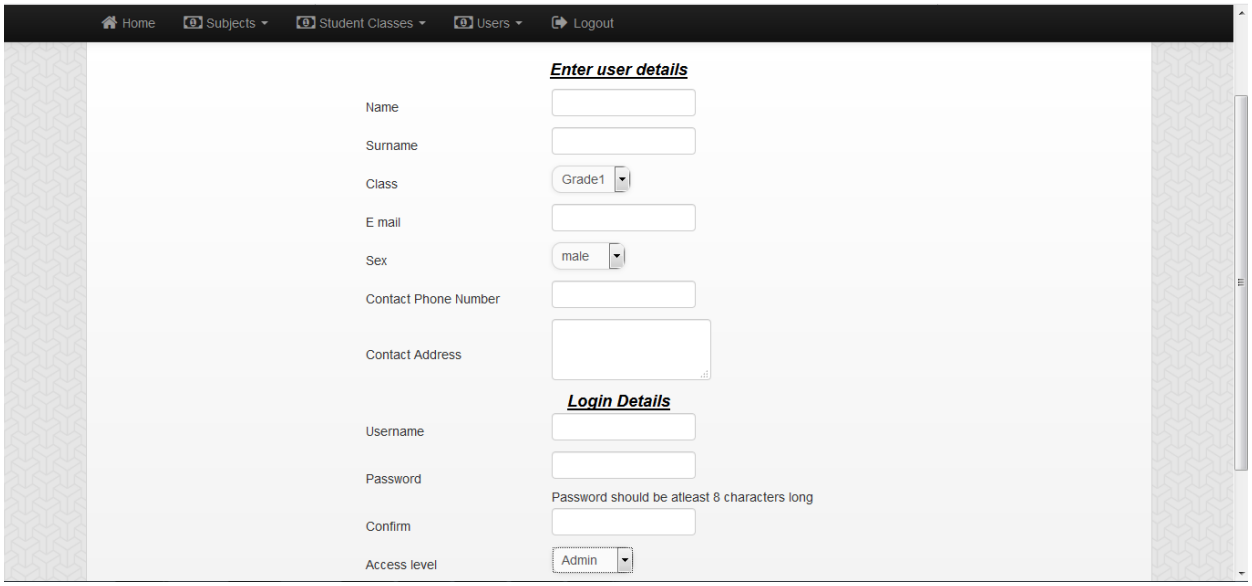

Figure 4.3: Creation of system users

4.3.3 Teacher pages

In the Figure 4.4 below, the teacher logs in and selects the particular subject that the wants to add questions. The figure shows where the teacher will enter his question and with the topic and categorize it under a skill level.

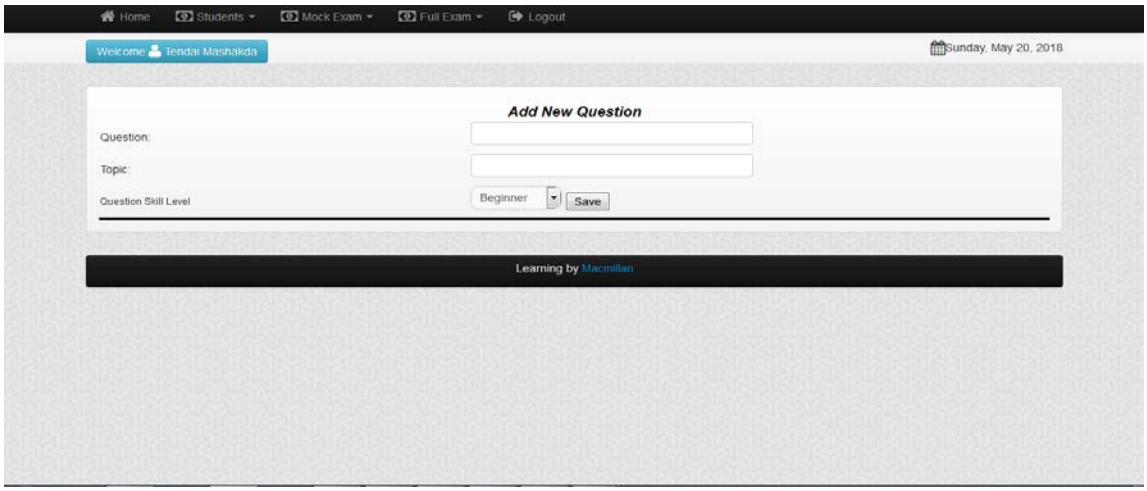

Figure 4.4: Teacher adds questions

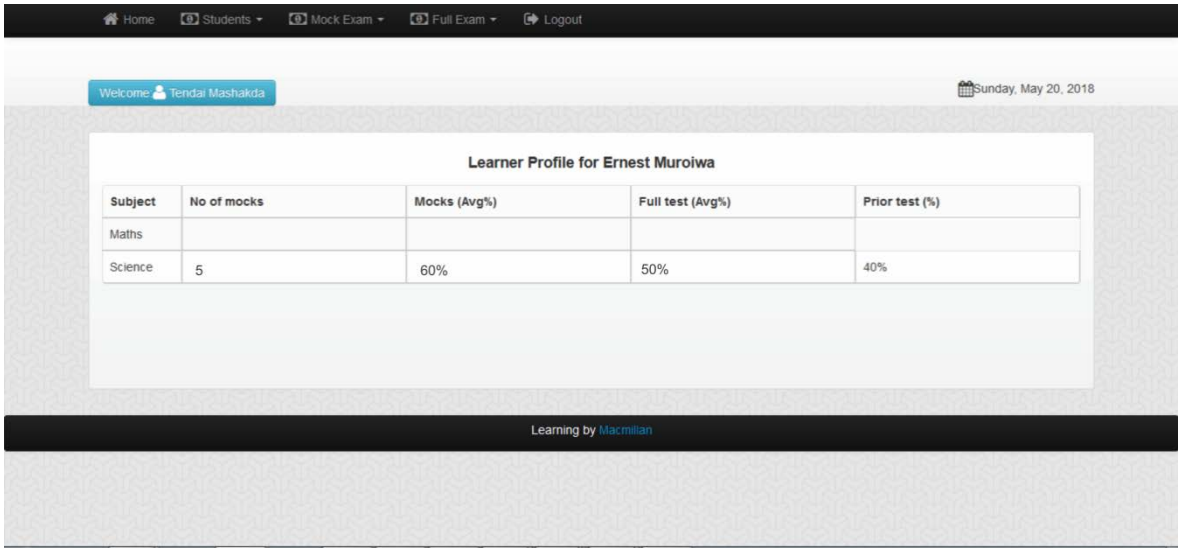

Figure 4.5: Learner's Profile

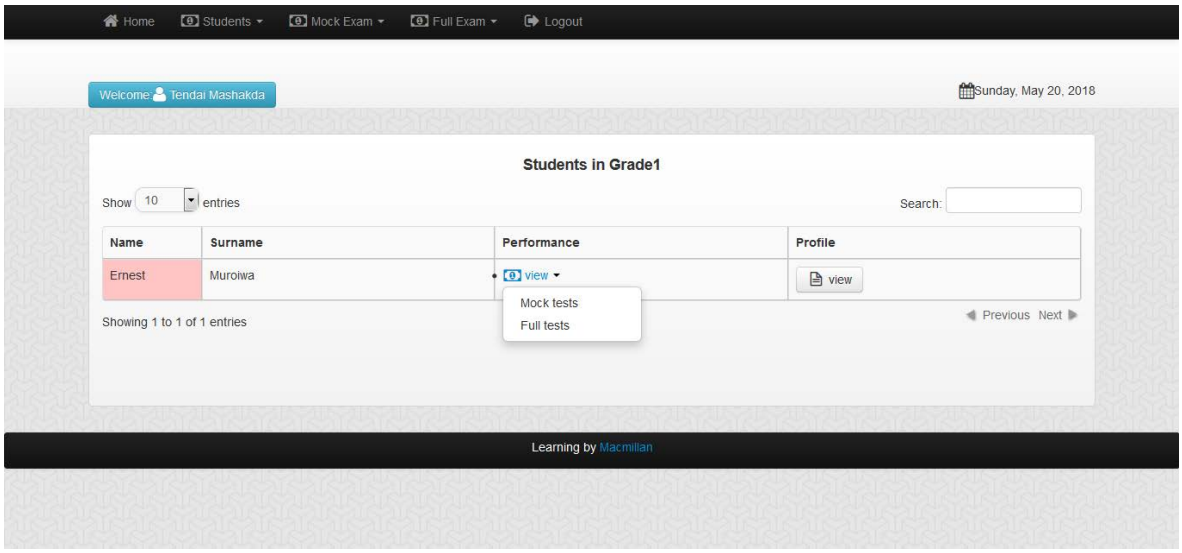

Figure 4.6: View students in teacher's class

4.3.4 Student Login

After logging into the system, a page with all the subjects enrolled in his class are shown as below in Figure 4.7.

Prior Test

If the student did not take a prior test in a particular subject, a blue button will be aligned to the respective subject as shown in Figure 4.7 on Maths subject. Prior test is taken only once to determine the level of prior knowledge so that the system knows which group of

questions to give to the user depending on the prior test score. If the student scores 49% and below, the ‘Beginner Mock Test’ button will be shown, if the student scores between 50% and 69%, an ‘Intermediate Mock Test’ button will be shown, also if the student scores 70% and above, ‘Advanced Mock Test’ button will be shown. All prior test questions are categorized under advanced/expert skill level so as to test on procedural prior knowledge. When a prior test for a particular subject has been taken, the blue button for prior test will be replaced by the respective green button for the mock test depending on the score of the prior test as shown in Figure 4.7 on Science subject.

Full Test

The teacher activates the full test when it is time for the students as a class to take the test. Full test questions are the same throughout to every student so that they can be used to assess the performance of all students as a whole. If the teacher has not active the full test, students will be able to view questions for the full test.

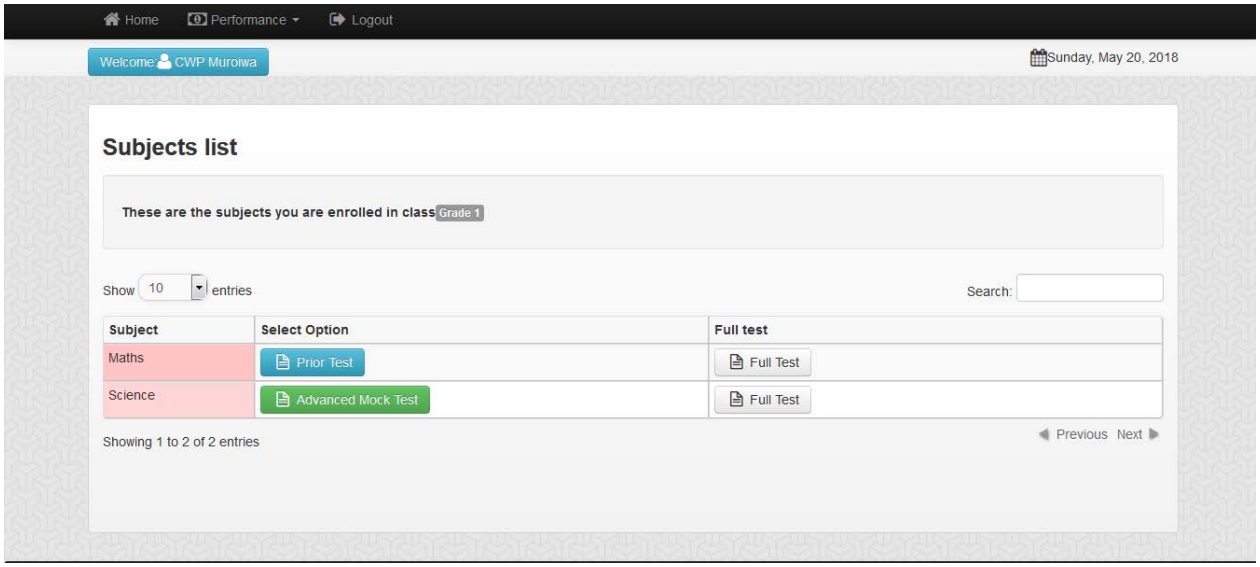

Figure 4.7: Student home page

Figure 4.8 below shows prior test questions for science subject. Each test is timed and the time counts down to 0 where the selected answers will be marked when even when the user has not finished taking his test, or rather when they finish within the stipulated time, they will click on submit button to see results. Furthermore, the student is required to select all answers and not leave answers unchecked.

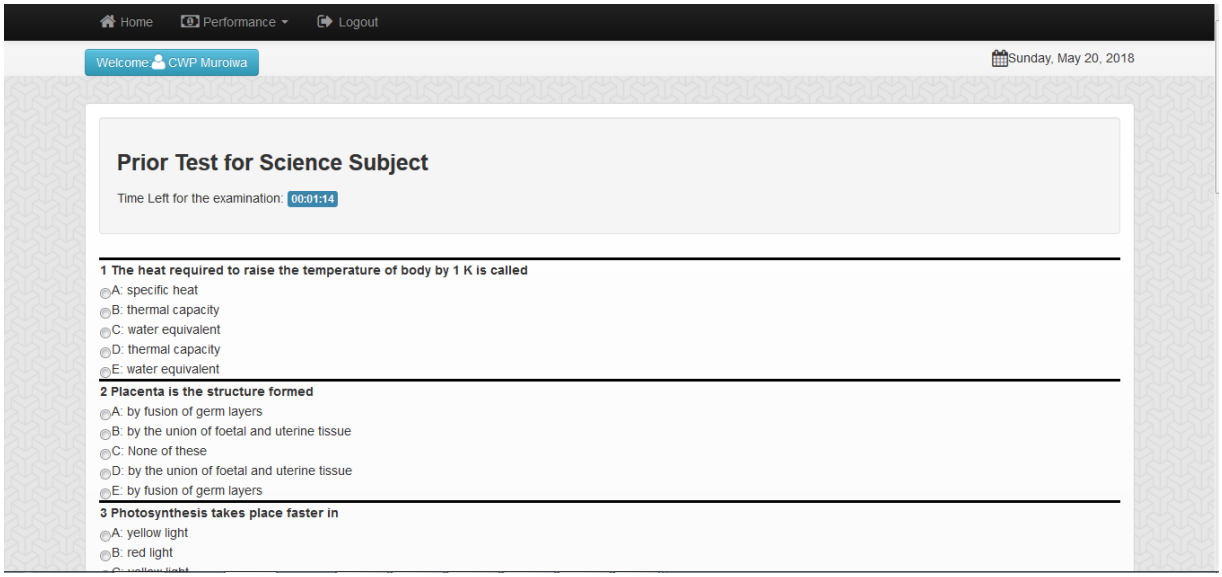

Figure 4.8: Prior Test questions

Results page (Prior Test)

The Figure 4.9 shows the results from the prior test taken by the student for the first time. In this case, the student scored 40% percentage and will be taken to 'Beginner Mock Test'. These are the following things that are shown on results page:

- Dynamic message – when the student scores 49% and less, and red notification page with the student's name and alerting the student that the mark scored is low for the type of test taken and will be taken to the respective mock test. If the mark is 50% above, the student will also be notified with a green pane about the type of test and the respective mock test; intermediate or advanced.
- Total questions asked - all questions are a total of 10 for each test and will be shown after the student has taken a particular test.
- Percentage/Score – the mark attained by the student on each test will be shown as a percentage, calculated by counting the number of correct questions against the total number of questions.
- The next step – the system shows the respective step to take depending on the type of test and score of the student. If the student has taken a prior test, it will notify the student to 'Proceed' to the respective mock test, depending on the score percentage and the respective button to the mock test will be shown. Also, if the student took a mock test, the system will notify the student to 'Take another mock test', with a button to the respective mock test depending on the scored percentage.

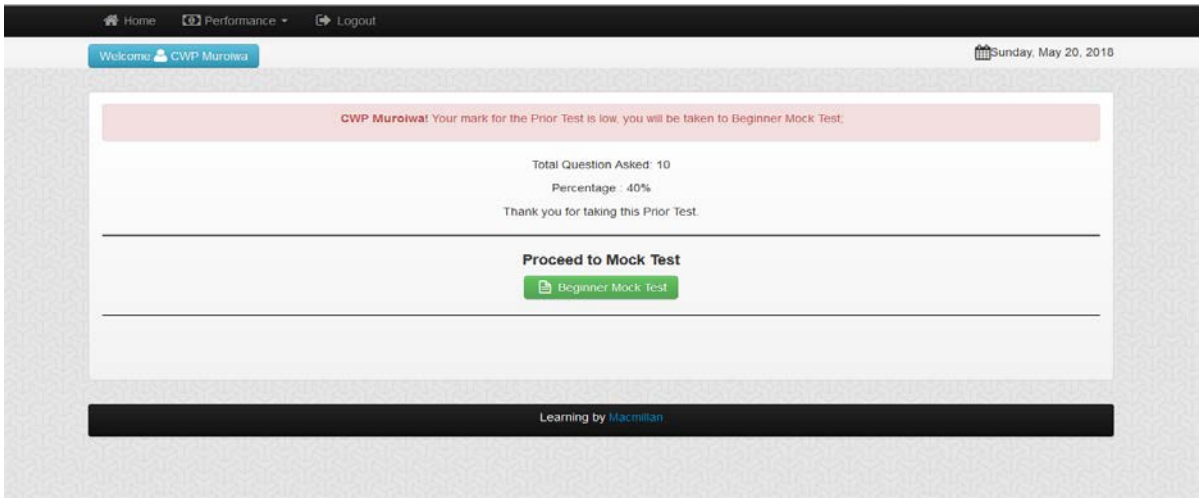

Figure 4.7: Prior Test results page

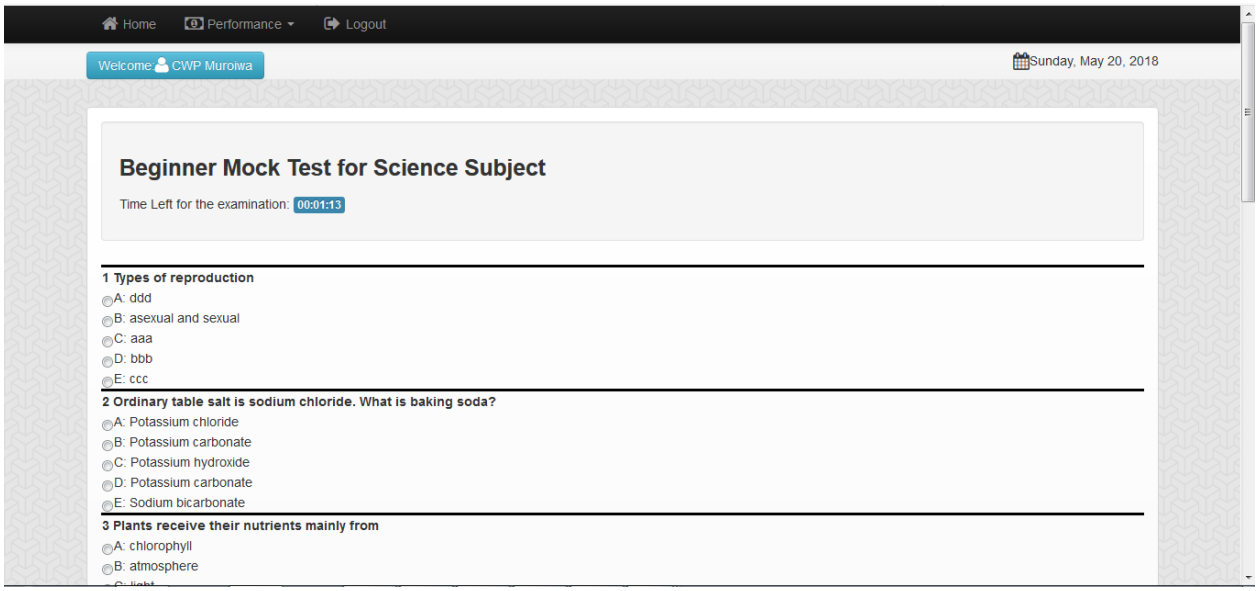

Figure 4.8: Beginner Mock test

Beginner Mock Test results

After the student has taken the beginner mock test and scores 80%, the system will take the student to the advanced mock test. Note that the mock tests can be taken as many times as possible to keep practicing and questions are jumbled up so that the student does not memorize the answers for each question, rather the purpose is to learn and not to remember.

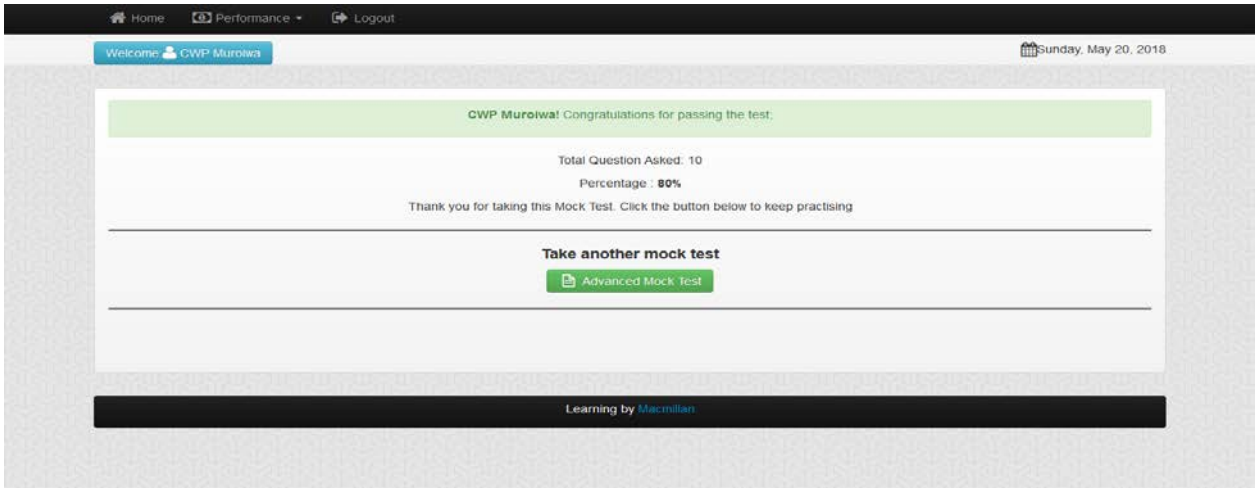

Figure 4.9: Beginner Mock Test results page

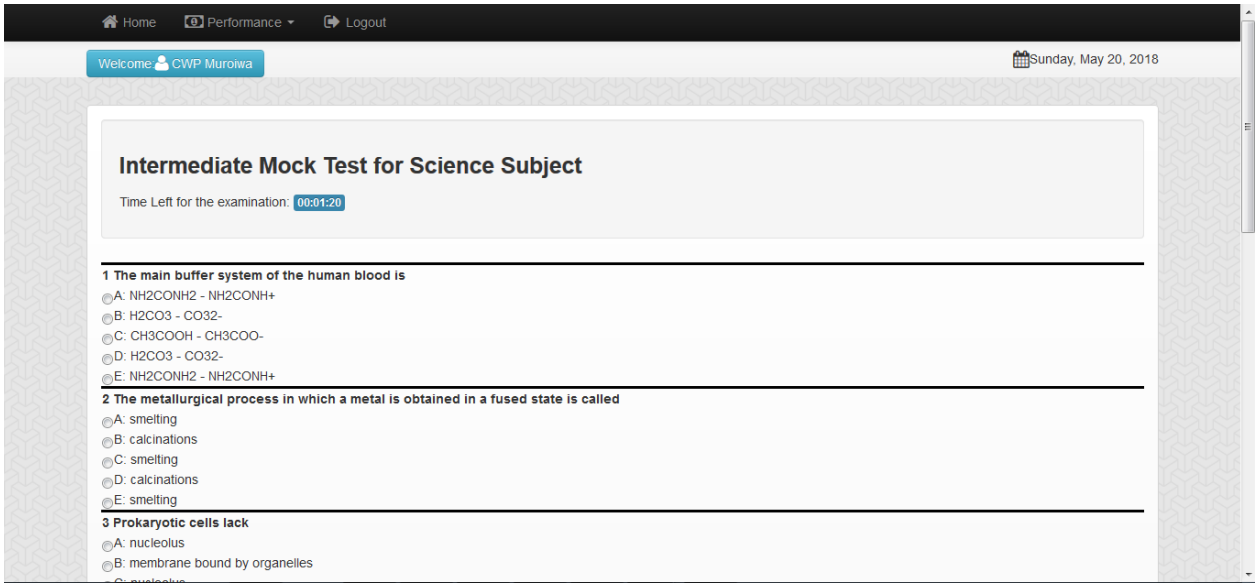

Figure 4.10: Intermediate mock test

Student subject performance (Student account)

The system shows the average performance for each subject for the mock tests taken. The average performance is the one used for determining the type of mock test to be given to a particular student and the percentage is aggregated as discussed in the previous chapter, where the total percentage is divided by the number of mocks taken. From there, there student is able to view his performance for the particular topics within the respective subject as shown in Figure 4.11.

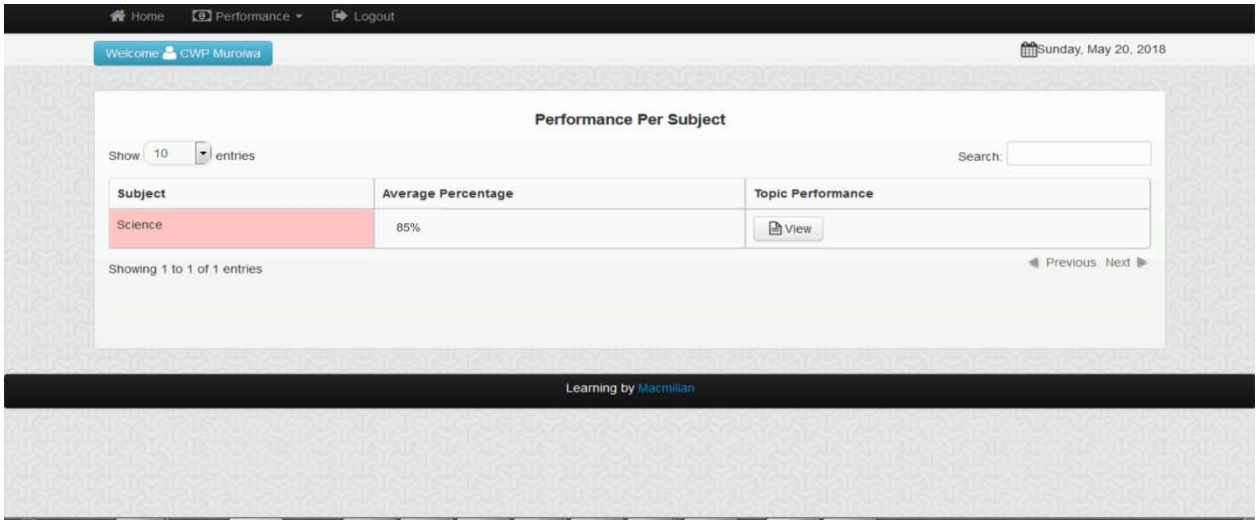

Figure 4.11: Student subject performance

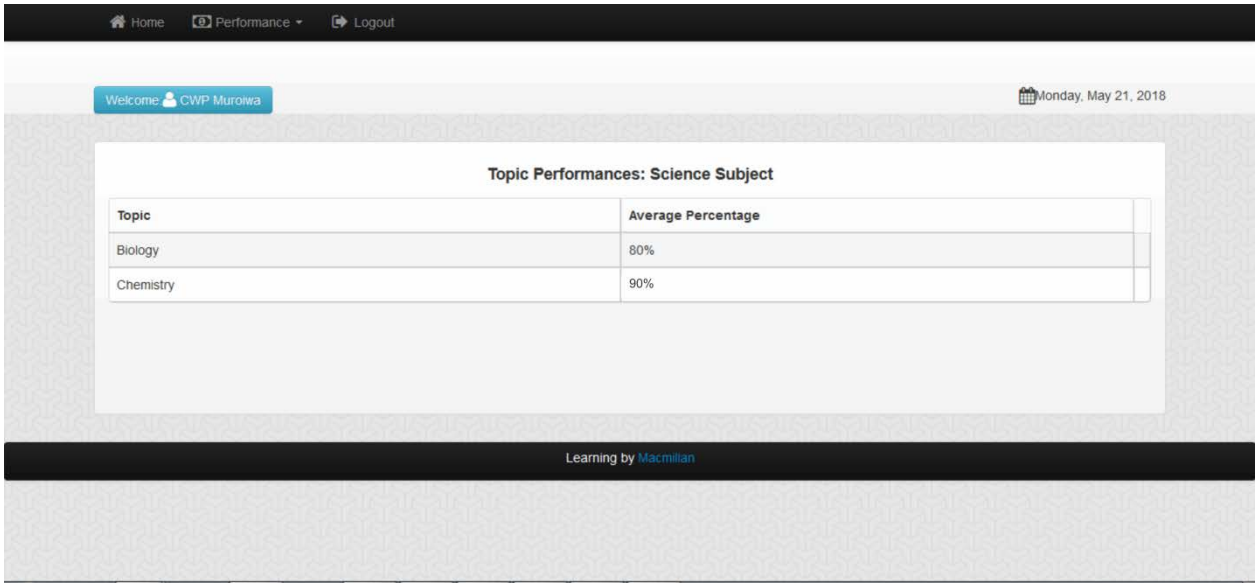

Figure 4.12: Student topic performance

CHAPTER 5
CONCLUSION AND FUTURE WORK

The study's purpose was to create a platform that allows instructors and students to accessadaptive learning system that matches practice learning material based on each student's prior knowledge. This seeks to provide a student with a unique learning path, adapting to their performance as they practice along the study. In this research, the major objectives were to match the learning content to the learner profile or capabilities by assessing how the learner is performing, and to provide tools which enable learners and instructors to see specific areas in which a particular student is doing well or struggling.

It was evident that students have different learning paths and styles. With this notion, the study gathered that it is crucial to determine every student's prior knowledge in a particular course before engaging them. This allows knowing how and what content to provide each student and build their knowledge from what they already know. In addition, after determining the student's prior knowledge they should practice more, to learn and grasp concepts. The practice content should be provided according to how the student is progressing in their learning path, meaning that content should not be generic but personalized for each student.

This therefore led to the development of the proposed system which tests a student's prior knowledge before embarking on their leaning path. The system provides students with a starting point to their learning based on prior knowledge and provide them with different practice content, categorized in 3 categories (beginner, intermediate, advanced). In the end, the system enables instructors to create a generic test to assess the student on a particular subject. Also, teachers and students can check subject and topic performances so that support can be given to learners on specific topics.

6.1 Future Work

To extend this work, there is need to allow instructors to create multimedia content that will engage the learner. This can be in form of videos, audios and pictures which can be used to explain and demonstrate a concept and this should enable the system to take into account each individual learner styles. Furthermore, the system can be extended to provide study content adding to the practice questions, and the system should be able to suggest relevant study content in topic areas in which the student is struggling. Also, the system should be implemented in artificial neural networks to enable more intelligent adaptive mechanisms to learn students' behavior, preferences and performance to suggest content and improve learners' learning experience.

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APPENDICES

APPENDIX 1

PHP CODE

Student course buttons

The following PHP and HTML code is for displaying the appropriate button for subjects depending on the previous performance or which the student has taken a prior test or not. If the student took a prior test, the button will be hidden and mock test button is activated.

```
<?php


        while($row=mysqli_fetch_array($rs)){
                                                                $sub_id =
$row['subjectName'];
                                                                $q_topic =
mysqli_query("select topicName from topic WHERE subjectid='$sub_id' ");

        $r_topic=mysql_fetch_array($q_topic);
                                                                //
var_dump($r_topic);
                                                                $topic_name =
$r_topic['topicName'];
                                                                $type = 'mock';
                                                                /////

                                                                $q_per =
mysqli_query("select result_percentage from test_results WHERE result_subject='$sub_id'
&&result_id=(SELECT MAX(result_id) FROM `test_results` WHERE
result_subject='$sub_id' &&result_test_type='mock' OR result_test_type='prior')");
                                                                $r_per =
mysql_fetch_array($q_per);
                                                                //
var_dump($r_topic);
```

```
                                                    $percentage =
$r_per['result_percentage'];
                                                    ?>
<tr class="odd gradeX" >
<td bgcolor="#FFFFFF"><span class="style2"><?php echo $row['subjectName'];
?></span></td>

<td bgcolor="#FFFFFF"><span class="style2"><?php
        // $session_user;
        $q_answered = mysql_query("select subt_topic_name from subjects_taken
WHERE (subt_user_name='$session_user') and(subt_subject_name='$sub_id') ");
        $row_answered = mysql_num_rows($q_answered);
if ($row_answered==0){
        echo                                                    "<a
href='index.php?page=testpage1.php&type=prior&topic=$r_topic[topicName]&subject=$r
ow[subjectName]&prior&code=".getRandomString()."'  class='btnbtn-info'> <i
class='icon-file-alt icon-large'></i>  Prior Test</a>";
    }elseif ($percentage>=70&&$row_answered==1){
      echo                                                  "<a
href='index.php?page=testpage1.php&mock_status=expert&type=mock&topic=$r_topic[t
opicName]&subject=$row[subjectName]&mock&code=".getRandomString()."'
class='btnbtn-success'> <i  class='icon-file-alt  icon-large'></i>   Advanced
Mock Test</a>";
    }elseif ($percentage >=50 && $percentage <=69 &&$row_answered==1){
        echo                                                    "<a
href='index.php?page=testpage1.php&mock_status=intermediate&type=mock&topic=$r_t
opic[topicName]&subject=$row[subjectName]&mock&code=".getRandomString()."'
class='btnbtn-success'> <i  class='icon-file-alt  icon-large'></i>   Intermediate
Mock Test</a>";
    }elseif ($percentage<=49 &&$row_answered==1){
        echo                                                    "<a
href='index.php?page=testpage1.php&mock_status=beginner&type=mock&topic=$r_topic
```

```
[topicName]&subject=$row[subjectName]&mock&code=".getRandomString()."'
class='btnbtn-success'> <i class='icon-file-alt icon-large'></i>  Beginner
Mock Test</a>";
        }
 ?>
```

Code for fetching questions

The code below was used to fetch questions from the database depending the type of questions and skill level.

```
<?php
if ($_GET['type']=="mock" && $_GET['mock_status']=="beginner"){
        $mymsg = "Beginner Mock Test for:";
}
elseif ($_GET['type']=="mock" && $_GET['mock_status']=="intermediate"){
        $mymsg = "Intermediate Mock Test for:";
}
elseif ($_GET['type']=="mock" && $_GET['mock_status']=="expert"){
        $mymsg = "Advanced Mock Test for:";
}
elseif ($_GET['type']=="prior"){
                $mymsg = "Prior Test for:";
}
elseif ($_GET['type']=="full"){
        $mymsg = "Full Test for:";
}
?>
<div class="well well-sm">
<p><h3><?php echo $mymsg; ?><?php echo $_GET['subject'];?></h3></p>
<p>Time Left for the examination: <span class="label label-info" id='CountDownPanel'
"></span></h3>
</div>
```

```
<?php

	if($_GET['type']=="full"){
		// echo "Full";
	$rs = mysql_query("SELECT *,questions.id qid FROM `questions` INNER JOIN studentclass INNER JOIN users on studentclass.classname=users.studentclass and questions.username= users.username where classname='$_SESSION[class]' and examtype='full' and topic in(select topicName from topic where subjectid='$_GET[subject]') LIMIT 10");
	// }
	// // elseif($_GET['type']=="mock"){
	// //	echo "Mock";
	// //	echo "SELECT *,questions.id qid FROM `questions` INNER JOIN studentclass INNER JOIN users on studentclass.classname=users.studentclass and questions.username= users.username where classname='$_SESSION[class]' and examtype='$_GET[type]' and topic in(select topicName from topic where subjectid='$_GET[subject]') ORDER BY RAND() ";
	// // $rs = mysql_query("SELECT *,questions.id qid FROM `questions` INNER JOIN studentclass INNER JOIN users on studentclass.classname=users.studentclass and questions.username= users.username where classname='$_SESSION[class]' and examtype='$_GET[type]' and topic in(select topicName from topic where subjectid='$_GET[subject]') ORDER BY RAND() ");
	}elseif($_GET['type']=="mock" && $_GET['mock_status']=="beginner"){
		// echo "Mock Diff";
		// echo "SELECT *,questions.id qid FROM `questions` INNER JOIN studentclass INNER JOIN users on studentclass.classname=users.studentclass and questions.username= users.username where classname='$_SESSION[class]' and examtype='$_GET[type]' and topic in(select topicName from topic where subjectid='$_GET[subject]') ORDER BY RAND() ";
	$rs = mysql_query("SELECT *,questions.id qid FROM `questions` INNER JOIN studentclass INNER JOIN users on studentclass.classname=users.studentclass and questions.username= users.username where classname='$_SESSION[class]' and
```

examtype='mock' and topic in(select topicName from topic where subjectid='$_GET[subject]' and mock_status='beginner') ORDER BY RAND() LIMIT 10");

}

elseif($_GET['type']=="mock" && $_GET['mock_status']=="intermediate"){

// echo "Mock Diff";

// echo "SELECT *,questions.id qid FROM `questions` INNER JOIN studentclass INNER JOIN users on studentclass.classname=users.studentclass and questions.username= users.username where classname='$_SESSION[class]' and examtype='$_GET[type]' and topic in(select topicName from topic where subjectid='$_GET[subject]') ORDER BY RAND() ";

$rs = mysql_query("SELECT *,questions.id qid FROM `questions` INNER JOIN studentclass INNER JOIN users on studentclass.classname=users.studentclass and questions.username= users.username where classname='$_SESSION[class]' and examtype ='mock' and topic in(select topicName from topic where subjectid='$_GET[subject]' and mock_status='intermediate') ORDER BY RAND() LIMIT 10");

}

elseif($_GET['type']=="mock" && $_GET['mock_status']=="expert"){

// echo "Mock Diff";

// echo "SELECT *,questions.id qid FROM `questions` INNER JOIN studentclass INNER JOIN users on studentclass.classname=users.studentclass and questions.username= users.username where classname='$_SESSION[class]' and examtype='$_GET[type]' and topic in(select topicName from topic where subjectid='$_GET[subject]') ORDER BY RAND() ";

$rs = mysql_query("SELECT *,questions.id qid FROM `questions` INNER JOIN studentclass INNER JOIN users on studentclass.classname=users.studentclass and questions.username= users.username where classname='$_SESSION[class]' and examtype !='full' and topic in(select topicName from topic where subjectid='$_GET[subject]' and mock_status='expert') ORDER BY RAND() LIMIT 10");

}

else{

```
		// echo "Else Prior";
		$rs = mysql_query("SELECT *,questions.id qid FROM `questions` INNER JOIN studentclass INNER JOIN users on studentclass.classname=users.studentclass and questions.username= users.username where classname='$_SESSION[class]' and topic in(select topicName from topic where subjectid='$_GET[subject]' and mock_status='expert') ORDER BY RAND() LIMIT 10");
		}
	$rz = mysql_num_rows($rs);
	$counter = 0;
	while ($counter < $rz)
	{
	while($rw = mysql_fetch_array($rs))
	{
		// $topicName =$rw['topicName'];
	 $counter++;
	 ?>

<table width="100%" border="0" align="center" style="border-top:3px solid #000">
<tr><td width="50%"><strong><?php echo $counter." ".$rw['question']; ?>
</strong></td></tr></table>
<?php
	// echo "select * from answers where questionid = '$rw[qid]'";
//	echo $rw['qid'];
	$res = mysql_query("select * from answers where questionid = '$rw[qid]'");

	while($row = mysql_fetch_array($res))
	 {

	 ?>

<form method="post" id="myform" name="myform" action="index.php?page=results.php&code=<?php echo $_REQUEST['code'];
```

```
?>&type=<?php echo $_REQUEST['type']; ?>&subject=<?php echo $_REQUEST['subject']; ?>&topic=<?php echo $_REQUEST['topic']; ?>&randid=<?php echo $six_digit_random_number = mt_rand(1000000, 9999999);?>" >
<table width="100%" border="0" align="center">
<tr><td width="4%"><input type="radio" required name="answerid<?php echo $rw['qid']; ?>" id="answerid<?php echo $rw['qid']; ?>" value="<?php echo $row['id']; ?>" /><?php echo $row['symbolid']."): ".$row['answer']; ?></td></tr>
                        <?php
                        // $cookie_question_id =$rw['qid'];
                        // $_SESSION['questionid'] = $cookie_question_id;
                        // $_SESSION['answerid'] = "answerid".$row['id'];
                }
                 }
                 ?>
<tr align="center">
<td align="center"><input type="submit" name="Submit" value="Submit" class="btn" /></td>
</tr></form>
<?php
                }
                ?>
```

Code for marking the answered questions

```
if($_GET['type']=="prior"){
        // $numberOfQuestions= countTable("select * from questions INNER JOIN users on questions.username=users.username and users.studentclass='$_SESSION[class]' and topic in(select topicName from topic where subjectid='$_GET[subject]' and )");
        $numberOfQuestions= 10;

        }else{
```

```
                // $numberOfQuestions= countTable("select * from questions INNER JOIN users on questions.username=users.username and users.studentclass='$_SESSION[class]' and examtype='$_GET[type]' and topic in(select topicName from topic where subjectid='$_GET[subject]')");
                $numberOfQuestions= 10;
        }
        $res = mysql_query("select * from questions");

 while($row = mysql_fetch_array($res))
 {
 @$answerid = $_POST['answerid'.$row['id']];
 // echo $answerid;
 // exit;
  $rs = mysql_query("select * from answers where id ='$answerid' ");
        $per_rs = mysql_query("select * from answers where id ='$answerid' and status ='1' ");
        @$per_row += mysql_num_rows($per_rs);
        // var_dump($per_row);

  @$rw += mysql_num_rows($rs);
        // var_dump($rw);
  while($rowrs = mysql_fetch_array($rs))
 {
 $CorrectQuestions=$rowrs['questionid'];
 $questionid=$rowrs['questionid'];
 $rowstatus=$rowrs['status'];
//////////////////////////
$q_result = mysql_query("select * from test_results WHERE (result_user_name='$session_user')
and (result_random_value='$get_random_number') ")or die (mysql_error());
$r_result = mysql_num_rows($q_result);
```

Saving test results in database

```
if ($r_result !==1 && $get_type =="mock" ){
$que = mysql_query("select * from questions where id = '$questionid' ");
$que_row = mysql_fetch_array($que);
$que_topic = $que_row['topic'];
$counter =0;
if  ($rowstatus ==1){
 $rs2 = mysql_query("INSERT INTO `correctQuestions` (`questionid`, `student`, `code`,`topic`,`status`) VALUES ('$CorrectQuestions', '$_SESSION[username]', '$_REQUEST[code]','$que_topic','$rowstatus')");
}elseif ($rowstatus ==0){
$counter++;
if($rowstatus == 0){
 $rs2 = mysql_query("INSERT INTO `correctQuestions` (`questionid`, `student`, `code`,`topic`,`status`) VALUES ('$CorrectQuestions', '$_SESSION[username]', '$_REQUEST[code]','$que_topic','$rowstatus')");
}
}
}
//else
 ////////////////////
}
```

Calculation of average performance

```
$rs1 = mysql_query("select * from answers where id ='$answerid'");
  @$rw1 += mysql_num_rows($rs1);
        }
        $percentage = (($per_row / $numberOfQuestions) * 100);
```

Calculation of topic percentage

```
$c_loop_q = mysql_query("select * from topic WHERE subjectid ='$get_subject' ");
                while($c_loop_row = mysql_fetch_array($c_loop_q)){
                $temp_topic = $c_loop_row['topicName'];
                $count_1s= mysql_query("SELECT SUM(status) AS value_sum FROM
correctQuestions where
                (student ='$session_user') and
                (topic = '$temp_topic')
                ");
                $row_count1s = mysql_fetch_array($count_1s);
                $all1s = $row_count1s['value_sum'];

                $c_query = mysql_query("select * from correctQuestions WHERE
                (student='$session_user') and
                (topic = '$temp_topic')
                ");
                $count_rows = mysql_num_rows($c_query);
                $topic_percentage = ($all1s/$count_rows)*100;
```