

## Declaration

The dissertation is my original work and has not been submitted previously for a degree at this or any other university/institute. To the best of my knowledge it does not contain any material published or written by another person, except as acknowledged in the text.

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This is to certify that this dissertation is based on the work of Mr.R.Sugumar under my supervision. The dissertation has been prepared according to the format stipulated and is of acceptable standard.

Certified by:

Supervisor Name: Dr. Thushani .A.Weerasinghe

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## **Abstract**

In ancient education system in Sri Lanka used traditional learning method, which was limited to teacher-centered instruction. But today many education institutions have turned into virtual learning centers and use web based learning systems which can provide more opportunities for student-centered pedagogical practices.

The aim of this project was to increase the GIT pass rate by provide an interactive web based teaching and learning facility to the ICT teacher and students in addition to traditional class room teaching and learning by developing a web based GIT course. Problems and difficulties faced by students and teachers in teaching and learning GIT subject for grade 12 students going to be lessened by this web based system. Through this project it is possible to provide a better learning experience for GIT students and effective teaching tools for teachers by designing and developing a web based course.

After analyzing the learner's requirements, four modules were selected and each lesson consists of interactive learning materials, quizzes, tests and forums. Moodle was installed in WAMP server and used to provide web based learning management system. Articulate storyline, Powtoon studio, Natural Reader, GIMP were used to develop the web based course material. Once developed, each module was uploaded onto a virtual learning environment allowing students to use these modules. After that, their feedback was collected using a questionnaire.

Based on the feedback, course modules were improved. The project was finished meeting the user requirements. Learner's feedback was positive and they found this web based course is easy to use and extremely helpful for their studies.

## **Acknowledgement**

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## **List of abbreviation**

ADDIE	- Analysis, Design, Development, Implementation and Evaluation
CD	- Compact Disk
GIT	- General Information Technology
ICT	- Information and Communication Technology
LMS	- Learning Management System
MCQ	- Multiple Choice Questions
MOE	- Ministry of Education
MOODLE	- Modular Object-Oriented Dynamic Learning Environment
PDF	- Portable document format
SCORM	- Sharable Context Object Reference Model
UCSC	- University of Colombo School of Computing
VLE	- Virtual Learning Environment
WBE	- Web Based Education

## **Chapter 1: Introduction**

The Department of Examinations, Sri Lanka conducts General Information Technology (GIT) Examination Island wide every year to examine the Information and Communication Technology (ICT) knowledge of the advanced level students. All advanced level students must acquire basic ICT knowledge; this is the objective of the GIT course. But expected goal could not be achieved at Jaffna College. Because when we compare the final GIT results, it is very low. This dissertation describes the reason for the failure and what kind of solution could be more appropriate at Jaffna College.

### **1.1 Statement of the Problem**

GIT was introduced as a computer education related subject common for students of all streams of G.C.E (A/L) examination. Implementing GIT at the grade 12 is likely to present a number of challenges to Jaffna College.

Jaffna College is a private school located at Vaddukoddai, Jaffna in the Northern Province. Computer Laboratory was established here in 1984. At that time there were four Commodore 64 computers [1]. Then gradually few Amstrad-PCW Computers [2] were bought for the Computer Laboratory [3]. Due to the unusual circumstances of the country, development of the Computer Laboratory was interrupted. Currently the laboratory has 40 computers and internet facilities.

The biggest problem is that the lack of ICT teachers to teach ICT subjects. The high salaries available for ICT graduates in the private sector will not allow them to work as teachers on a low salary [4]. Only one ICT graduate teacher is at Jaffna College to teach ICT subjects. While preparing the time table, priority is usually given to the G.C.E (O/L) and G.C.E (A/L) ICT classes. Because final ICT results of the G .C .E (O/L) and G.C.E (A/L) classes affect the schools status. Which is decided based on the overall results of the students. As a result, GIT students do not get adequate time allocation. Therefore the teacher finds it difficult to cover the whole GIT syllabus, and the students cannot prepare themselves for the GIT final examination without enough resources. As a result students are unable to get the best results.

The Ministry of Education insists the use of ICT while teaching. Recently Ministry of Education has introduced an online learning portal call e-Thaksalawa [5] for the students. Now schools have realized the benefit of the ICT enhanced learning. For an example, Jaffna College provides an online English program to improve the English knowledge of selected group of students from G.C.E ordinary level classes. Students' attention can be drawn to the education through the use of new technologies such as web based learning, so we can expect high pass rate in GIT subject by introducing a web based course to GIT subject.

## 1.2 Project goals

The purpose of this project is to introduce an e-Learning environment for GIT course at Jaffna College in order to increase the pass rate of the students following GIT subject.

## 1.3 Project Objectives

The following are the objectives of the project

- (i) Provide interactive course contents to carry on their learning on their own pace.
- (ii) Make the learning content more easily accessible from anywhere any time.
- (iii) Provide more opportunities to learn collaboratively.

## 1.4 Project Scope and limitation

The whole G.C.E (A/L) GIT syllabus is not considered in this project. According to the students' request, four major- modules (computer architecture, number systems to represent the data, logic gates, flow chart) will be covered in the project.

The online course makes all recommended text accessible through the Internet. Also, the students will be able to learn by interacting with the online activities, quizzes and with the peers through online discussion forums.

In order to deliver this course and track student progress records a learning management system (LMS) needs to be implemented. The online course and the learning management system will provide following facilities to the students;

- Select any module in the course to study.
- Can take a test from any module of this course and self-evaluate their learning.
- Identify their weakness by doing quizzes.
- Discuss through the forum discussions.
- Can send messages to the teacher/peer.

Ministry of Education revised the GIT syllabus recently (2010); therefore there will not be a significant change in the GIT syllabus in the next few years. Also this project can support all G.C.E (A/L) GIT students in Sri Lanka.

### 1.5 Outline of the dissertation

Chapter 1: This chapter includes the statement of the problem, project goals, project objectives

and project scope and limitation.

Chapter 2: This chapter discusses about project background which includes learning theories and methodology used to analysis, design and develop.

Chapter 3: Third chapter explains the design section and course structure.

Chapter 4: This chapter discusses about implementation of the learning management system

and course content

Chapter 5: Fifth chapter discusses about evaluation methods used to do the evaluation.

Chapter 6: This chapter includes the conclusion and future works.

## **Chapter 2: Background**

e- Learning has become an effective way of delivering learning content. Therefore, schools and other educational institutions tend to integrate ICT into education. However, in order to reap the promising benefits of e-learning, the course designers and developers should use the appropriate instructional design methodologies for the design and development of e-Learning courses.

### **2.1 Importance of ICT**

Information and Communication Technology has become an important part of the modern world. Information and Communication Technology has spread to every field at present. In this modern world any person with a thorough knowledge of ICT can survive easily. Most of the economically developed countries are increasingly ICT dominant. Therefore investing on ICT in the 21st century has become a compulsory requirement for a country to survive.

### **2.2 ICT in Sri Lankan education system**

ICT education is a must to fulfill the requirements of the future; our country has taken many steps to increase the ICT knowledge of the citizens. All universities in our country conduct ICT based courses. The Ministry of Education (MOE) has taken many steps to uplift the ICT education at the school level. The MOE has taken two approaches to introduce ICT to Sri Lankan schools: introducing ICT as a subject in the school curriculum from Grade 1 to 13 and adopting ICT as a tool in learning and information handling. [6]

MOE has introduced few ICT subjects in school level. For instance, General Information Technology (GIT) was introduced as a subject in year 2002, based on a decision taken by the Ministry of Education to introduce the computer education related subject in Grade 12 (First year of G.C.E A/L) [7]. GIT was planned as a common subject to suit the ICT needs of students in different streams of G.C.E (A/L). In 2006, Information Communication Technology subject has been introduced to G.C.E (O/L) examination as an optional subject. Thereafter ICT was introduced to the main subject stream of G.C.E (A/L) in year 2009.

First National level examinations for ICT were held in 2011. “The National Examination for GIT held first time on 21st August 2005. The examination was conducted by the Department of Examinations, Sri Lanka. More than 80,000 students sat for this examination [8].”

But there are no sufficient ICT qualified teachers for teaching ICT related subjects in the Northern Province schools [9]. At present, both teachers and students do not have any proper course materials except teachers’ instruction manual for G.C. E (A/L) GIT subject. Teachers and students are facing many difficulties when continuing with GIT syllabus.

### 2.3 Importance of web based learning

Web based learning method can be introduced to solve the shortage of ICT teachers. Web based learning is most helpful to deliver the learning materials such as animation, image, text, streaming video and audio etc. via internet.

Web-based education (WBE) brings a rich learning experience to learner through the text, video, images, audio and simulations. It can also be used individually in self-paced learning. That uses World Wide Web as a communication medium and supporting technology. There are many other terms for WBE; some of them are online education, virtual education, Internet-based education, and e-learning[10].

There are two types of web based learning available

**Synchronous e- Learning** facilitates the learners to be interacting and learning at the same time through the chat rooms, video conferencing and audio teleconferencing.

**Asynchronous e- Learning** is involving student center teaching method that uses online to deliver the coursework and learning resources students can complete the course work at their own pace through the internet.

Many universities and institutes use e-Learning systems to deliver their courses. e-Learning can provide self-paced learning, increase access to learning materials.

## e-Learning Theories

There are three commonly known learning theories available. They are Behaviorism, Cognitivism and Constructivism. When develop an e-Learning course we must consider the suitable learning theories. Below table 2.1 describes the learning theories.

<b>Learning theories</b>	<b>Explanation</b>	<b>Implication on e-Learning course</b>
<b><i>Behaviorism</i></b>	Stimulus and response: * Students remember and respond (change in clear behaviour due to conditioning)  * Teachers present and provide for practice and feedback.	Sees mind as a “black box, so very little effect on e-Learning courses
<b><i>Cognitivism</i></b>	Information transmission and processing: * Students remember strategies, rules and patterns. * Teachers plan for cognitive learning strategies.	The mind should be opened and understood. Therefore, it has high effect on e-Learning courses
<b><i>Constructivism</i></b>	Personal discovery of knowledge: * Discover relationships between concepts, e.g. addition and subtraction.  * Teachers provide instructional context for active and self-regulated students.	Sees each learner as a unique individual with unique needs and backgrounds, So it has very high effect on e-Learning courses

Table 2.1: Summary of learning Theories

## 2.4 Learning theories used to developing the course

Dale's Cone of Experience is a model that incorporates several theories related to instructional design and learning processes. Figure 2.1 shows how much an average student can retain out of what is learnt through different channels of knowledge input. We can understand that learning outcome depends on the student's capacity of concentration and the teaching aid used to teach [11]. In the point of view of Sri Lanka examination system, they expect student must remember everything what they learnt, grade one to higher studies, student need to memories everything for long time to face the final examination. Therefore Dale's Cone of Experience has used to design this web based course. Interactive contents with background voice, videos and pictures are included in this course to provide more experience to learner.

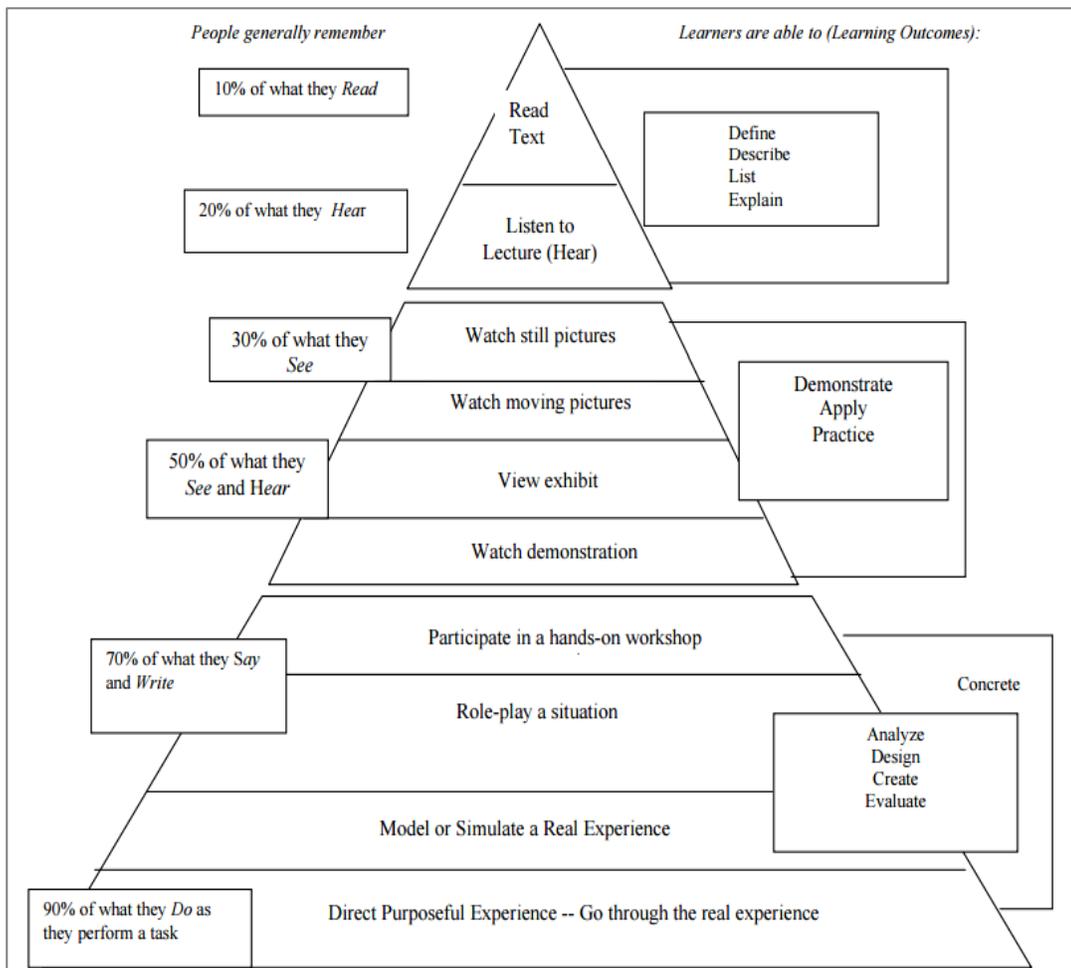


Figure 2.1: Dale's Cone of Experience.

## Bloom's Taxonomy

Bloom's Taxonomy was developed by “Benjamin S. Bloom and his team, who worked for over fifty years as an educational psychologist dedicated to developing ways of describing, assessing and encouraging higher-order thinking in children and adults” [12]. They divided the learning domains as cognitive domain, affective domain and psychomotor domain. Figure 2.2 illustrates the six levels of Bloom's Taxonomy and revised Bloom's Taxonomy, which used verbs rather than nouns. Bloom's Taxonomy was developed to provide a common language for facilitators to discuss and exchange learning and assessment methods with learners to understand and use concepts, to exhibit the skills. Bloom's Taxonomy is used in this course content development, because it encourages a higher level of thought in the learners by building up from lower-level cognitive skills.

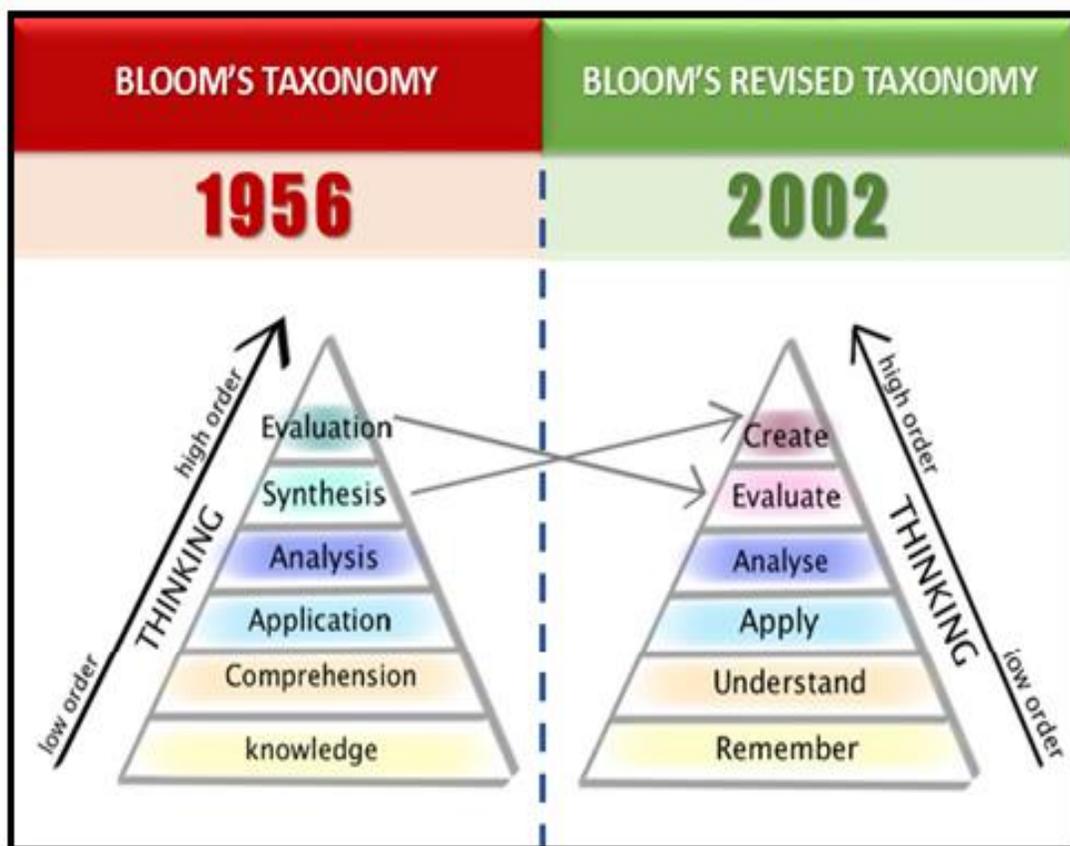


Figure 2.2: Bloom's Taxonomy and Revised Bloom's Taxonomy

## 2.5 Course development framework

There are many learning content development methodologies available such as Analysis, Design, Development, Implementation, and Evaluation (ADDIE), AGILE. Out of them ADDIE model was selected to develop this proposed project since it has been recommended by many other e-Learning content developer's [13].

### **ADDIE model**

The ADDIE model is a framework that lists generic processes. It represents a descriptive guideline for building effective training and performance support tools in five phases as shows in figure 2.3. Therefore ADDIE model is used to develop the course contents of this project.

### **Five phases of ADDIE model**

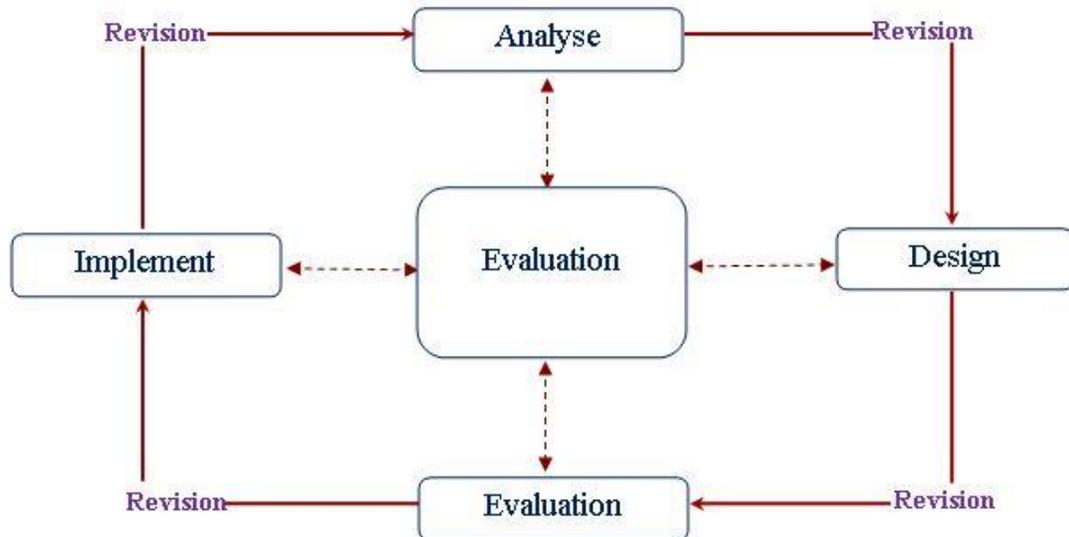


Figure 2.3: Five phases of ADDIE model

## **Analysis phase**

The analysis phase clarifies the instructional problems and objectives, and identifies the learning environment and learner's existing knowledge and skills. In this step before developing the content we need to think of “Why I’m teaching this course”, “To whom I am teaching it?” To find answer to these questions following analysis are carried out.

- Need analysis
- Client, Technical and environment (Context) analysis
- Learners’ Task analysis
- Teacher analysis
- Learning Content analysis

## **Design phase**

In this phase following activities will take place. Define a set of learning objectives to achieve the goal of this course. Arrange the objective in an order. Select the instructional, evaluation, delivery strategies.

## **Development phase**

In this stage instructional designer and developer create the content, storyboard and course material in the design phase and assemble those contents. This phase involves creating contents and testing of learning outcomes. Also the course is reviewed and revised according to learner’s feedback.

## **Implementation phase**

In this phase developed course will be delivered to the instructor and learners by installing it on a server. Instructor is the person who is going to cover the course curriculum.

## **Evaluation phase**

Evaluation is the last phase in ADDIE model. In this phase course contents are tested very carefully. Evaluation phase can be divided into two parts, which are formative and summative. Formative evaluation takes place during any phase of the ADDIE, to improve

the course design and performance while summative portion of it occurs at the end of the program.

## 2.6 Existing similar e- Learning system

To develop the course content for GIT course, a thorough search was done using internet. There was no similar course available for this purpose. Because GIT course target and was designed for our local school students. There were few e-Learning courses available for other ICT subjects. Brief description has been given below for the above e-Learning courses.

### ICT ezy

ICT ezy is a special e-Learning system for students with a user friendly interface design. Few basic level courses are offered by ICT ezy for the O/L ICT and A/L ICT students, But not for GIT. Lessons are delivered in Portable Document Format (PDF), html format, videos are linked from YouTube. There is no practice quiz or examination available for the above courses [14].



Figure 2.4: ICT ezy Course page

## E-thaksalawa - Learning Content Management System

“e-thaksalawa” learning content management system which has been created and maintained by the information and communication technology branch of the ministry of education. This was introduced as a strategy to empower the entire general education through the e-Learning methods of the ICT education in line with the 1000 secondary schools regenerating program [15]. This learning content management system contain resources developed aligned Grade 1 to 13 curriculum such as creative lessons, past exam papers, Term exam papers. But there are no resources available for G.C.E (A/L) GIT subject.



Figure 2.6: e-thaksalawa course content page

## ALISON

There are many foreign web based learning sites. Figure 2.7 describes the course page of “ALISON”. ALISON is an e-Learning service provider and academy founded in **Galway, Ireland** [16]. This site offers a wide range of online courses for free of charge. Course contents are well designed. End of each chapter student has to answer the few quizzes. End of the quiz student will get the feedback. But available ICT course cover

only few contents in the GIT syllabus. Most of the units related to GIT syllabus not available there.

The screenshot shows the ALISON website header with the logo 'ALISON A New World of Free Certified Learning' and navigation links for HOME, COURSES, SERVICES, and COMMUN. Below the header is a banner for 'Professional Scrum Training' with a 'Register now' button. The main content area is titled 'Course Outline' and contains a table with the following data:

Module Title	Start Module	Topics
ABC IT - Introduction	Start Module	0 / 1
ABC IT-1: Basic Concepts	Start Module	0 / 148
ABC IT-2: Software Applications	Start Module	0 / 163
ABC IT-3: Practical IT Skills	Start Module	0 / 79

Figure 2.7 ALISON Course page

The screenshot shows the ALISON website header with the logo 'ALISON A New World of Free Certified Learning' and navigation links for HOME and COUR. The main content area is a 3D-rendered scene with a blue grid floor. In the scene, there is a computer monitor displaying a document, a keyboard, a mouse, a CD-ROM, and a letter that says 'Dear'. A text box in the foreground reads: 'WORD PROCESSING - FIRST STEPS' and 'Word processing has replaced the electric typewriter as the most efficient way of creating and editing text documents.' The scene is framed by a blue border with icons for 'close', 'sound', 'text', 'TOPICS', and 'MENU'.

Figure 2.8: ALISON Course content page

After considering the above review it was decided to develop a web based learning course for advanced level students to improve their performance in General Information Technology.

## Chapter 3: Analysis

### 3.1 Context analysis

Context analysis is a method to analyse and identify the environment, where learning will take place. Gathered information can be used to develop the course to improve the student's knowledge. The target users for this course will be G.C.E. Advanced Level students at Jaffna College. Students can sit for the GIT final examination only once. Private candidates cannot face this GIT examination.

### 3.2 Need assessment

Need assessment is a process of identifying what is expected from the project. Need assessment helps to identify potential problems in the project which we intent to do. Before designing a web based course, a need analysis should be conducted to identify the following:

- Online learning is the best solution to deliver the course?
- Available equipment/ tools are enough to deliver the course?
- Knowledge, skills and attitudes of the target students.
- Identify the needed course contents.

#### 3.2.1 Target users

##### **Students (Learners)**

Learners are the advanced level students who are facing GIT examination. Every year there are nearly ninety students participating for this examination from Jaffna College.

##### **Teachers (Facilitator)**

One ICT teacher available to teach ICT subject form grade 10 to advanced level classes. Interview was conducted to gather data from the Teacher.

## **School Administration**

The Manager, Principal giving their effort to increase the pass percentage of the final results. So they were interviewed to gather data.

### **3.2.2 Sampling Procedure**

Small representative group of 30 students were selected randomly to conduct needs assessment from advanced level science, mathematics, and commerce and arts streams. When we consider the gender of the participants, there were 18 male students and 12 female students.

### **3.2.3 Data Collection Methods**

In order to collect the data, several data collection methods such as interview, direct observation, survey, focus group were used.

#### **Interviews:**

Interviews were conducted to gather data about GIT final results, funding from the school administrators. During the interview with teacher, data related to the course and course contents have been inquired.

#### **Direct observation:**

Direct observation is a widely used method to collect the necessary data from the field, during the practical class time, a sample group of students behaviors were observed. Through this method, major learning behaviors of the students were identified. Further, lab computers, their configurations and bandwidth of the Internet connection were also observed.

#### **Survey**

Survey is another method to gather data regarding learning difficulties and requirements. Survey can be done by giving a questionnaire to the students to fill it and return. In order to, do so; a questionnaire with 15 questions (see Appendix A) was given to a random sample of students to fill and return it on the same day.

### 3.2.4 Data Analysis and findings

Data collected through questionnaire were analysed to identify the needs of the students. The analysed data depicted in charts (Figure 3.1 – 3.7), helped to create the design that meets audience’s needs.

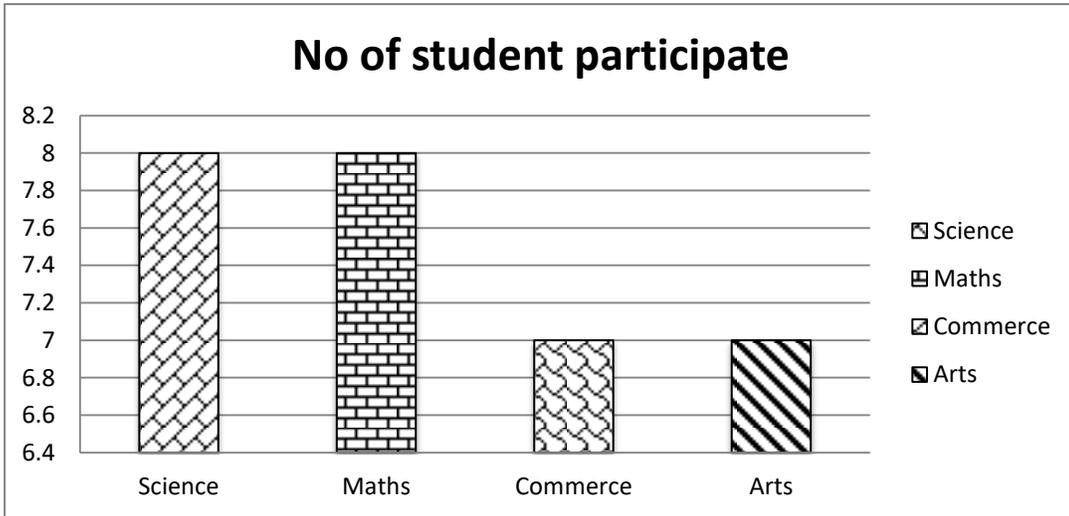


Figure 3.1: No of student participate

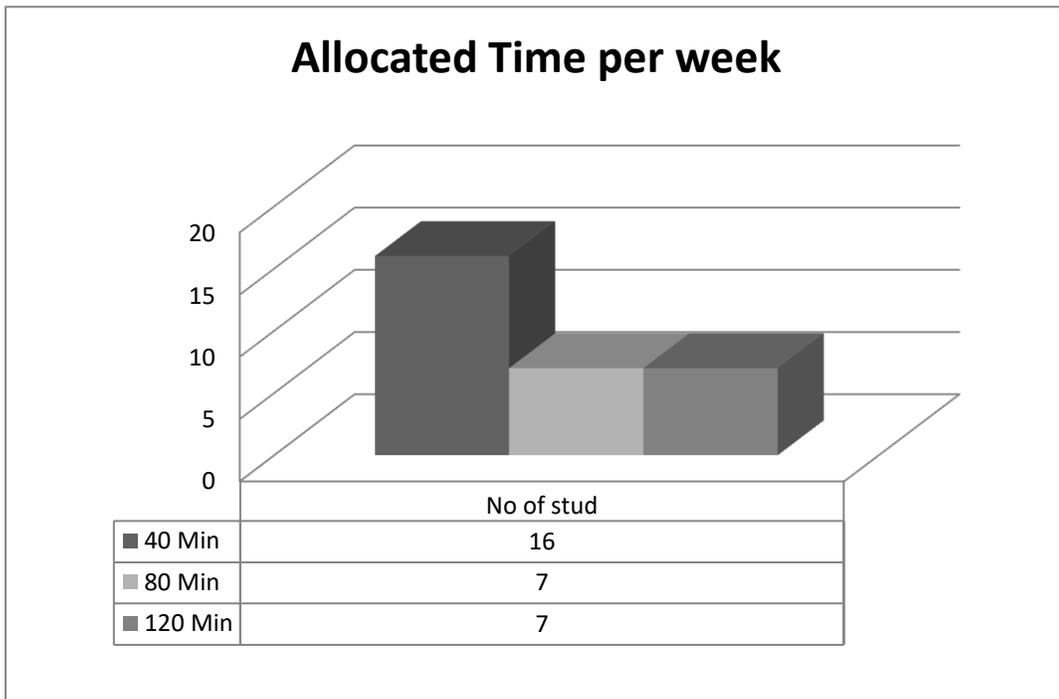


Figure 3.2: Time allocation for GIT

According to Figure 3.2, time allocation for GIT subject is not enough. Minimum 120 minutes should be allocated for advanced level students to follow GIT course. But here most of the students will not get that time period.

The number of student who is following private classes for GIT subject is shown below



Figure 3.3: Students who following private classes for GIT

According to Figure 3.4 only few students seem to be following private classes for GIT subject, other students are totally depending on the school to learn the subject. Most of the students know how to operate the computer.

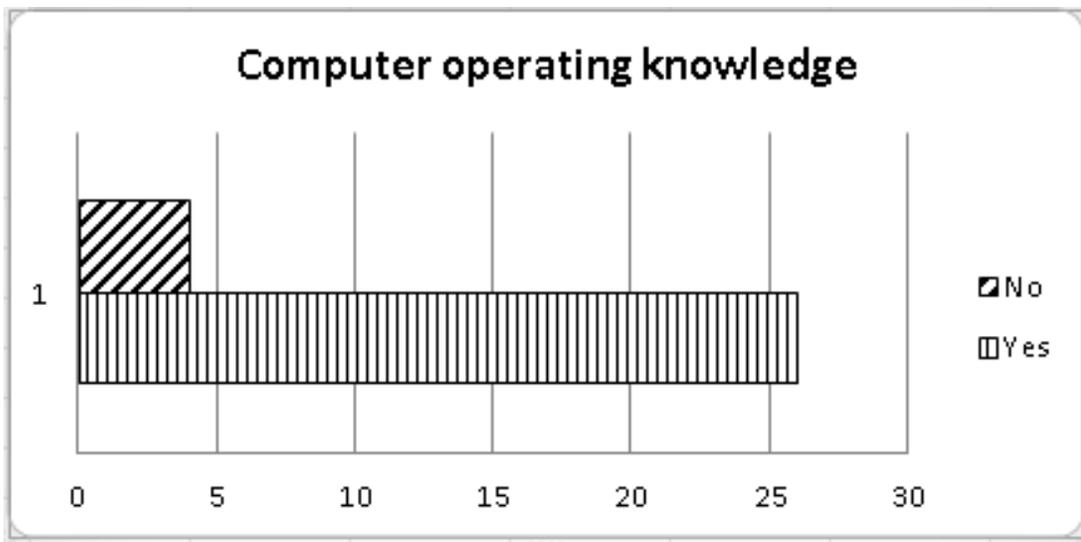


Figure 3.4: Computer operating knowledge

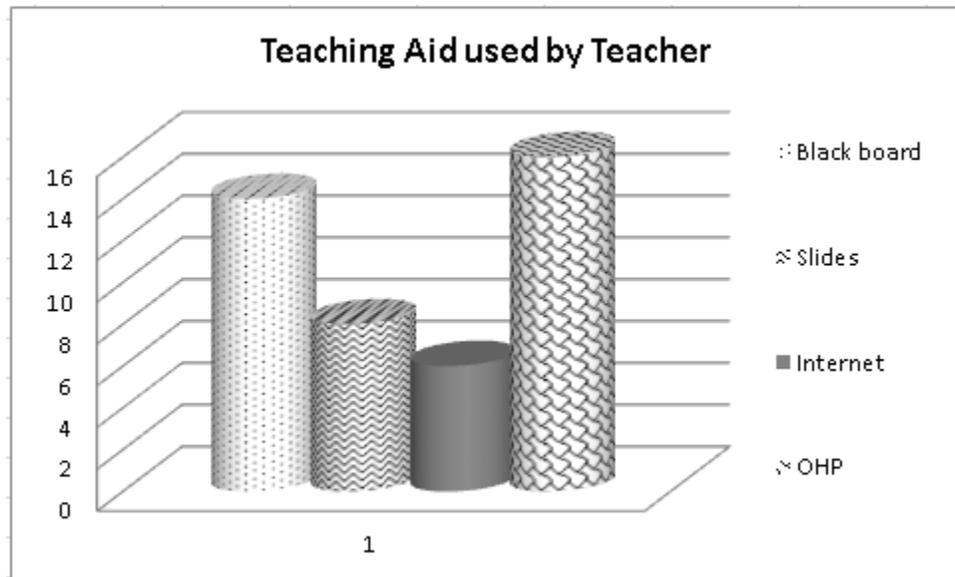


Figure 3.5: Teaching aid used by teacher.

Above chart (Figure 3.5) clearly shows that most of the time traditional black board and OHP used to teach the GIT subject.

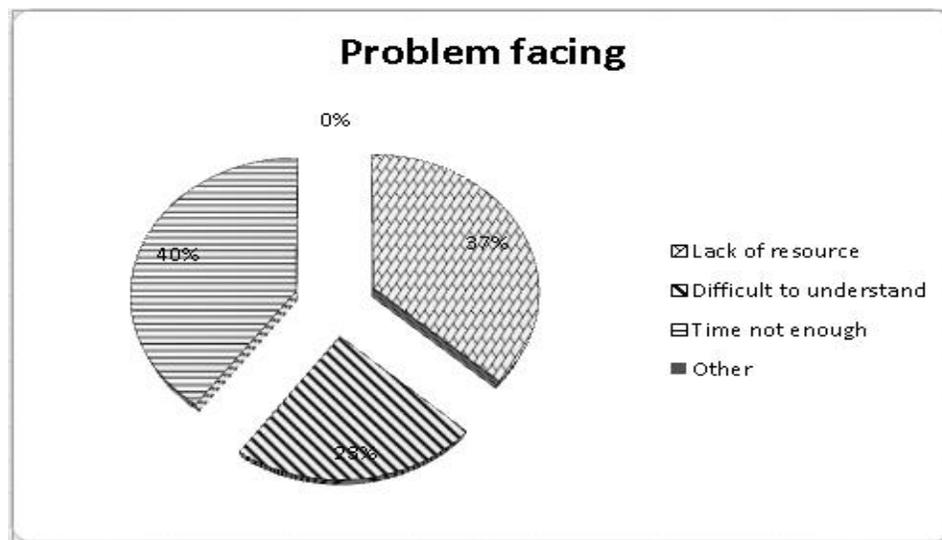


Figure 3.6: Problem facing

According to Figure 3.6, many students have mentioned that resources for this GIT course is not available. There are no proper books available in the market for GIT course. So, students have to depend on the teacher to learn GIT. But lack of Time allocation makes the situation worse. Teacher cannot cover the entire syllabus with-in a short time period.

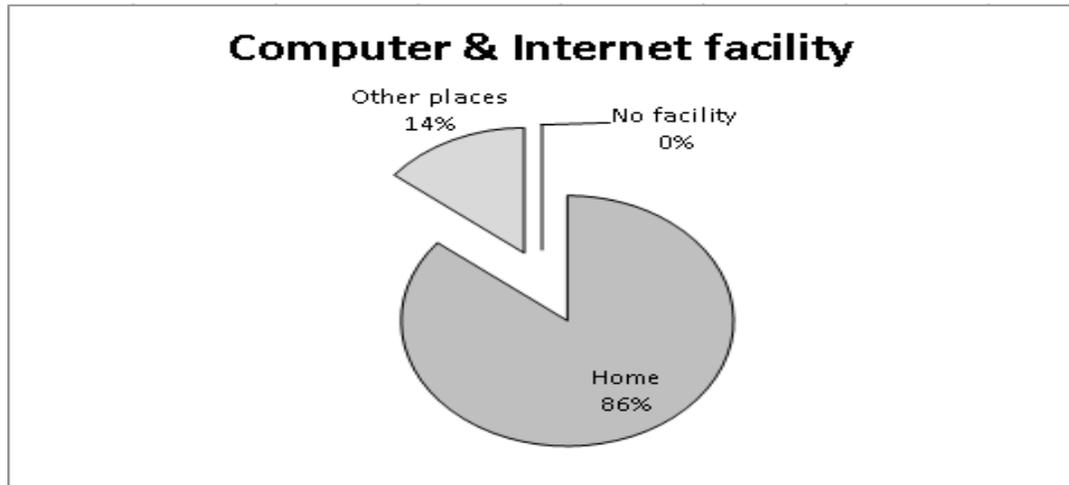


Figure 3.7: Available Computer and Internet facility

According to Figure 3.7, All most all of the students have access to the internet facilitated computers outside the school.

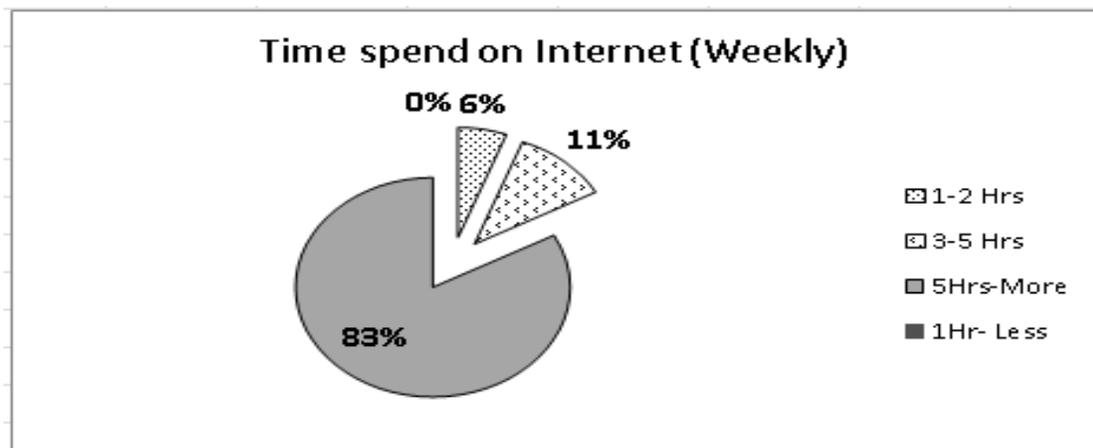


Figure 3.8: Time spend on internet per week

According to Figure 3.8, most of the students spend more than 1- 2 hours for internet per week.

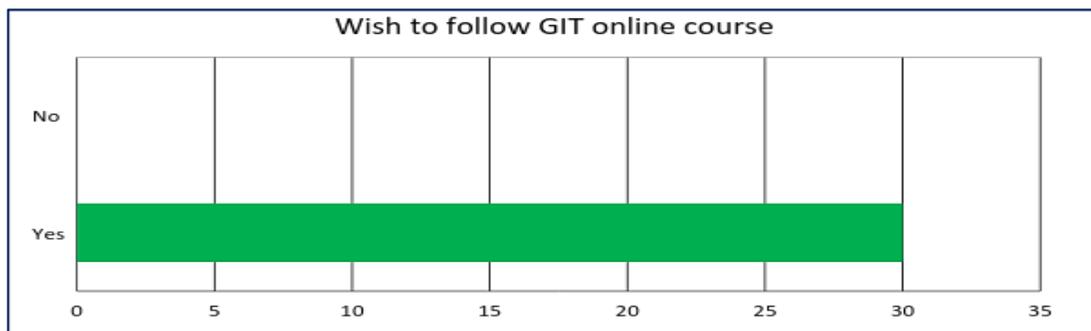


Figure 3.9: No of student prefer to GIT online course

The last question (question no 15) inquired about course topics that students need more help. Tick (☑) the section/s you would like to learn through the web based course.

- |  |   |
|--|---|
| <input type="checkbox"/> Explores the evolution of computers | <input type="checkbox"/> Number system and conversion |
| <input type="checkbox"/> Classifies computers                | <input type="checkbox"/> Logic gates and truth Tables |
| <input type="checkbox"/> Explores computer systems           | <input type="checkbox"/> Operating systems            |
| <input type="checkbox"/> Basic Computer Architecture         | <input type="checkbox"/> Office package               |
| <input type="checkbox"/> Computer networks                   | <input type="checkbox"/> Internet and services        |
| <input type="checkbox"/> Use of ICT in the society           | <input type="checkbox"/> Flow chart                   |

The answers for the above question are arranged in Table 3.1.

	Course topics	No of students	Percentage
1)	Explores the evolution of computers	06	20%
2)	Classification of the computers	05	17%
3)	Explores computer systems	06	20%
<b>4)</b>	<b>Computer Architecture</b>	<b>25</b>	<b>83%</b>
5)	Computer networks	02	7%
<b>6)</b>	<b>Number system and conversion</b>	<b>27</b>	<b>90%</b>
<b>7)</b>	<b>Logic gates and logic circuit</b>	<b>29</b>	<b>97%</b>
8)	Operating systems	06	20%
9)	Office package	02	7%
<b>10)</b>	<b>Drawing Flow chart to a problem</b>	<b>29</b>	<b>97%</b>
11)	Internet and services	01	3%
12)	Use of ICT in the society	02	7%

Table 3.1: Summary answers for the question No 15.

The above charts were created using summary analysed data collected via questionnaire. It shows that, all students have the facilities to use a computer with internet connection at least one hour per day. Users lack learning resources and time for GIT course and it is not enough to cover the syllabus. They are willing to learn through web based course in addition to the, normal class room method. Also the students mentioned the list of content (topics) they expect from this web based GIT course. Therefore it was decided to design a web based GIT course for Jaffna College students.

### 3.3 Learner Analysis

The learners for this course were G.C.E. Advanced Level students of Jaffna College. Information about the learners were collected and summarised through the survey, direct observation and interviews.

### 3.4 Teacher Analysis

Teacher analysis was conducted to gather the details of teachers to develop this web based GIT course. One ICT teacher available for teach ICT subject form grade 10 to advanced level classes. Interview was conducted to gather data from the Teacher.

### 3.5 Content Analysis

After analyzing the student's needs and contents of the G.C.E (A/L) GIT syllabus, contents for the course was selected. The whole G.C.E (A/L) GIT syllabus will not be considered in this project. According to the learners preference selected modules will be considered in this project, Selected modules covers 25 multiple choice questions (M.C.Q) out of 40 in part one examination paper and three questions out of five in part two GIT final examination paper.

### 3.5.1 Syllabus Outline of the GIT course

<b>Module</b>	<b>Topic</b>	<b>Hours</b>
1	Data representation methods. 1.1. Different Number systems 1.2. Relevant methods of number conversion	07
2	Logic gates for Boolean expression. 2.1. Basic Logic Gates 2.2. Draw the logic circuit for Boolean expressions.	09
3	Computer Architectures. 3.1. Block diagram of a computer system. 3.2. Computer slots and ports.	10
4	Flow charts for problem solving. 4.1. Symbols used in Flow chart. 4.2. Draw the flow chart	10
	<b>Total hours for the course</b>	<b>36</b>

Table 3.2: Syllabus outline for GIT course

### 3.5.2 Learning Outcome

On successful completion of this web based GIT course student will be able to:

- (i) Describe the computer block diagram.
- (ii) Recognize the devices in the computer system.
- (iii) Identify the different computer ports.

- (iv) Compare the different number systems.
- (v) Identify and draw logic gates for Boolean expression.
- (vi) Recognize the problem and draw flow charts to solve it.

### 3.5.3 Overview

This course introduces the concepts and theories of Information communication technology as well as provides the learner with the most essential knowledge to pass the final GIT examination.

### 3.5.4 Examination/ Requirements

The learners are expected to obtain knowledge on the concepts and applications of GIT. There will be an examination that will be held at the end of the course. Also there will be activities and practice quizzes. That may help to the students to check their subject knowledge. The scores of the practice quizzes are not counted for the final examination.

## 3.6 Course Map for the course

Content analysis was used to design the course map. It is similar to the flow chart and describes course contents were structured.

### 3.6.1 Course Map Level 1

Figure 3.10 shows the Level 1 course map for the entire Web based GIT Course.

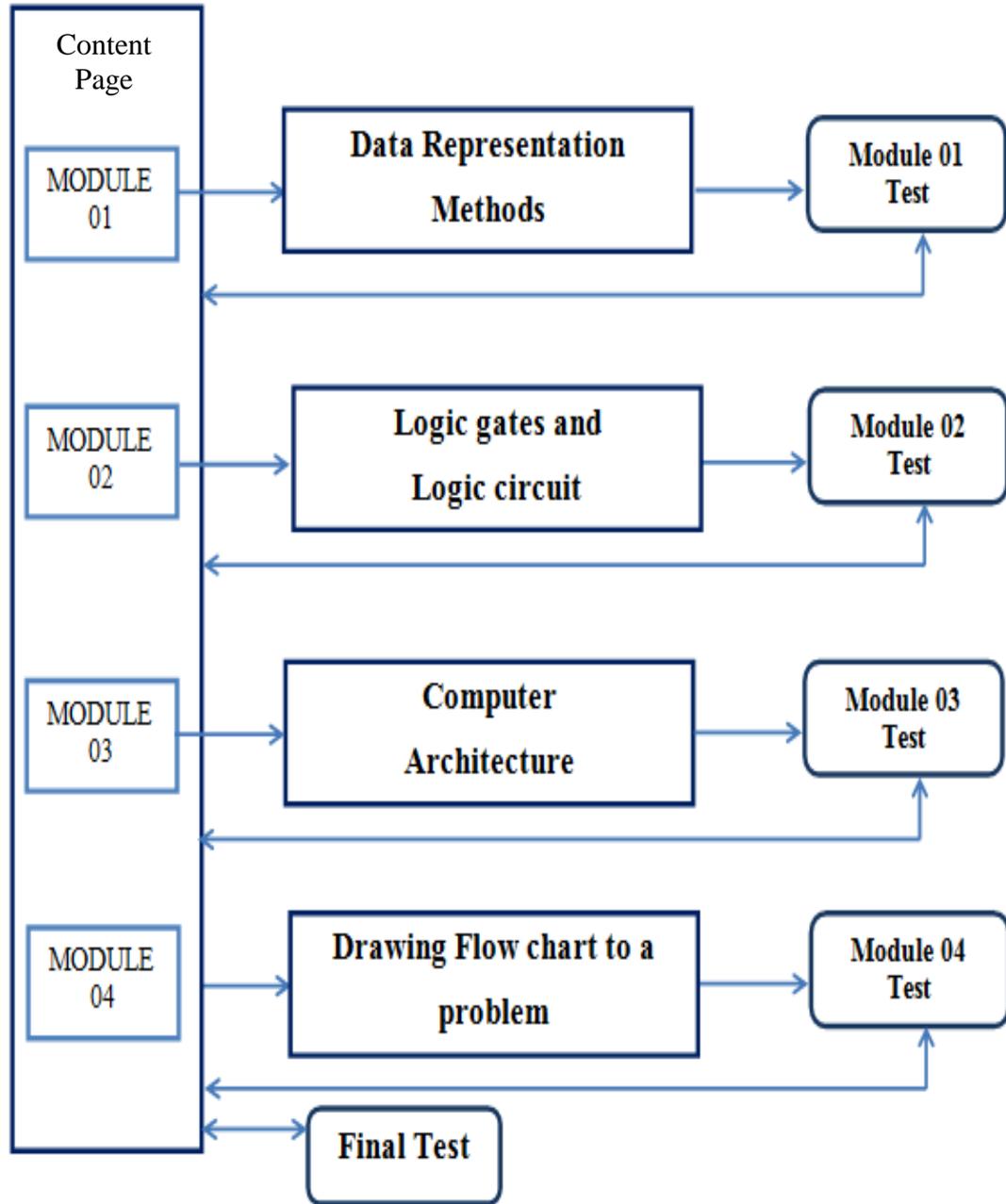


Figure 3.10: Level 1 course map

### 3.6.2 Course Map Level 2

Course Map Level 2 is derived from Course Map Level 1. Course Map Level-2

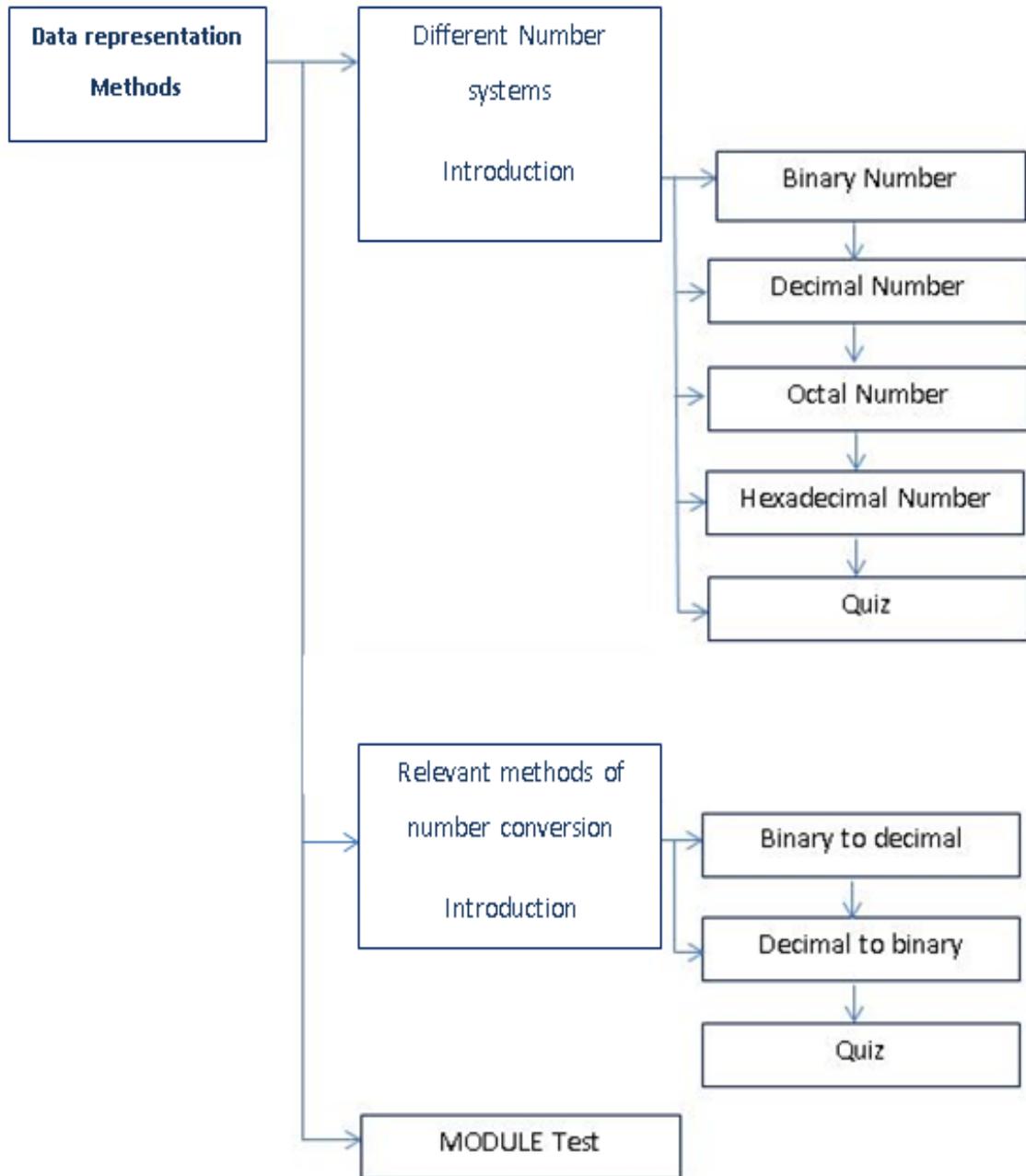


Figure 3.11: Course map level 2

Course map for other modules was designed similar to the above level 2 map. See the appendix B.

### 3.7 SWOT Analysis

Findings of the Strengths, Weakness, Opportunities and Threats (SWOT) analysis for Jaffna College is presented below Figure 3.12.

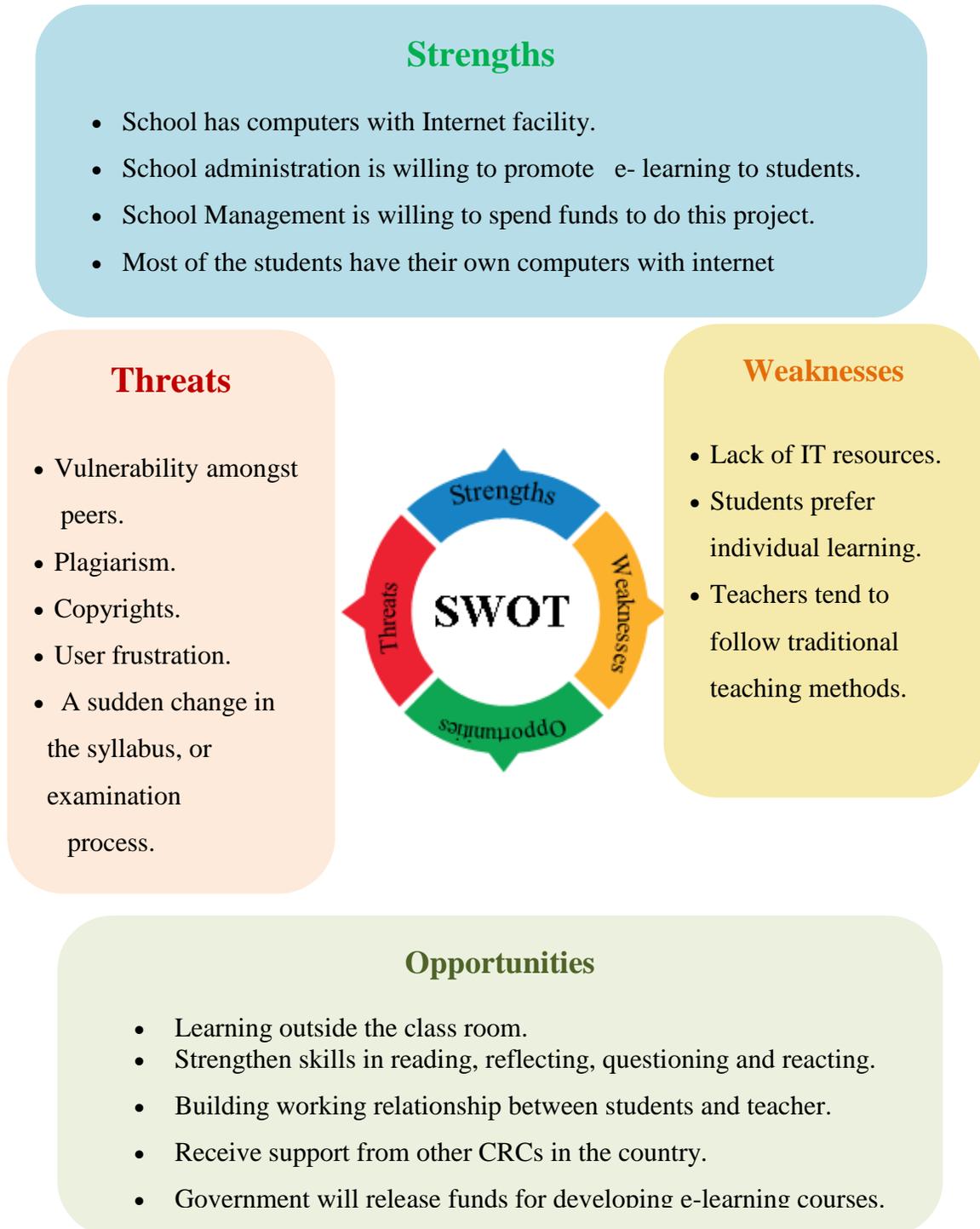


Figure 3.12: SWOT analysis

### 3.8 Technical and Software Requirements of the System

Following section describe software and hardware requirements of the proposed system.

#### Hardware Requirements

- Minimum 2 Gigahertz(GHz) Dual Core processor.
- Minimum 1 Gigabyte (GB) RAM
- 50GB available hard disk space.
- Speaker / Headphone
- Internet connection

#### Software Requirements

- Windows Operating system
- Web Browser
- Flash Player
- Acrobat Reader/ PDF reader

## Chapter 4: Design

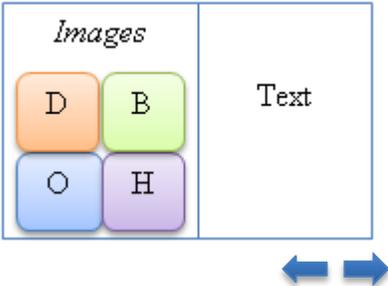
This chapter covers the design part based on the identified learner requirements. Dale's Cone of Experience theory [11] has used to design interactive learning contents in this web based course, in order to provide good learning experience to the learner.

### 4.1 Storyboard

Storyboard is a sketched version of the course content design. Storyboard can be considered as a blueprint of the course content development. Because, storyboard including the details about the each and every screen of the final product. So overall course content designing is depend on the storyboard. Therefore, before starting the development of the final product storyboard has to be checked and corrected properly [17].

Each section of a lesson has few interactive activities and at the end of it, there is a quiz. Quizzes will help learners to check their knowledge, that they gained by the course. Activities help them to apply they learned to improve their knowledge.

#### Top level story board for lesson 1.1

Visual	Explanation
<p><b>Introduction</b></p> 	<p>This page contains an introduction video to the number systems.</p> <p>There will be a next button to move to the next page.</p>
<p><b>Different number systems</b></p> 	<p>This page describes about different number systems. Images will be displayed related to different number systems. Textual description will be displayed for decimal, binary, octal and hexadecimal numbers. Next and previous buttons will be there to move.</p>

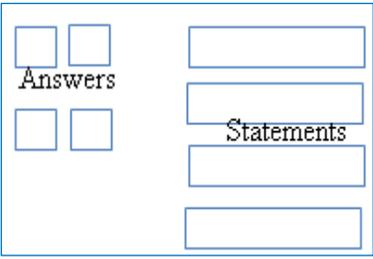
<p><b>Activity</b></p> <p>Drag and drop activity will be provided.</p> 	<p>A drag and drop activity will be provided relate to the number system lessons. This activity is provided to enhance the interactivity of learners with the system.</p>
<p><b>Quiz</b></p> <p>Multiple choice questions</p>	<p>Checks whether the Learner has acquired the skills about different number system.</p>

Table 4.1: Story board plan.

### 4.3 Detail Storyboard

Details Storyboard is a visual representation of the story board plan. Sketches on the story board plan were improved by adding detail information about them and converted all diagrams to detail storyboard. It helps the developers to create the interactive lessons.

<b>Course Name:</b> <i>Web based GIT course</i>		<b>Storyboard File no.</b> 01.01.01
<b>Course section:</b> 1.1		
<b>Lesson Name:</b> Introduction to number systems.		<b>ID's name:</b> R Sugumar
<b>Objective(s):</b> Learner will be able to identify the different number systems.		<b>SME's name:</b>
<b>Page Title:</b> Introduction	<b>Page no.</b> 01	<b>CD's name:</b>
<b>Date Designed:</b> 14.09.2016		<b>Date verified:</b> 16.09.2016

### Design

## Introduction to different number systems



### Special Comment(s):

- i) Font -Georgia, Color – Blue, Size – Heading:18, Sub heading:13, Text:12
- ii) When the user clicks next button it should load page 01.01.02
- iii) Audio control panel will be displayed on the bottom of the screen.

<b>Page Title:</b> <i>Different Number systems</i>	<b>Page no.</b> 01.01.02	<b>SME's name:</b>
<b>Date Designed:</b> 14.09.2016		<b>Date verified:</b> 16.09.2016
<b>Design:</b>		
<div style="border: 1px solid black; padding: 2px; display: inline-block;">EXIT</div>		
<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <b>Different Number systems</b> </div> 	<p>Uses TEN different symbols. Least value is 0</p> <p>The digit on the left has the greatest value.</p> <p>The digit on the right has the least value.</p> <p>Decimal numbers are represented with a suffix 10.</p> <div style="text-align: right; margin-top: 20px;">  </div>	
<b>Special Comment(s):</b>		
<ul style="list-style-type: none"> <li>i) Select an image to display the details of a number system.</li> <li>ii) Add back ground sound.</li> <li>iii) Exit button to close the page.</li> <li>iv) When the user clicks back button it redirects the previous page.</li> </ul>		

Table 4.2: Detail story board for course

Page Title: Activity	Page no. 01.01.03	SME's name:
Date Designed: 14.09.2016		Date verified: 16.09.2016
Design		
<div style="border: 2px solid black; border-radius: 15px; padding: 10px; text-align: center;"> <p>DRAG the name labels from left side and DROP it on the block right side.</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="display: flex; flex-wrap: wrap; gap: 10px;"> <div style="background-color: #6a3d9a; color: white; padding: 10px 20px; border-radius: 5px;">BINARY</div> <div style="background-color: #6a3d9a; color: white; padding: 10px 20px; border-radius: 5px;">DECIMAL</div> <div style="background-color: #6a3d9a; color: white; padding: 10px 20px; border-radius: 5px;">OCTAL</div> <div style="background-color: #6a3d9a; color: white; padding: 10px 20px; border-radius: 5px;">HEXA DECIMAL</div> </div> <div style="display: flex; flex-direction: column; gap: 10px; align-items: center;"> <div style="border: 1px solid #000; border-radius: 10px; padding: 10px 20px; text-align: center;">0 -9, A- F</div> <div style="border: 1px solid #000; border-radius: 10px; padding: 10px 20px; text-align: center;">0, 1</div> <div style="border: 1px solid #000; border-radius: 10px; padding: 10px 20px; text-align: center;">0 -7</div> <div style="border: 1px solid #000; border-radius: 10px; padding: 10px 20px; text-align: center;">0 -9</div> </div> </div> </div>		
<input type="button" value="SUBMIT"/>		
<p>Special Comment(s):</p> <ul style="list-style-type: none"> <li>i) User should drag and drop the correct answer on the correct statement.</li> <li>ii) By clicking submit button answers can be checked.</li> <li>iii) Correct answers should be set as given below. <ul style="list-style-type: none"> <li>Binary – statement 2,</li> <li>Decimal – statement 4,</li> <li>Octal – statement 3,</li> <li>Hexadecimal - statement 1</li> </ul> </li> </ul>		

Table 4.3: Detail story board for activity

## Chapter 5: Development and Implementation

### 5.1 Developing Tools

Different tools can be used to design the various types of files depending on the developers need. The Following tools used to design and develop this web based course project.



#### **Powtoon Studio**

Powtoon is a platform to create a short quick animation for free [18]. Animation can be combined with narration, embedded videos and music. Powtoon gives quick, intuitive way to create simple but effective message.



#### **Natural Reader 14**

Natural Reader is text to speech software with natural sounding voices. This software can convert typed text files such as MS Word, PDF files into spoken words. Also, converts any written text into audio files. But free version hasn't got that feature. Natural Reader premium version has many other functions, such as OCR. OCR function can convert printed characters into digital text and it is up to 99% accurate [19].



#### **GIMP 2.8**

GNU Image Manipulation Program is free, open source software. This is similar to Adobe Photoshop and can be used for image editing, free form drawing, cropping, and converting between different image format and many more [20].



## **Articulate Storyline 2**

Articulate Storyline 2 has numerous features that give more user friendly easy to use interfaces this makes e-Learning simple. The power point style user interface will make new user to feel familiar to build his/her content design. But it may take more time to become an expert content designer using articulate. Many features are available to produce fantastic learning contents. The following content publishing options available in articulate Web hosted online service, SCORM content, CD or MS Word [21].



## **AVIDEMUX**

### **Avidemux**

Avidemux is a free video editor designed for simple cutting, filtering and encoding tasks. It supports many file types, including AVI, DVD compatible MPEG files, MP4 and ASF, using a variety of codecs [22].



Audacity is a free open source digital audio editor and recording computer software application, available for Windows, Linux and other operating systems. Audacity can be used for post-processing of all types of audio, including podcasts by adding effects such as normalization, trimming, and fading in and out [23].



### **Content generator**

Content generator programs allow anyone to generate their own e-Learning quizzes, games and applications through this custom software - no coding required [24].



## **Moodle**

Moodle is a learning platform designed to provide educators, administrators and learners with a single robust, secure and integrated system to create personalised learning environments. A simple interface, drag-and-drop features, and well-documented resources along with ongoing usability improvements make Moodle easy to learn and use. Moodle is provided freely as Open Source software, under the GNU General Public License [25].

### **5.2 Implementation of the LMS**

In this project Moodle learning management system is used to interact with the learners. Course contents are developed as SCORM packages and the SCORM packages uploaded to Moodle LMS which was installed in WAMP server.

### **5.3 Developing Course materials**

This project is to enhance the learner's knowledge about general information communication technology. The learners of this web based GIT course are Jaffna college students. Therefore interactive course materials developed for this project.

Powtoon studio and Avidimux used to create the videos for this GIT course. Some videos embedded into SCORM package using Articulate Storyline2. Also, Articulate Storyline used to create interactive lessons, activities and quizzes. Audacity used to record and edit the audio files. Content generator used to design fun quizzes.

## LMS login page



Figure 5.1: User login screen

Figure 5.1 illustrate the user login page for the Web based GIT course. Which allow the users to login to the web based GIT course.

## Course page

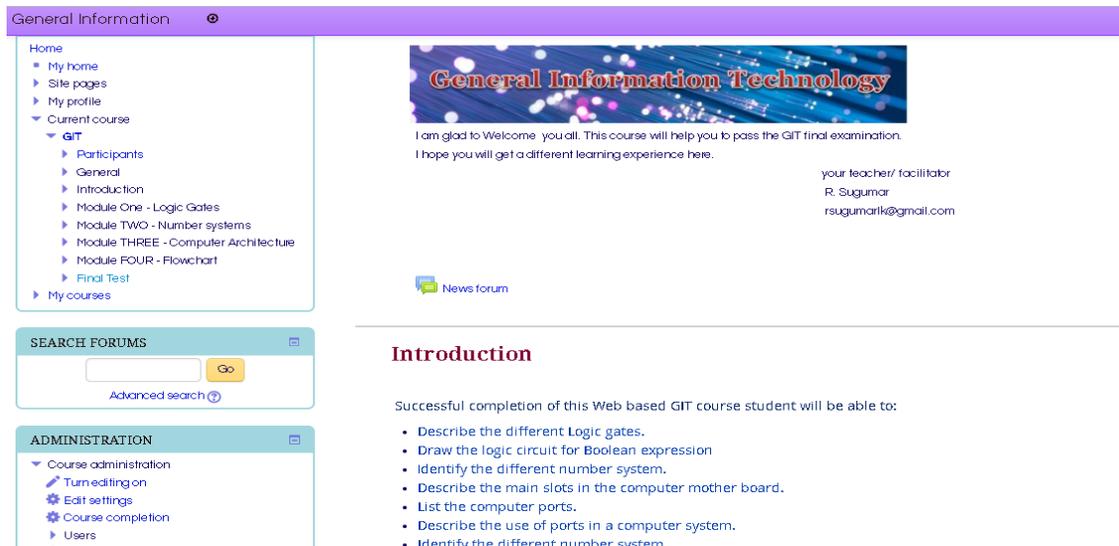


Figure 5.2: GIT course Front page

Figure 5.2 illustrate the front page of the web based GIT course. Simple theme was chosen to present the content. All the content delivered in English. The modules are

divided into lessons and each module contains different learning materials such as SCORM packages, forums, assignments and PDF files.

### Activities

Most of the lessons were designed in SCORM packages. This includes different type of activities such as Matching activities, Drag and drop activities. Also fun quiz activities were used to retain learner's consideration on lesson. Figure 5.3 illustrate a quiz activity and figure 5.4 shows a drag and drop activity. See Appendix- E for more course screen shots.

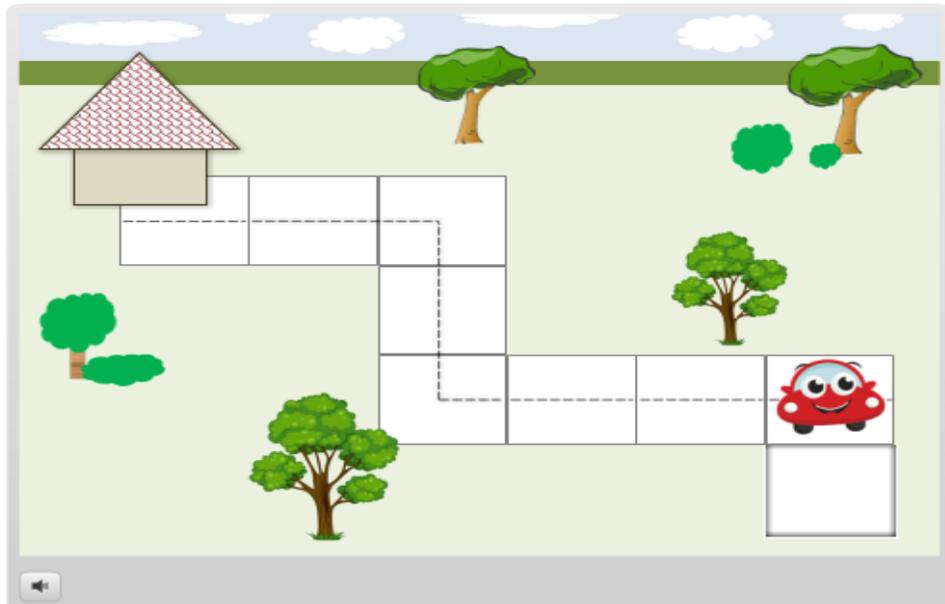


Figure 5.3: Activity designed using Articulate Storyline

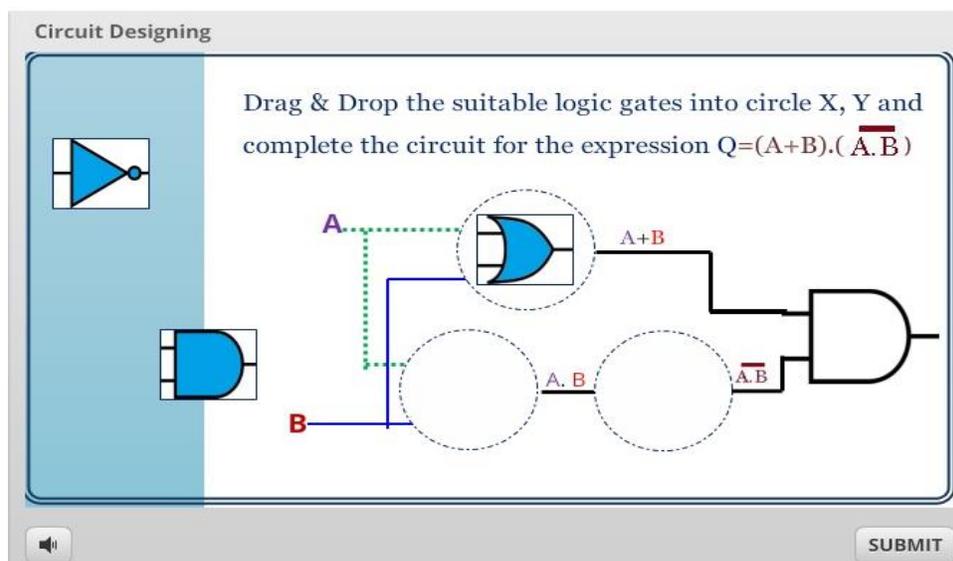


Figure 5.4: Activity for logic gates

## Quizzes

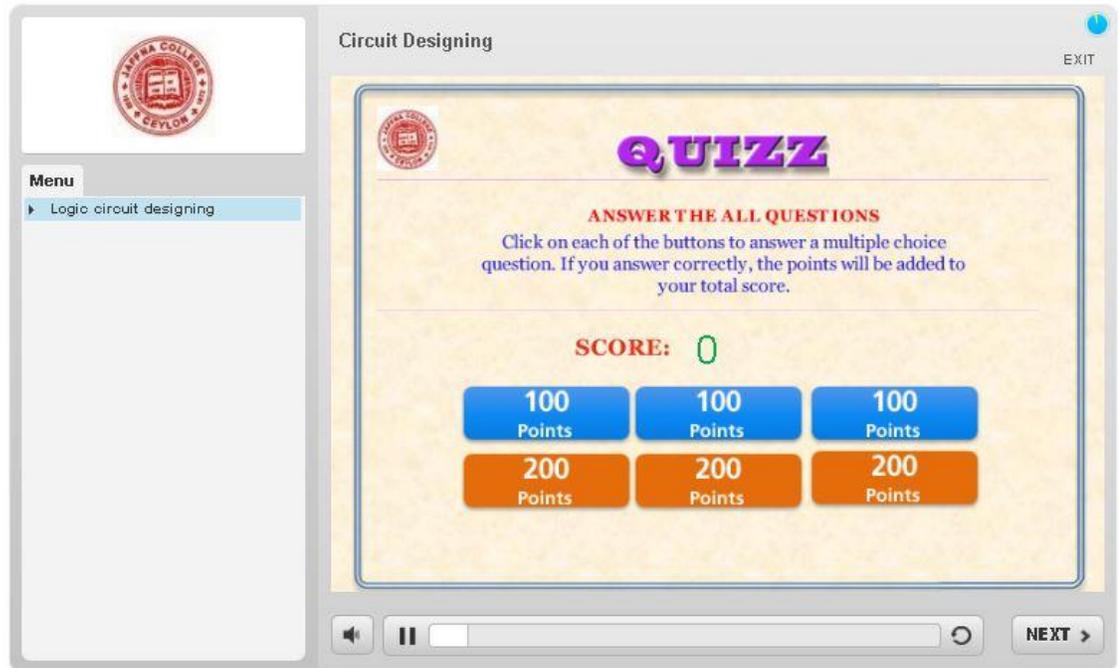


Figure 5.5: Quiz for Logic gates

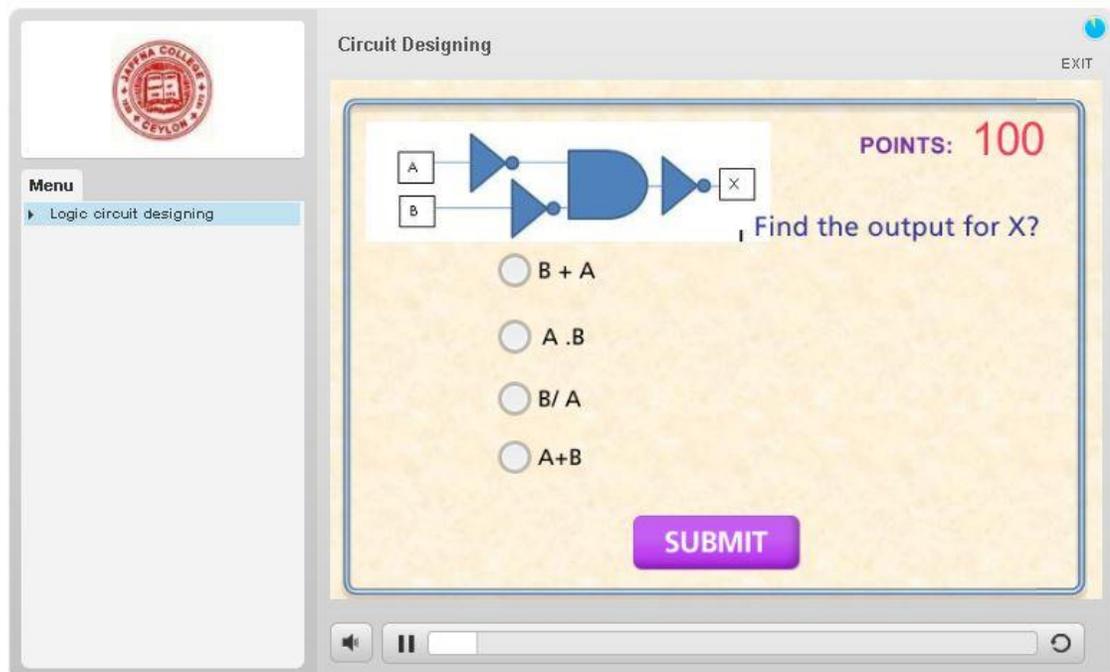


Figure 5.6: Logic gates Quiz

## **Chapter 6: Course Evaluation**

The goal of this web based course evaluation is to evaluate the learner's interaction and gather their feedback on learning contents.

### **6.1 Methodological Approach**

Quantitative and qualitative approaches are the two broad evaluation methods used in evaluation process of the product [26].

#### **Quantitative Method**

This method is used to analyze numerical data and measurements. The results obtained using statistical methods. Anyone who analyzes the same situation should get the same results.

#### **Qualitative Method**

This method is used to analyze non numerical data such as photograph, Sound and animations or videos. We can use this method to analyze the data by non-statistical methods. In-order to gather

### **6.2 Type of evaluation**

The formative and summative evaluations method can be used to do evaluation, depending on the objective purpose of evaluation one can select summative evaluation approach. Formative evaluation method was used during the project development time and summative evaluation method was used to assess the project at the end. In order to evaluate the Web based GIT course summative evaluation method was used.

### **6.3 Sampling**

LMS account was created using Moodle cloud and the course materials were uploaded to that cloud account ([www.jcict/moodlecloud.com](http://www.jcict/moodlecloud.com)). Then the users have access to the course material at any time and practice it in a real environment without any disturbance. In order to get the feedback students were informed about the online course and they were given access to use the course. The evaluation questionnaire was prepared using Google form and uniform resource link (URL) was emailed to them. Twelve students

have completed the questionnaire. The questionnaire used to gather data from the group is in the Appendix C.

## 6.4 Analysis of the Results

User evaluation comments were collected and results for below factors were analyzed and presented in the tables and charts. Detailed charts depicted in Appendix D. Following Table 6.1 represent the summary of the collected results.

Factors	Overall Results	
	Excellent	Very good
<b>Visibility of content</b>		
User friendly	33%	58%
Contents were organized	67%	25%
Designed properly	25%	58%
<b>Learnability and accessibility</b>		
Helps to learn GIT in interesting way	58%	33%
Course contents were interactive	50%	42%
<b>Navigation structure and flexibility of use</b>		
Learning environment has better navigation	50%	42%
GIT course was easy to follow	67%	25%
<b>Effectiveness &amp; satisfaction</b>		
Relevant to GIT syllabus.	75%	25%
Qualities of lesson were good	67%	33%
Provides enough quizzes and activities	50%	42%
Did this course meet your expectation?	25%	50%

Table 6.1: Results of e-Learning environment evaluation

The analyses results depicted in charts (Figure 6.1-6.4). According to Figure 6.1, all most all of the learners have mentioned that course contents visibility is good.

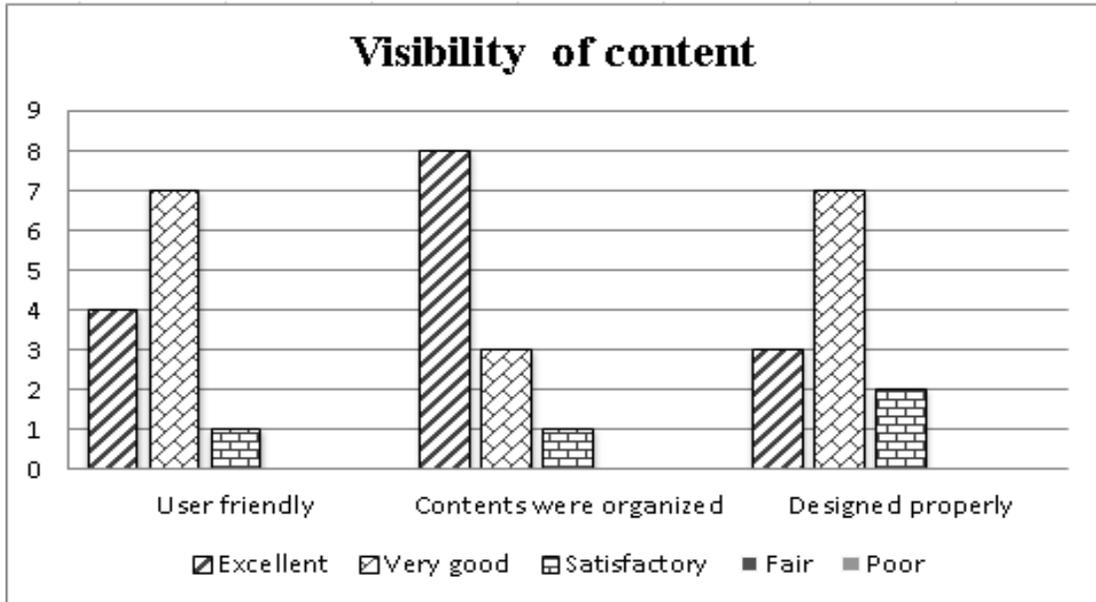


Figure 6.1: Visibility of content

According to Figure 6.2, many learners accepted learnability and accessibility of the course content is excellent.

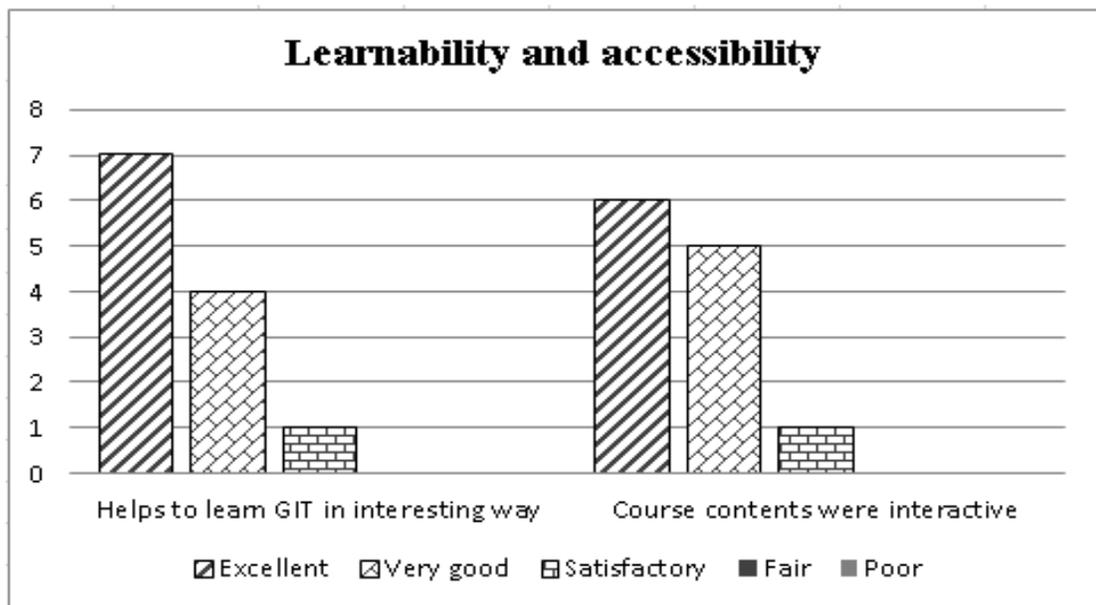


Figure 6.2: Learnability and accessibility

According Figure 6.3, Most of the learners said learning environment has better navigation and GIT course was easy to follow.

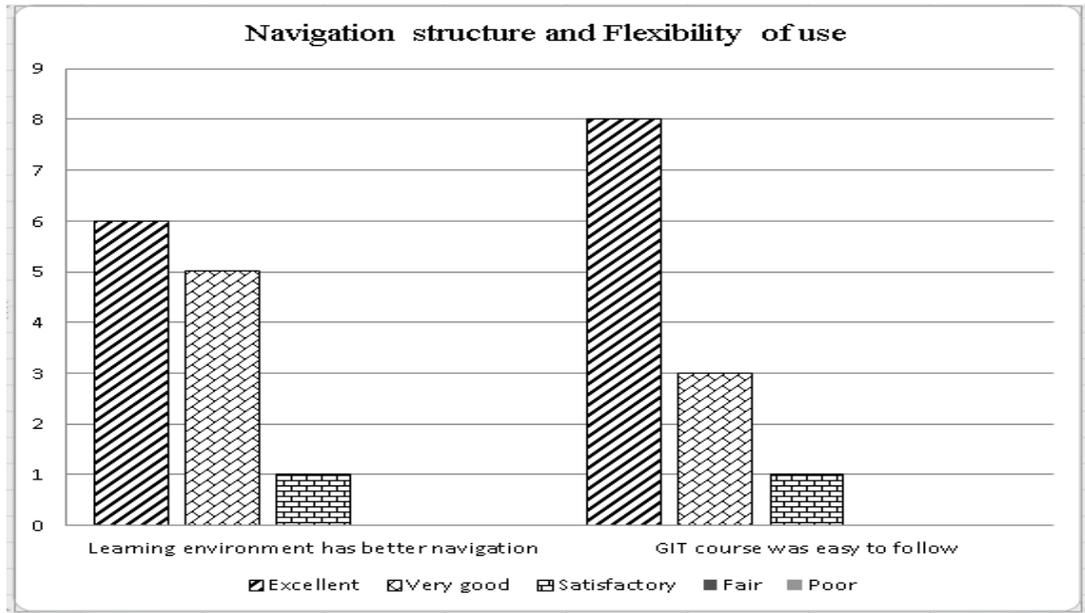


Figure 6.3: Navigation structure and flexibility of use

According to Figure 6.4, all most all of the learners have mentioned that course contents effectiveness and satisfaction is good.

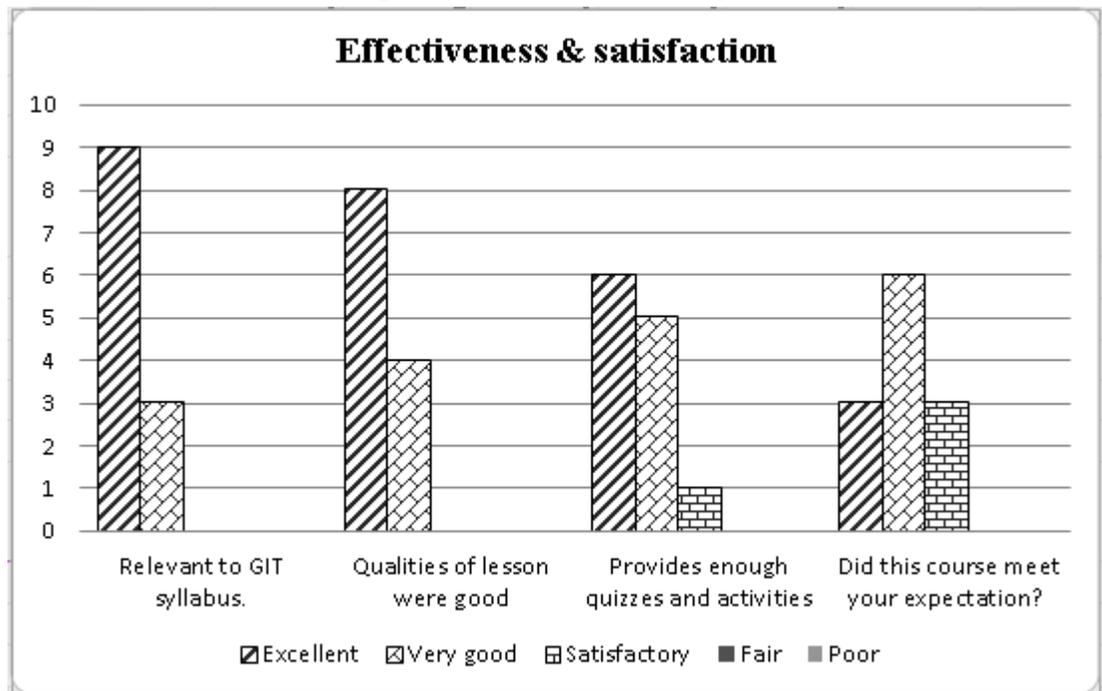


Figure 6.4: Effectiveness and satisfaction

User evaluation comments indicated that users like the web based General Information Technology course. Evaluation results were positive. Some participants of the evaluation were given their additional comments and suggestions on this e-Learning course. Their comments and suggestions are below.

- 1) Have to add more quizzes and activities for each lesson.
- 2) Better to re-record the voice to improve the sound quality.

## **Chapter 7: Conclusion and Future Works**

### **7.1 Difficulties in selecting software**

The development work Articulate Storyline, Audacity, Natural Reader and Avidemux software's were used. But number of other software has to be studied. That took a long time, designing part took several circles of improvement. so when they were improving and then changing, the software that are required for developing learning contents that took long time for the development process.

In order to implementing the LMS, I went through different articles and search to find what sort of software will be better and working with that also I had to spend long time studying the software.

### **7.2 Lesson learned**

Many new skills such as preparing questionnaires for evaluation, Data collecting and analyzing, drawing course maps, story boards, editing audios, pictures, videos and content designing were developed and skills gained were practices throughout this project.

### **7.3 Future Work**

This project is done for the Grade 12 students of Jaffna College to provide interactive course contents to carry on their learning on their own. GCE A/L GIT syllabus consists with four lessons for grade 12. Based on the feedback given by the learners Interactivity of the course materials, activities and voice script files will be improved.

This Web based GIT course is developed in English medium. But most of the students are following in Tamil medium at Jaffna College. Therefore it is better to develop this Web based GIT course in Tamil medium, also all the other lessons will be developed and integrated with the e-Learning course as future developments.

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- [26]Methodological Approach.[Online].Available: <https://ncsu.edu/ffci/publications/2011/v16-n1-2011-spring/vaterlaus-higginbotham.php>

## Appendix A – Learner analysis Questionnaire

The following questionnaire is for your benefit only. To find out whether Web based learning is suitable for you. All the information you are provided in this survey will not be disclosed to anyone and your privacy will be protected. Please underline the most suitable answer/s.

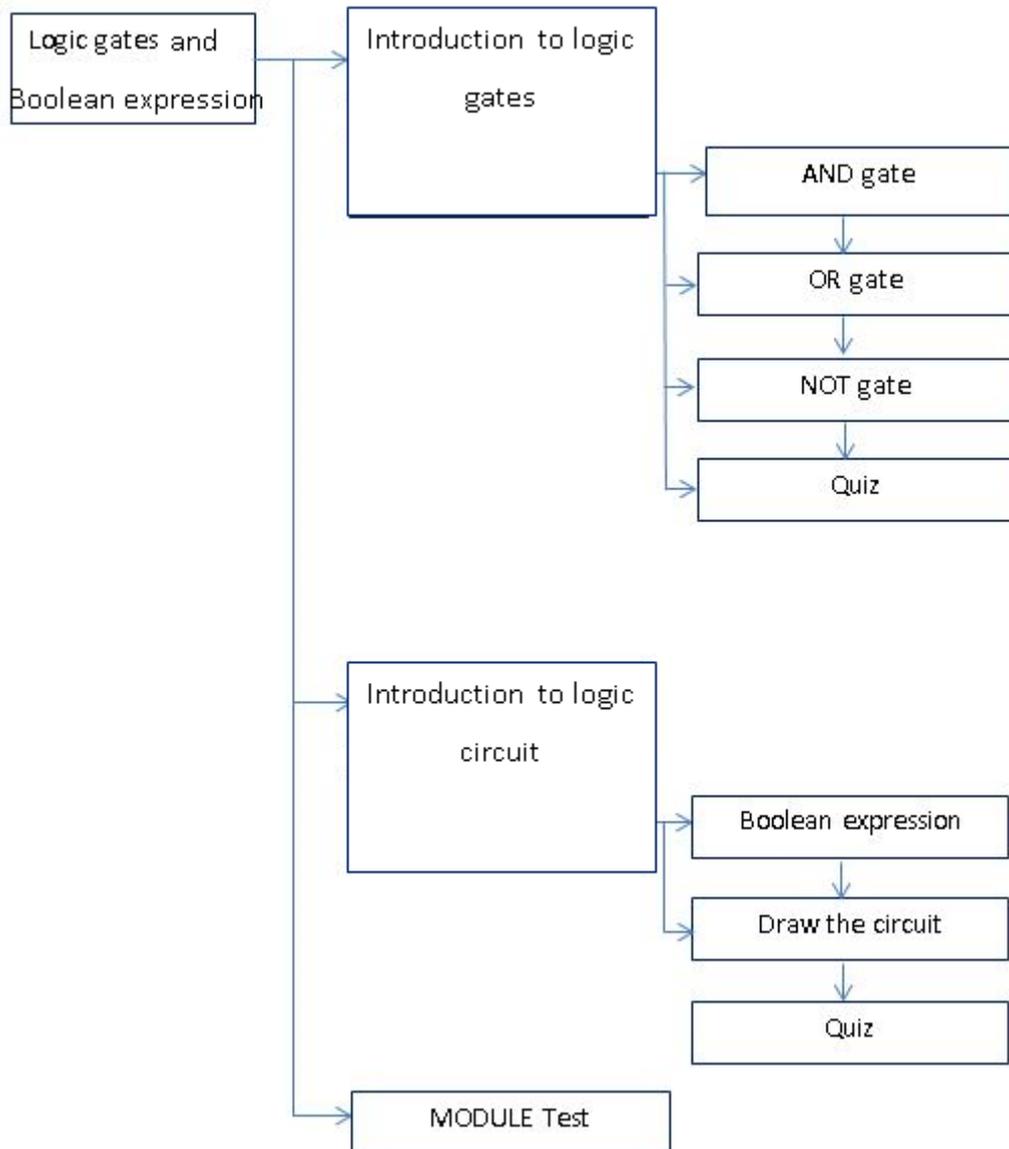
- 1) What stream you are following in G.C.E A/L?
  - a) Science
  - b) Mathematics
  - c) Commerce
  - d) Arts
  
- 2) What is the time duration allocated for GIT subject per week?
  - a) 40 Min
  - b) 80 Min
  - c) 120 Min
  - d) Other (specify).....
  
- 3) Do you follow any extra classes for GIT in any private institute?
  - a) Yes
  - b) No
  
- 4) Have you got any basic knowledge to operate a computer?
  - a) Yes
  - b) No
  
- 5) What are the resources your teacher used when teaching this subject?
  - a) Black board
  - b) Slide shows
  - c) Internet facility
  - d) Other (specify).....
  
- 6) Which method do you prefer more?
  - a) Just explaining
  - b) Doing activities
  - c) Self-learning
  - d) Other (specify).....
  
- 7) What are the problems facing when you learning?
  - a) Lack of resource
  - b) Difficult to understand
  - c) Time not enough
  - d) Other (specify).....
  
- 8) What facilities not available in your school computer Lab?
  - a) Everything there
  - b) Internet facility
  - c) Necessary software
  - d) Other (specify).....
  
- 9) Do you own a computer at your home?
  - a) Yes (*If you select YES, go to question No16.*)
  - b) No

- 10) Do you have facility to use the computer anywhere else?  
a) Yes  
b) No (*If you select NO, skip other questions and go to question 14*)
- 11) If you don't have a computer at home, then where you can use the computer?  
a) School computer  
b) Relatives computer  
c) Friends computer  
d) Other .....
- 12) Can you access the internet facility?  
a) Yes  
b) No
- 13) How many hours you spent on internet per week?  
a) 1 – 2 hours  
b) 3- 5 hours  
c) More than 5 hours  
d) Less than 1 hour.
- 14) Do you like to learn GIT through web based course?  
a) Yes  
b) No
- 15) Tick () the section/s you would like to learn through the web based course.
- Explores the evolution of computers
  - Classifies computers
  - Explores computer systems
  - Computer Architecture
  - Computer networks
  - Number system and conversion
  - Logic gates and truth Tables
  - Operating systems
  - Office package
  - Internet and services
  - Flow chart
  - Use of ICT in the society

\*\*\*\*\*

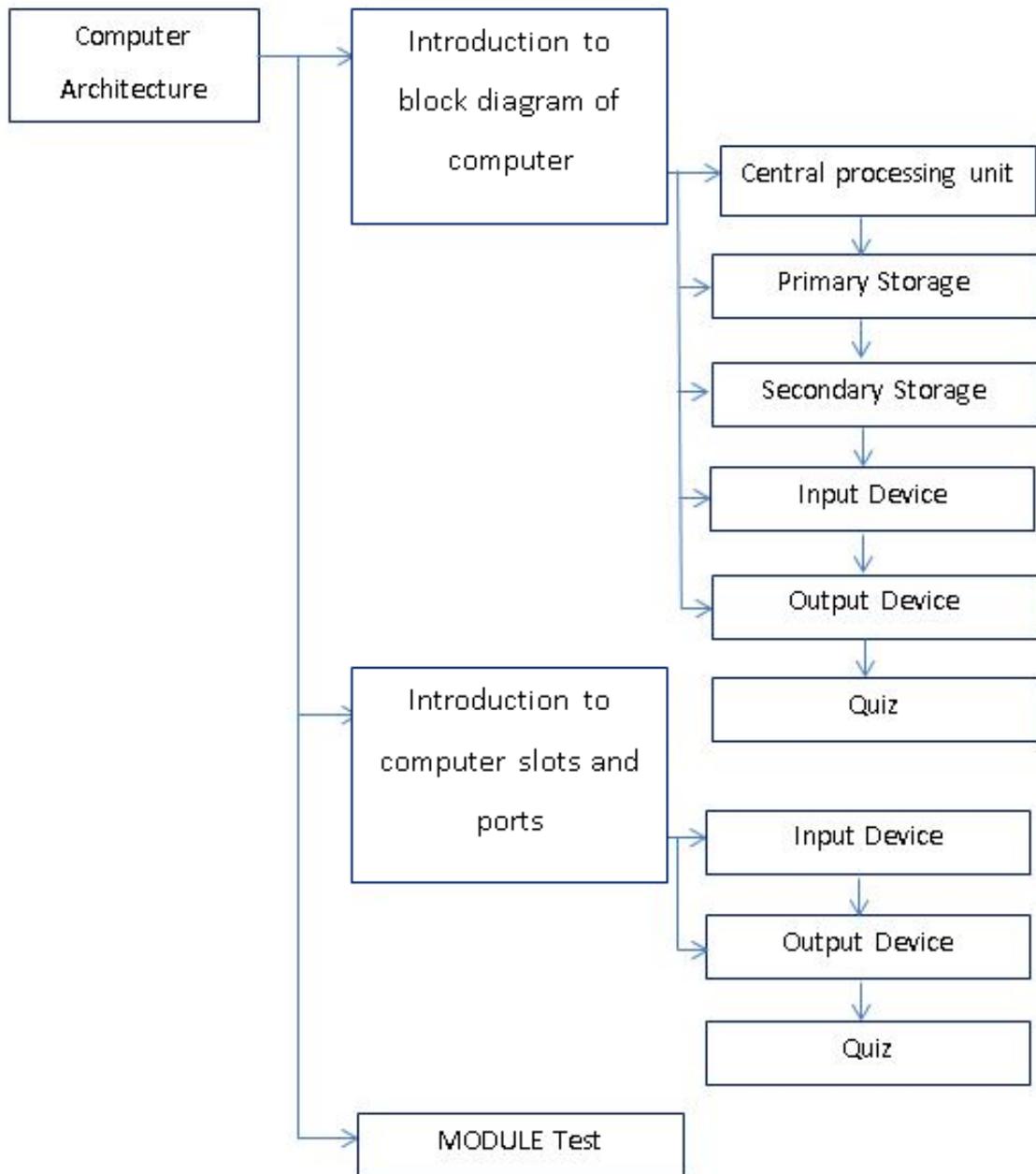
## Appendix B - Course Maps

### Course map for module 2



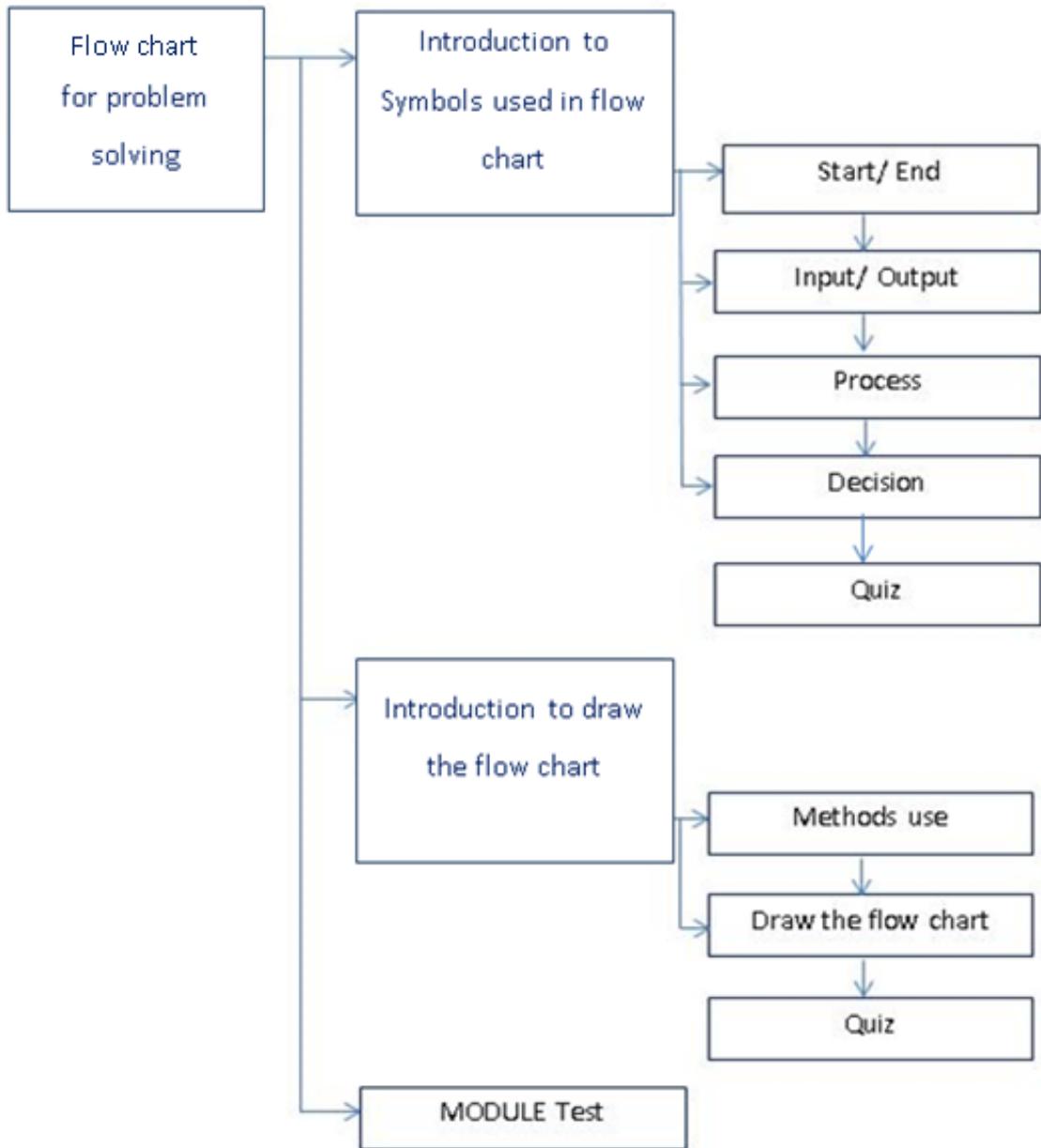
Course map Level 2 for module 2

### Course map for module 3



Course map Level 2 for module 3

## Course map for module 4



Course map Level 2 for module 4

## Appendix C - Course Evaluation Questions

The following is an evaluation survey for the Web based GIT course. In order to evaluate the effectiveness of the course and provide a better learning experience for future students, please spend few minutes and complete the following survey.

Your participation in the evaluation survey is voluntary. You may or may not choose to answer any question and you are allowed to stop answering the questions. Information that you are provided will not be disclosed to anyone. Privacy will be protected. We ask for your participation for evaluation purposes only.

	Excellent	Very good	Satisfactory	Fair	Poor
--	-----------	-----------	--------------	------	------

### Visibility of content

- |   |                          |                          |                          |                          |                          |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 1) The interface and learning environment is user friendly        | <input type="checkbox"/> |
| 2) Lesson contents were organized in correct order                | <input type="checkbox"/> |
| 3) Lessons were designed using proper font size, colour and style | <input type="checkbox"/> |

### Learnability and accessibility

- |   |                          |                          |                          |                          |                          |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 4) GIT course helps to learn GIT in interesting way | <input type="checkbox"/> |
| 5) Course contents were interactive                 | <input type="checkbox"/> |

### Navigation structure

- |  |                          |                          |                          |                          |                          |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 6) Course learning environment has better navigation | <input type="checkbox"/> |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|

### Flexibility and efficiency of use

- |                                  |                          |                          |                          |                          |                          |
|----------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 7) GIT course was easy to follow | <input type="checkbox"/> |
|----------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|

### Effectiveness & satisfaction

- |   |                          |                          |                          |                          |                          |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 8) Lessons were relevant to GIT syllabus. | <input type="checkbox"/> |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|

9) Qualities of lesson were good

10) Course provides enough quizzes and activities

11) Did this course meet your expectation?

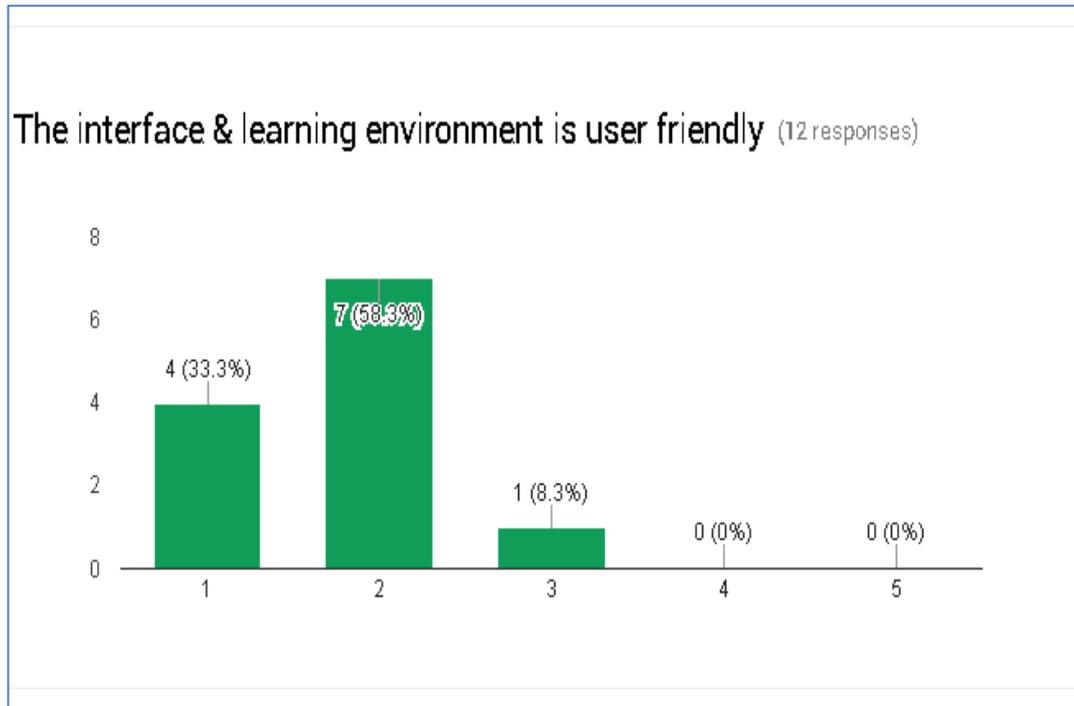
    

12) Give your additional comments, suggestions to improve this course?

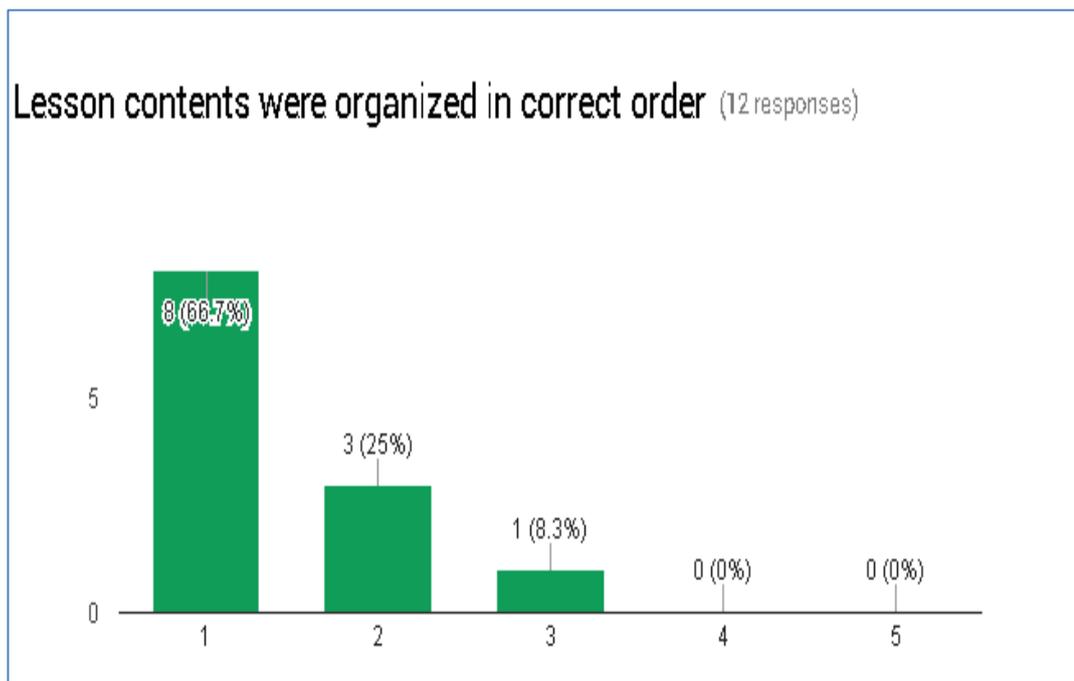
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## Appendix D – Results from the evaluation

Results gathered through the evaluation questionnaire were analyzed and detailed charts depicted below.

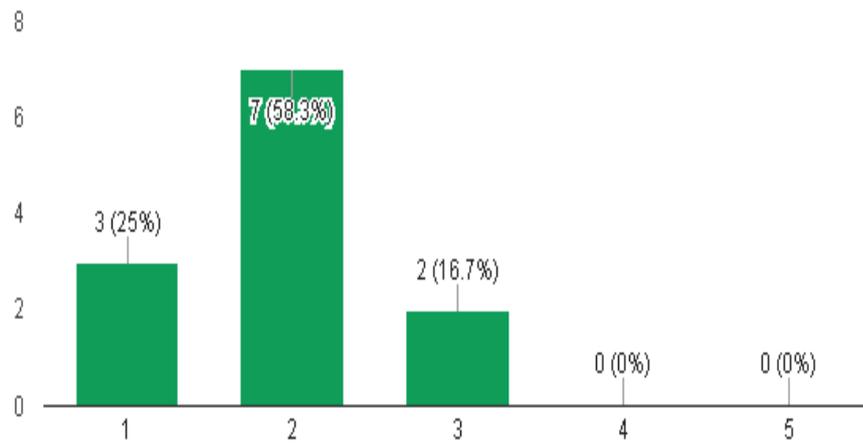


Comments for question 1.



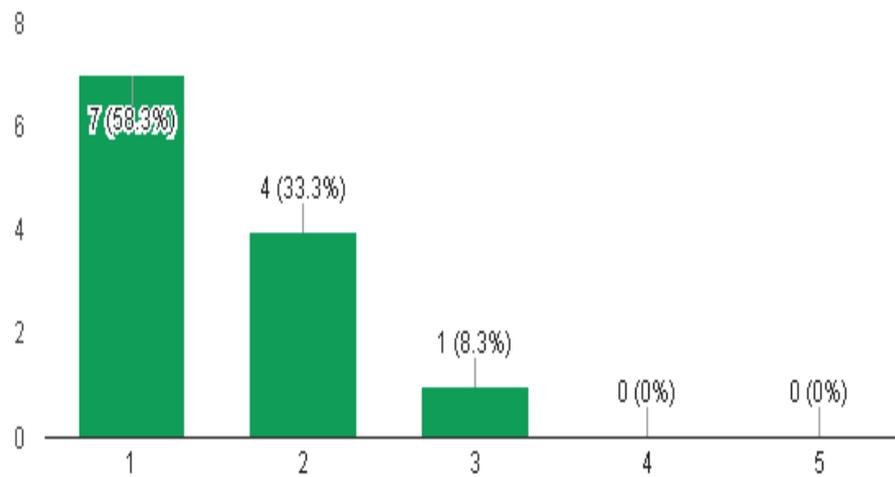
Comments for question 2.

Lessons were designed using proper font size, color and style. (12 responses)



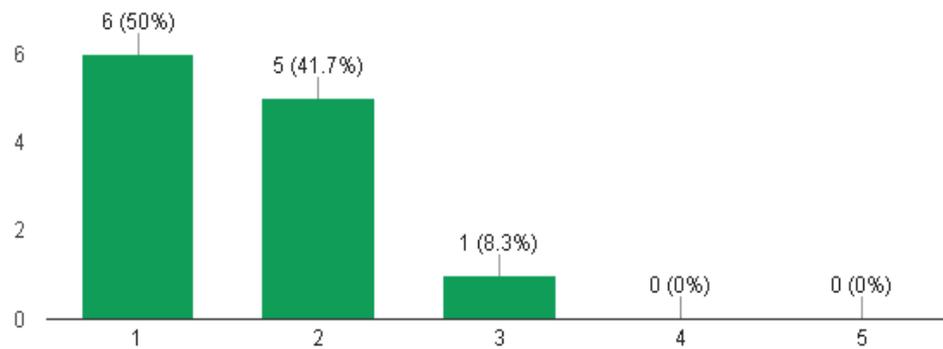
Comments for question 3.

GIT course helps to learn GIT in interesting way. (12 responses)



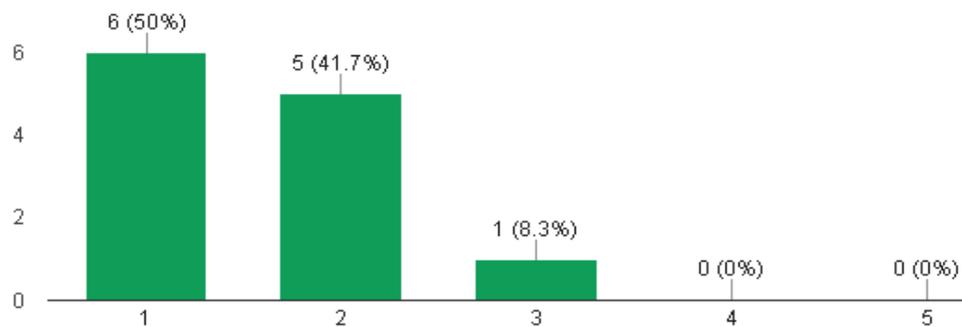
Comments for question 4.

Course contents were interactive. (12 responses)



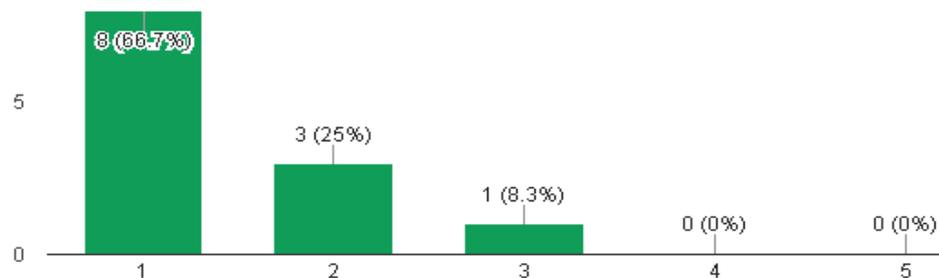
Comments for question 5

Course learning environment has better navigation. (12 responses)

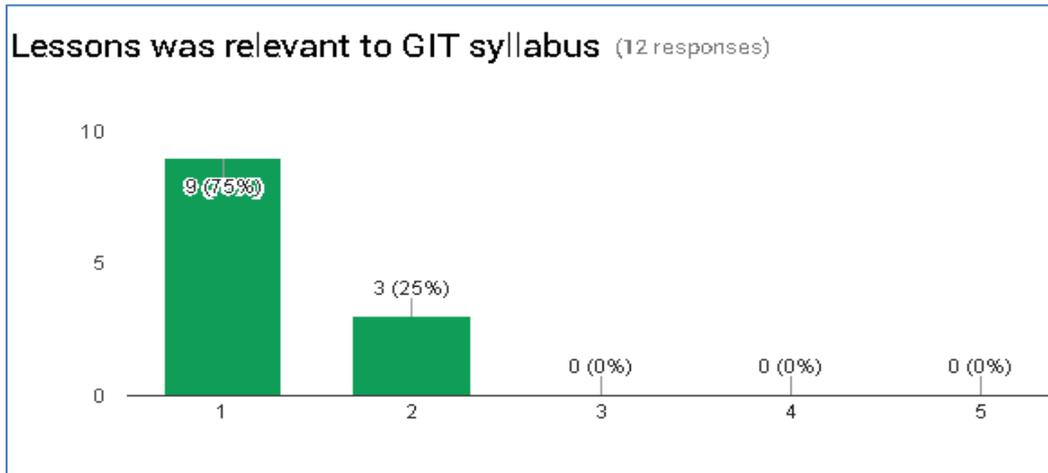


Comments for question 6

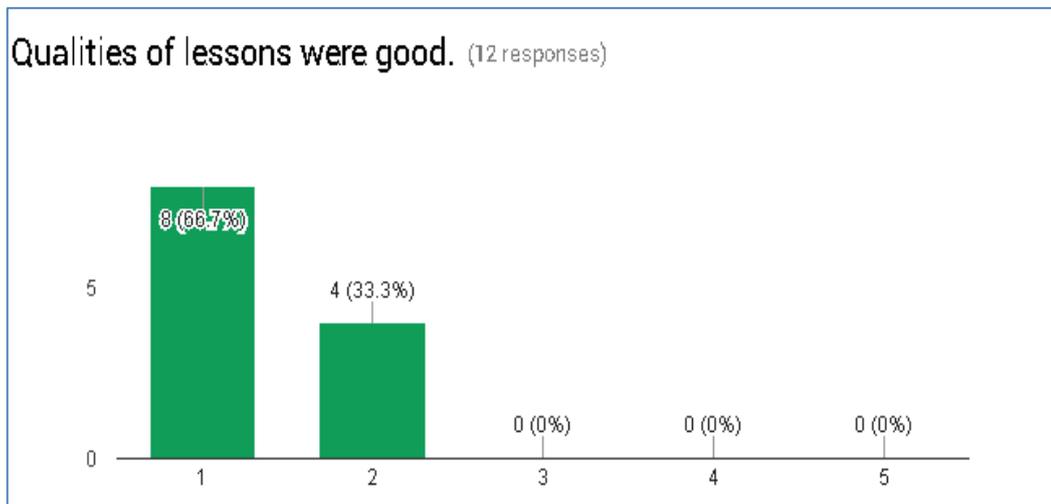
GIT course was easy to follow. (12 responses)



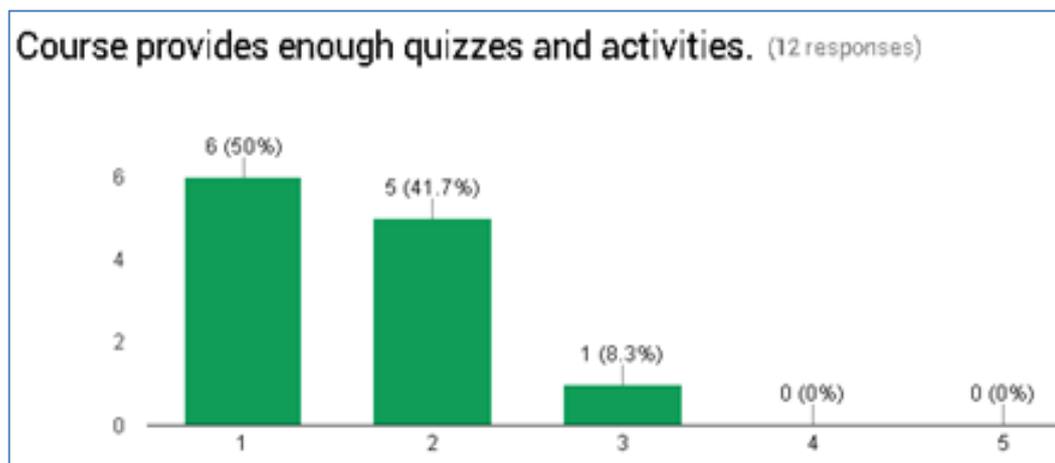
Comments for question 7



Comments for question 8

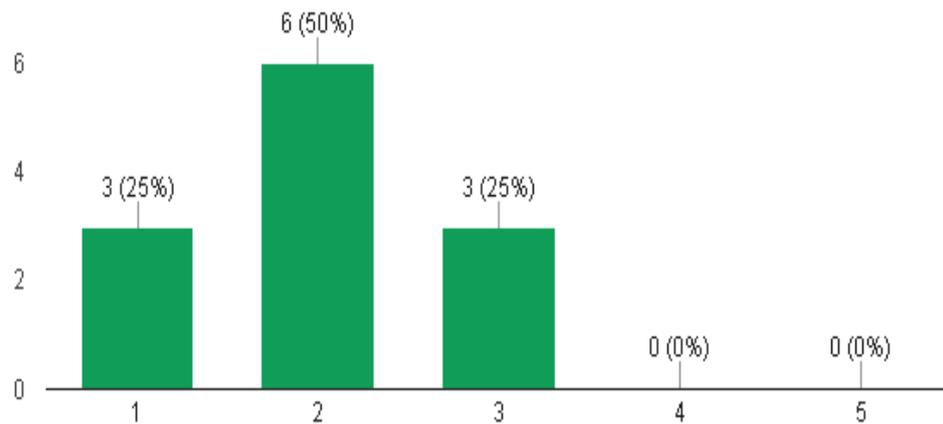


Comments for question 9



Comments for question 10

11. Did this course meet your expectation? (12 responses)



Comments for question 11

12. Give your additional comments, suggestions to improve this course.

(7 responses)

Need more questions to practice

Please check the sound quality

More quiz please

back ground noise disturbing, must improve.

Need more activities and quiz, Sound quality should be improve.

need some extra quiz

improve the sound, add more activity

Users suggestions for question 12

\*\*\*\*\*

## Appendix E – Web based Course Screen shots

### GIT Course front page

The screenshot shows the front page of the GIT course. At the top, there is a banner with the Jaffna College logo and the text "Jaffna College eLearning Unit". Below the banner is a purple navigation bar with "General Information" selected. A breadcrumb trail reads "Home > My courses > General Information Technology (GIT) > GIT". On the left, a "NAVIGATION" sidebar lists various course sections, with "GIT" expanded to show sub-sections like "Participants", "General", "Introduction", and several modules. The main content area features a blue header with the text "General Information Technology" and a welcome message from the teacher/facilitator, R. Sugumar. A "News forum" icon is located at the bottom of the main content area.

### Course Content page

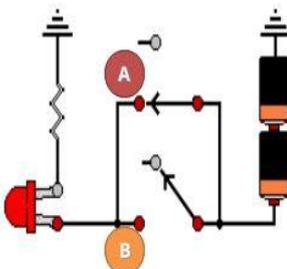
The screenshot displays the "Logic Gates" course content page. The page has a header with the Jaffna College logo and the title "Logic Gates". A sidebar menu on the left lists the course content, with "Logic circuit" highlighted. The main content area contains the text "Logic gates" and a definition: "Electronic circuits which combine digital signals according to the Boolean algebra are referred to as *logic gates*; gates because they control the flow of information." Two diagrams are included: one showing three basic logic gates (AND, OR, NOT) and another showing a complex logic circuit with multiple gates and inputs/outputs. The page includes navigation controls at the bottom, such as "PREV" and "NEXT" buttons, and an "EXIT" button in the top right corner.



Logic Gates EXIT

**OR Operation**

Let us consider the simple series electronic circuit given below to understand OR operation.



**Nature of the bulb in the circuit for OR**

A	B	Output
Open	Open	OFF
Open	Closed	ON
Closed	Open	ON
Closed	Closed	ON

⏮
⏪

⏩
⏭
⏸

## Activity Page



Logic Gates EXIT

The task of the **X** gate is to provide the complement as the output. which of the following logic gate best illustrated the above X gate?

OR,N

NOT

AND

OR

**Correct**

That's right!

Continue

⏮

⏭
SUBMIT

## Course Module structure

### Module THREE - Computer Architecture

#### Objectives:

- Explain basic block diagram of a computer system.
- Describe the main slots in the computer mother board.
- List the computer ports.
- Describe the use of ports in a computer system.

-  Block Diagram
-  Computer Slots & Ports
-  Fun with Quiz
-  Computer architecture - pdf
-  Computer architecture - presentation
-  Computer diagram
-  Who is here to chat
-  Test - Computer Architecture

### Module FOUR - Flowchart

#### Objectives:

- Describe the use of Flow chart.
- Draw the Basic symbols in flow chart.
- Develop flow charts for problem solving.
- Explain types of flow charts.

-  Introduction to Flow Chart
-  Flow chart
-  Draw Flow chart
-  Fun with Flowchart
-  Flow chart - pdf
-  Use of Flow chart
-  Who is here to chat about Flow chart
-  Test - Flow chart

\*\*\*