

Students Resource and Information System

A midterm report

Submitted for partial fulfillment of the requirements for the degree of
Bachelor of Electronics and Communication Engineering of Pokhara University.

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Recommendation

The undersigned certify that he has read and recommended to the Department of Electrical and Electronics Engineering for acceptance, a mid-term project report entitled “Student Resource and Information System”, submitted by Arjan kc, Ashok Ghimire and Marshal Basnet and that he believes they have the completion of % of the work of the project.

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Abstract

Interaction is crucial to student satisfaction in online courses. Adding synchronous components (virtual classroom technologies) to online courses can facilitate interaction. Many of the Nepalese youth want a rather different method of teaching and learning than they are used to seeing. Thus, we came up with an idea that motivates to learn and study for those people by harnessing the power of the web enabling us to create an effective, cost efficient teaching learning environment that is collaborative, interactive and informative. The details of our approach are here within this report.

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1. Introduction

1.1 Statement of problems:

Current classroom experience is monotonous and tethered allowing little room for collaboration and future reviews.

The objective of teaching is to make the pupils understand to the maximum about the subject intended, for doing that proper integration of education materials with the ease of use advancements that have been unlocked. This is not the case in the present Nepali education scenario.

This is an era of technology and the generation is a technologically adapt generation, the teaching methodology used at the present context in Nepal does not incorporate that.

1.2 Objectives/Scope:

We visualize a world where education and technology go hand in hand. Using interactive technologies we intend to accelerate and impregnate ideas influenced in a classroom. Our approach towards implementing our ideas of classroom technology is targeted towards being flexible, cost efficient and collaborative.

These ideas of technology can be used to collect data and information, conduct interactive surveys and enhance the teaching learning experiences in the modern day classrooms. Interactive technologies can be used to present ideas in an efficient manner in meetings and presentations too.

1.3 Applications:

1. For enhancing the teaching learning experience in modern day classrooms.
2. To present ideas in efficient manner in meetings, presentations and workshops.
3. Can be used to conduct Massive Online O Courses (MOOCs).
4. Can be used to collect feedback from the audience.
5. This project is also a research on the mobile learning pedagogy and impact of e learning implications in the modern day classrooms.

1.4 Summary of report:

This report is authored for the midterm project report for Nepal Engineering College, Electronics and Communication Department, Project division. The project is titled “Student Resource and Information System” and has “sris” as an acronym; which is our approach towards collaborative and interactive classroom experience harnessing the power of the web and Open Source standards.

This report contains extensive research on elearning methodologies and application that have been used worldwide and their implications. This report also contains information on elearning services in the context of Nepal at the present moment. We have included the works that we have carried out, the works that are remaining and the schedule for the works that needs to be done in order to meet the time frame that we are allotted. We have briefly described our approach in terms of technologies that we have used and the technologies that can be used in order to create a similar teaching learning environment.

2. Literature review:

2.1 Use of technology in education:

Technology is the application of scientific knowledge for practical purposes whereas education is the process of receiving or giving systematic instruction esp. at a school or university. The systematic instructions thus delivered are in fact predefined before the class, may it be in the syllables or in the form of academic calendars.

A wide variety of solutions cater to the need of reaching the learning goals, technology enables to efficiently share data and information and also search for specific information regarding the subject of interest with ease. Technology can help to provide time-saving help for busy teachers, resource sharing is an easy endeavor as a way to help make the point that education technology is not optional and is, in fact, essential.

But implementation and hugging of education and technology is an expensive asset in the present context. Devices are quite expensive if one educational institution is entitled to buy them all for their students. Hence the concept of BYOD or Bring Your Own Devices ¹ kind of classroom has emerged. There are also instances of classes where at least one computer is required in one group of student.

There are also developing and poor nations to be considered where even the primitive forms of formal education are hard to trace. Technology is scalable and flexible but unfortunately it is quite expensive. This can be directly linked to the revenue that a product generates and the amount of research that is poured into the subject. Technology emphasizes in fundamental structural changes that are essential in achieving significant improvements in productivity of the learner. They are used to support both teaching and learning, technology infuses classrooms with digital learning tools, such as computers and handheld devices; expands course offerings, experiences, and learning materials; supports learning 24 hours a day, 7 days a week; builds 21st century skills; increases student engagement

¹ "YouTube - Why BYOD? | BYOD- Bring your own devi... - Scoop.it." 2012. 1 Dec. 2013 <<http://www.scoop.it/t/byod-bring-your-own-device/p/2642633513/youtube-why-byod>>

and motivation²; and accelerates learning³. Technology also has the power to transform teaching by ushering in a new model of connected teaching⁴. This model links teachers to their students and to professional content, resources, and systems to help them improve their own instruction and personalize the learning environment.

Online learning opportunities and the use of open educational resources and other technologies also do increase educational productivity by accelerating the rate of learning; reducing costs associated with instructional materials or program delivery; and better the utilization of the time that is allocated to the teacher.

2.2 Different forms of technologies used in education:

2.2.1 Virtual or online learning:

In the United States, the state government and local districts run virtual and online courses. These opportunities include dual enrollment, credit recovery, summer school programs, and learners can take courses such as Advanced Placement and honors, or remediation classes. Both core subjects and electives can be taken online, many supported by online learning materials. While some online schools or programs are homegrown, many others contract with private providers or other states to provide online learning opportunities⁵.

² "The Promise of Accessible Textbooks: Increased Achievement for All ..." 2010. 1 Dec. 2013 <http://aim.cast.org/learn/historyarchive/backgroundpapers/promise_of_accessible_textbooks>

³ "Technology, Accelerated Learning Keys to Fostering K-12 Students ..." 2011. 1 Dec. 2013 <<http://thejournal.com/articles/2011/01/07/technology-accelerated-learning-keys-to-fostering-k-12-students-interest-in-higher-ed.aspx>>

⁴ "Principles of Connected Teaching | U.S. Department of Education." 2011. 1 Dec. 2013 <<http://www.ed.gov/technology/draft-netp-2010/principles-connected-teaching>>

⁵ "Use of Technology in Teaching and Learning | U.S. Department of ..." 2011. 1 Dec. 2013 <<http://www.ed.gov/oii-news/use-technology-teaching-and-learning>>

2.2.2 Full-time online schools:

Students enrolled in these type of schools do not attend a bricks and mortar school; instead they receive all of their instruction and earn all of their credits through the online school. State operated Virtual school are as old as 20 years old and they offer about a hundred and twenty courses to thousands and billions of students all over the world; in some cases limited within the state or district boundaries. These courses include diploma certification, credit recovery options and even career planning services.

Karval Online Education⁶ offers a public primary and secondary education via an online school for Colorado residents and it also provides a free computer for the family to use while the student is enrolled and provides compensation to offset Internet and other educational expenses. Other approaches by different technological uses include loaning a computer⁷ and managing to receive subsidized Internet access, as well as materials including CDs, videos, instructional materials, and hands-on tools and resources to complement the interactive online elements of the program.

2.2.3 Charter operated online classes:

These classes offer activities to support student-to-student interactions, and drop-in centers to facilitate enrollment, counseling, assessments, and other services.

2.2.4 Blended learning:

Blended learning is a mix of both face-to-face and online learning opportunities. The degree to which online learning takes place, and the way it is integrated into the curriculum, can vary across schools. The strategy of blending online learning with school-based instruction is often utilized to accommodate students' diverse learning styles and to enable them to work before or after school in ways that are not possible with full-time conventional classroom instruction. Online learning has the potential to improve educational productivity by accelerating the rate of learning, taking advantage of learning time outside of school hours, reducing the cost⁸ of

⁶ "Karval Online School." 2007. 1 Dec. 2013 <<http://www.karvalschool.org/>>

⁷ "Use of Technology in Teaching and Learning | U.S. Department of ..." 2011. 1 Dec. 2013 <<http://www.ed.gov/oii-news/use-technology-teaching-and-learning>>

⁸ "Use of Technology in Teaching and Learning | U.S. Department of ..." 2011. 1 Dec. 2013 <<http://www.ed.gov/oii-news/use-technology-teaching-and-learning>>

instructional materials, and better utilizing teacher time. These strategies can be particularly useful in rural areas where blended or online learning can help teachers and students in remote areas overcome distance⁹.

2.2.5 Open educational resources:

Open educational resources are teaching, learning, and research resources that reside in the public domain and are freely available to anyone over the Web. They are an important element of an infrastructure for learning and range from podcasts to digital libraries to textbooks and games. It is critical to ensure that open educational resources meet standards of quality, integrity, and accuracy as with any other educational resource and that they are accessible to students with disabilities.

Open educational resources are used to create an open source curriculum¹⁰. Teachers gather and sort through open source materials, align them with state standards, and modify the materials to meet student needs in order to create an open curriculum. The textbooks used in the Open education are known as FlexBooks¹¹. They are customizable, standards-aligned, digital textbooks for the primary and secondary level students. They are intended to provide high-quality educational content that will serve both as core text and provide an adaptive environment for learning. There are services offering series of online resource materials like books, videos and tutorials. These open communities harness the power of collaboration and discussion platforms to promote the use of technology to improve teaching and learning. In addition to the use of laptop computers and other technologies as instructional tools, the Initiative has led to a shift to digital textbooks which are aligned to the state's standards.

⁹ "Use of Technology in Teaching and Learning | U.S. Department of ..." 2011. 1 Dec. 2013 <<http://www.ed.gov/oii-news/use-technology-teaching-and-learning>>

¹⁰ "Open-source curriculum - Wikipedia, the free encyclopedia." 2012. 1 Dec. 2013 <http://en.wikipedia.org/wiki/Open-source_curriculum>

¹¹ "CK-12 Foundation | Free Online Textbooks, FlashCards, Exercises ..." 2007. 1 Dec. 2013 <<http://www.ck12.org/>>

2.2.6 Use digital resources well:

Schools and other teaching institutions can use digital resources in a variety of ways to support teaching and learning in real time both online and offline. Electronic grade books¹², digital portfolios, learning games, and real-time feedback on teacher and student performance, are a few ways that technology can be utilized to power learning.

There are schools offering project-based learning opportunities to students in the primary and secondary levels by linking technical and academic studies and focusing on personalization and the connection of learning to the real world. To support student learning and share the results of project-based learning, these schools make a wealth of resources available online, including teacher and student portfolios, videos, lessons, and other resources. Some schools also provide online grade books. These grade books are continually updated so that students can see how they are doing not only in each course, but also on each of their learning outcomes, averaged across all their courses. Electronic learning portfolios contain examples of students' work and associated evaluations across all classes and grades.

Whereas there are also instances of utilization of games and other forms of digital media to provide students with a curriculum that is design-led and inquiry-based. The goal of this model of technological approach is to use education technologies to support students in becoming active problem solvers and critical thinkers, and to provide students with constant feedback on their achievement.

2.3 The current state of mobile learning:

The first forms of mobile learning and tethering technology with technology first appeared during the dawn of twenty first century. It is rapidly growing as technology ease the learning process by adapting technological approach with the classical teaching methodologies. Although mobile learning has evolved a bit from its primitive stages, there is a lot to achieve and research in order to make possible the future of education.

¹² "LearnBoost: Free Gradebook for Teachers." 2010. 1 Dec. 2013 <<https://www.learnboost.com/>>

The definition of mobile learning is somewhat contradictory with tethered forms of elearning. Mobile learning utilizes technology to collaborate, and incorporate student participation in the teaching learning process. These educational approaches are characterized by their mobility and flexibility along with real time collaboration and authoring tools if necessary.

2.4 Edutech In context of Nepal:

In comparison with the advancement of edutech in other nations one can easily deduce the fact that very less has been achieved, researched and implemented in this sector. We came across a couple of approaches in the edutech and distance learning implementation. They are listed on the other page.

2.4.1 International Center for Academics:

Also known as ICA¹³, the International Center for Academics College of Distance Education and Online Studies is probably the most notable advances or approach that has been implemented in the education environment of Nepal. ICA was established in 1997 and has been providing educational services to the nation since then. In 2002, it became the first Partner Institution of Indira Gandhi National Open University¹⁴ (IGNOU) in Nepal. It is one of the pioneer Institution of Open and Distance Learning (ODL) in Nepal. The study center is approved by the Ministry of Education, Government of Nepal. It is also the only educational institution from Nepal to become the member of Asian Association of Open Universities. It has been providing internationally acclaimed degrees through the ODL Mode of education in Nepal. ICA presently offers 44 different Academic, Value Added and Awareness programs through Open and Distance Learning. Currently, the cumulative student strength of ICA is more than 1200. ICA also offers such programs in collaboration with government and non government agencies through an arrangement of program specific Work Centers and a strong network of Learner Support Centers situated in different locations of Nepal.

¹³ "ICA - The partner institution of IGNOU :: Approved by the Ministry of ..." 2005. 1 Dec. 2013 <<http://www.ica.edu.np/>>

¹⁴ "IGNOU - The People's University." 2002. 1 Dec. 2013 <<http://www.ignou.ac.in/>>

ICA offers a unique opportunity to study and work simultaneously. More than 1000 learners have successfully completed their graduation, under-graduation, post graduation, diploma and certificate level programs. One of the learners of ICA Mr. Gagan Gurung has also been Awarded with the prestigious Nepal Bidhya Bhusan Award from Rt.Hon. President of Nepal Dr. Ram Baran Yadav on Sept 8, 2011. Eight Learners from ICA has also received IGNOU Gold Medal in different faculties. IGNOU degrees awarded through ICA have also been recognized by all the Universities of Nepal including Tribhuvan University and other Government and non Government agencies of Nepal.

2.4.2 e-pustakalaya:

A initiative by Open Learning Exchange Nepal also known as OLE Nepal; e-pustakalaya is an education-focused digital library containing full-text documents, books, images, videos, audio files, and interactive educational software that can be accessed through an intranet or on the Internet. OLE Nepal started the development of E-Pustakalaya in 2008 with the aim to improve children's reading skills and develop a reading culture in schools by giving them free and open access to age-appropriate reading materials and to enable students to do research projects and promote habit of independent inquiry. Since E-Pustakalaya went live in 2009, teachers as well as other adults have also benefited widely from various teaching resources, and educational materials in agriculture, health, environment, local technologies, excusers of E-Pustakalaya can browse through these six major sections looking for items they like, or they can search for specific items based on full or partial author name, title, publisher and/or keywords. Users can also link to similar items based on author, publisher or keywords through a single click. Users can read books and documents, view videos, listen to audio clips, play educational games directly from E-Pustakalaya, and in the case of books and documents, download and store for later viewing.

OLE Nepal has sought and received permissions from authors, publishers and organizations to add the materials that are found in E-Pustakalaya. Contributing partners include NESCHIL (Nepalese Society for Children's Literature), Room to Read Nepal, the British Council, Madan Puraskaar Pustakalaya, Rato Bangla Kitab, World Education, Save the Children, Practical Action, Azim Premji Foundation, E-Learning for Kids, and Gorkhapatra Sansthan. The use of

the materials in E-Pustakalaya is governed by Creative Commons 3.0 Attribution-Non Commercial-Share Alike copyright licenses. E-Pustakalaya is accessible on the Internet at www.pustakalaya.org. It can also be installed in low power servers and deployed in schools and community libraries that either do not have Internet connectivity or have low bandwidth connection. Such local instances of E-Pustakalaya will enable better user experience through fast access and quick downloads. A panel consisting of prominent Nepali writers advice in the development of E-Pustakalaya. Nepal Library Foundation, a Canada-based organization, has been supporting OLE Nepal with E-Pustakalaya development since 2009.

2.4.3 E-Paath

Another admirable project of OLE Nepal, E-Paath is a collection of subject-specific, and grade-specific digital learning materials, and is at the core of their ICT in Education program. Conceptualized by educators and curriculum experts, these interactive educational software modules are closely aligned with the national curriculum and are designed to help teachers and students meet the learning objectives outlined in the curriculum. Curriculum experts work closely with a team of graphic designers and software programmers to bring the concept to life. The prepared materials go through a round of review by other experts before they are approved and finalized. These activities employ various features of technology such as audio, images; animation and text to help students better understand concepts in various subjects.

The following are key attributes of the E-Paath learning activities:

- Education-focused and curriculum-based
- Promotes self-learning and self-assessment
- Fun and interactive
- Free and Open

2.4.4 Other approaches to implement elearning methodologies in Nepal:

There have been approaches regarding training and information distribution regarding computer skills notably Touch Stone Infosys has contributed lots of video tutorials regarding software usage in fields of text formatting, graphics designing and spreadsheet.

Whilst others have contributed to Nepali language learning services online such that users can train themselves to speak in Nepali. For information sharing; blogs and news portals are gaining popularity whereas the popularity of social networking sites and their usability amounts to them is used for educational purposes such as file sharing and notice notification to the students in forms of messages and social groups.

2.5 History of Database Management System (DBMS)

A database is an organized collection of data in which comparisons, decisions are made. A DBMS is a computer system that manages the database, i.e. it provides an interface between the user and the actual database stored in a high storage capacity memory device in some remote location. The concept of database has been in existence since 1960s and gradually it is becoming more and more sophisticated. The term database first occurred in 1962 according to the Oxford Dictionary.

The first generations of the database systems were navigational, where the applications typically accessed data by following pointers from one record to another. The two main data models at this time were the hierarchical model, epitomized by IBM's IMS system, and the Codasyl model (Network model) and implemented in a number of products such as IDMS used in the Apollo missions to space by NASA.

The next generations of database were network databases, although now these database models are obsolete, from the historical point of view they serve as the ancestors of the modern data databases.

The next giant leap was the relational databases, the relational model stores data according to some relation between the entity (object or thing) and attribute(characteristic). For eg: a student is an entity and program is its attribute. The relational model for database management is a database model based on first-order predicate logic, first formulated and proposed in 1969 by Edgar F. Codd who was working as computer scientist at IBM computers.

DBMS is a very powerful tool, and much of the power is harnessed using the structured Query Language (SQL). In DBMS parlance we don't code the database, we query it. While entering/updating information we fire SQL queries and the DBMS software had a query processor for handling the queries fired by the user.

The history of Structured Query Language (SQL) began in an IBM laboratory in San Jose, California, where SQL was developed in the late 1970s. Initially the language was Structured English Query language (SEQUEL). In fact, SQL makes an RDBMS possible. SQL is a nonprocedural language, in contrast to the procedural or third generation languages (3GLs) such as COBOL and C that had been created up to that time. Third generation languages means the languages that make possible the direct use of databases. The SQL language is the most easy to learn query language because of the "English" part of the original language implementation.

In this digital world database plays a very important role in the day to day working of every company. The data generated helps the managers take decisions to maximize profit of the company. So databases are the single most important invention ever made in the field of web and technology.

2.6 Technologies that allow collaboration:

Collaboration is the action of working with someone to produce or create something. Many protocols are frequently used for collaboration in real time scenario. Websocket technology is one of them. WebSockets provide a persistent connection between a client and server that both parties can use to start sending data at any time. Websockets is the new standard starting from 2011. Every major browser that comes up on the desktop environment supports Websockets, except for the default browser in Android, a mobile operating system. Thanks to some great open source libraries like socket.io, Bidirectional-streams Over Synchronous HTTP (BOSH), and Google Channel API there are transparent fallback mechanisms for older browsers, like AJAX long-polling, Flash and Comet.

2.7 Current names in virtual learning services:

We have included a brief description of some of the virtual learning services that allow mobile learning and incorporate the basic features of distance learning in the world. They are listed below:

2.7.1 Udemy

Udemy is one of online the learning platform that allows instructors to host courses and also integrate the courses with their bank account so that the students can pay to enroll in the courses. Using this platform, instructors are allowed to upload high quality video, pdf, audio, ppt, mashup, and text documents. When an instructor creates courses, he/she is able to enter in to the curriculum. The curriculum tab contains section, sub section as lecture and also a quiz creation feature. Instructors are also allowed to engage and interact with users via online discussion boards.

This is one of the well managed online systems for better education delivery and the most popular among virtual education providers in the world as of today.

2.7.2 Udacity

Udacity is a for-profit organization which offers massive open online courses (MOOCs). Udacity is the outgrowth of free computer science classes offered in 2011 by the Stanford University. Course format and ideas used in this organisation is little bit different from Udemy. Udemy allows us to create random courses but udacity provides existing datas to the online user from a presentation perspective and evaluates by multiple choice questions and interactive quizzes. A massive open online course (MOOC) is an online course aimed at unlimited participation and open access via the web.

2.7.3 Khan Academy

Khan Academy is a non-profit educational website created in 2006 by an educator Salman Khan, a graduate of MIT and the Harvard Business School. The stated mission is to provide "a free world-class education for anyone anywhere". All of the site resources are available to anyone free of charge. It provides complete, realistic questions in any subject fields and fast answer checking capabilities too. Khan academy presents users' progress graph smoothly and

efficiently. It covers all types of problems and solutions of related subject regarding primary and secondary level of education.

2.8 History behind the idea of distant learning:

Before the Digital Age, distance learning appeared in the form of correspondence courses, scatter courses and early forms of e-learning. By the 1890s similar courses on specialized topics such as civil service tests and shorthand were promoted by door-to-door salesmen. Over 4 million Americans, far more than those that attended traditional colleges were enrolled in respective courses by the 1920s, covering hundreds of practical job-oriented topics. Their completion rate was under 3%.

Broadcast radio was new in the 1920s and with programs that were free to audiences of any size. By 1922, New York University operated its own radio station, with plans to broadcast practically all its courses. Other schools followed, including Columbia, Harvard, Kansas State, Ohio State, NYU, Purdue, Wisconsin, Utah and many others. Students read textbooks and listened to broadcast lectures, while mailing in answers to tests. Completion rates were very low, cheating was hard to detect, and there was no way to collect tuition. By the 1940s radio courses had virtually disappeared in the United States. The Australian School of the Air used two-way shortwave radio starting in 1951 to teach students in classrooms in remote locations, with students able to ask questions of the live instructor. During World War II, movies were used to train millions of draftees, as lecturers could demonstrate physical equipment in action. Universities offered televised classes, starting in the late 1940s at the University of Louisville. At many universities in the 1980s classrooms were linked to a remote campus to provide closed-circuit video access for some students.

3. System description:

Our approach towards mobile learning incorporates an audio/video system processed by raspberry pi computer connected to a network backed by a web application. The web approach is minimalistic as the projection screen is a whiteboard in the classroom environment. The web app is however accessible to mobile devices using responsive web layout technologies to incorporate collaboration and accessibility.

The raspberry pi has been used to reduce deployment costs and utilize Open Source standards.

The system block diagram is given below:

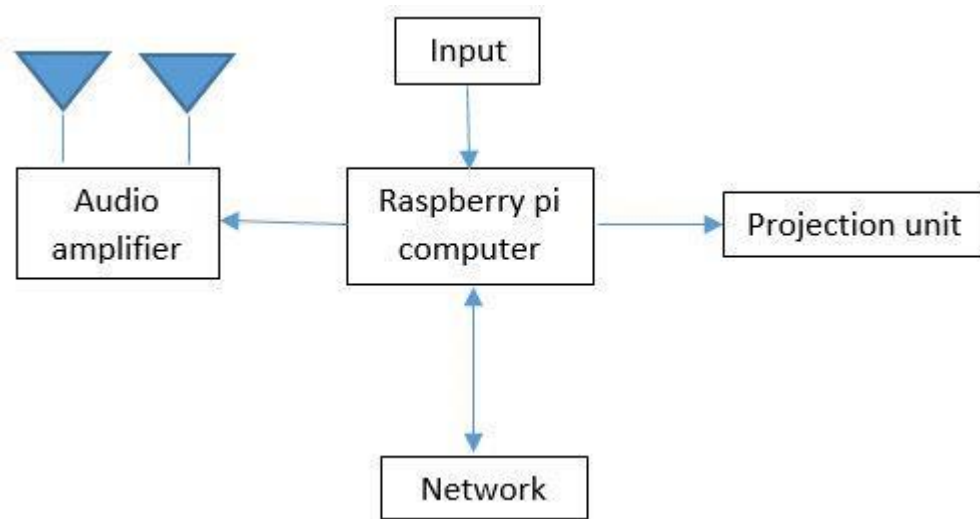


Fig 3.0 System block diagram

3.1 The raspberry pi:

Raspberry Pi foundation of the the United Kingdom is the company that is responsible for developing the Raspberry Pi which is a credit-card-sized single-board computer. This computer has powerful and a lightweight ARM processor which is capable of doing many of things that a desktop PC can do. The powerful graphics capabilities and the HDMI video output makes the raspberry pi an ideal device for multimedia applications such as media centers and video narrowcasting solutions for multimedia houses and small networks. In addition to the processing capabilities of the ARM processor, all video processings are carried out by BCM2835. The BCM2835 is a cost-optimized, full HD, multimedia applications processor. The BCM2835 features a design that is optimized for power efficiency of the device, BCM2835 uses Broadcom's VideoCore® IV technology to enable applications ranging from media playback, imaging, camcorder, streaming media, graphics and even 3D gaming environments. This is portable one and cheap to use. we have needed browser supporting and small sized hardware and it is the best alternative instead of using pc or laptop. Raspberry pi extracts data from cloud in to local storage(SD card in this case) through web browser and interfaced with projector. It does not feature a built-in hard disk or solid-state drive, instead relying on an SD card for booting and long-term storage.

3.2 Projector:

A Projector is a device designed to take an image from a video, images, doc's source and project it as faithfully as possible onto a screen or other surface. A Projector is designed to receive a video signal from some external device-usually a DVD player, a Blu-Ray player, or a computer-and project that signal onto a screen. Raspberry pi would be input device for projector in our system. It does this by displaying the presentation slides, images inside the projector itself, which is then projected onto a screen using a bright light and a lens. The lens is a piece of glass shaped in a very specific way designed to take the small image and turn it into a dramatically larger one. Projectors allow users to alter a variety of image features, including brightness, sharpness and color settings, in the same way a standard television would.

3.3 Audio Amplifier:

It acts as output device for raspberry pi. It would be helpful to play YouTube video links and other audio files. There is no default sound device in this card sized computer. This will be one of the essential device for our system in near future. We are focusing on lecture audio recording, saving so that anyone can re- listen recorded voice.

3.4 Input Device:

Input device sense the user's action and change it in to expected output in to the system. Although our system based on touch technology, we are willing to make one IR input device that can performs functions like changing presentation slide to whiteboard and next slide etc. Actually raspberry pi supports that kind of input devices and easy to implement.

3.5 Network:

Our system exists in network so that anyone can extract and contribute documents, other resources and educational web tools. Web browser like chrome, opera that deals in between server and clients. This section does not visible in our project but plays important roles for collaboration.

4. Theoretical analysis/Project details:

4.1 Benefits of mobile learning in the teaching learning experience.

- Promotes Learning by doing approach
- Enables self-paced learning
- Provides access to wide range of up-to-date learning materials
- Enriches learning through a combination of audio, video, images, text and animation
- Enhances learning through interaction and collaboration
- Provides a platform that engages students

4.2 Use of different technologies to influence ideas and conduct elearning:

4.2.1 Hyper Text Markup Language:

Hypertext markup language (html) is the main markup language for creating web pages. It defines certain rules to present text in internet network. This language is the basic building block of web based programs. Latest html5 contributes more functionality than previous one. html mainly categories in html basic, html5 news, html media and html references.

4.2.2 Cascading Style Sheet:

Html basically deals with the content of page and css take care of presentation semantics of that documentation. CSS is designed primarily to enable the separation of document content from document presentation, including elements such as the layout, colors, and fonts.

4.2.3 JavaScript:

JavaScript is a prototype-based scripting language with dynamic typing and has first-class functions. Its syntax was influenced by C. Javascript communicates asynchronously in between clients and server. Javascript outputs action of user dynamically.

4.2.4 Hypertext Preprocessor:

PHP is server side scripting language for web development. PHP is free software released under the PHP License. In short form, php works in between user interface and database system. PHP has hundreds of base functions and thousands more via extensions.

4.2.5 Web app design:

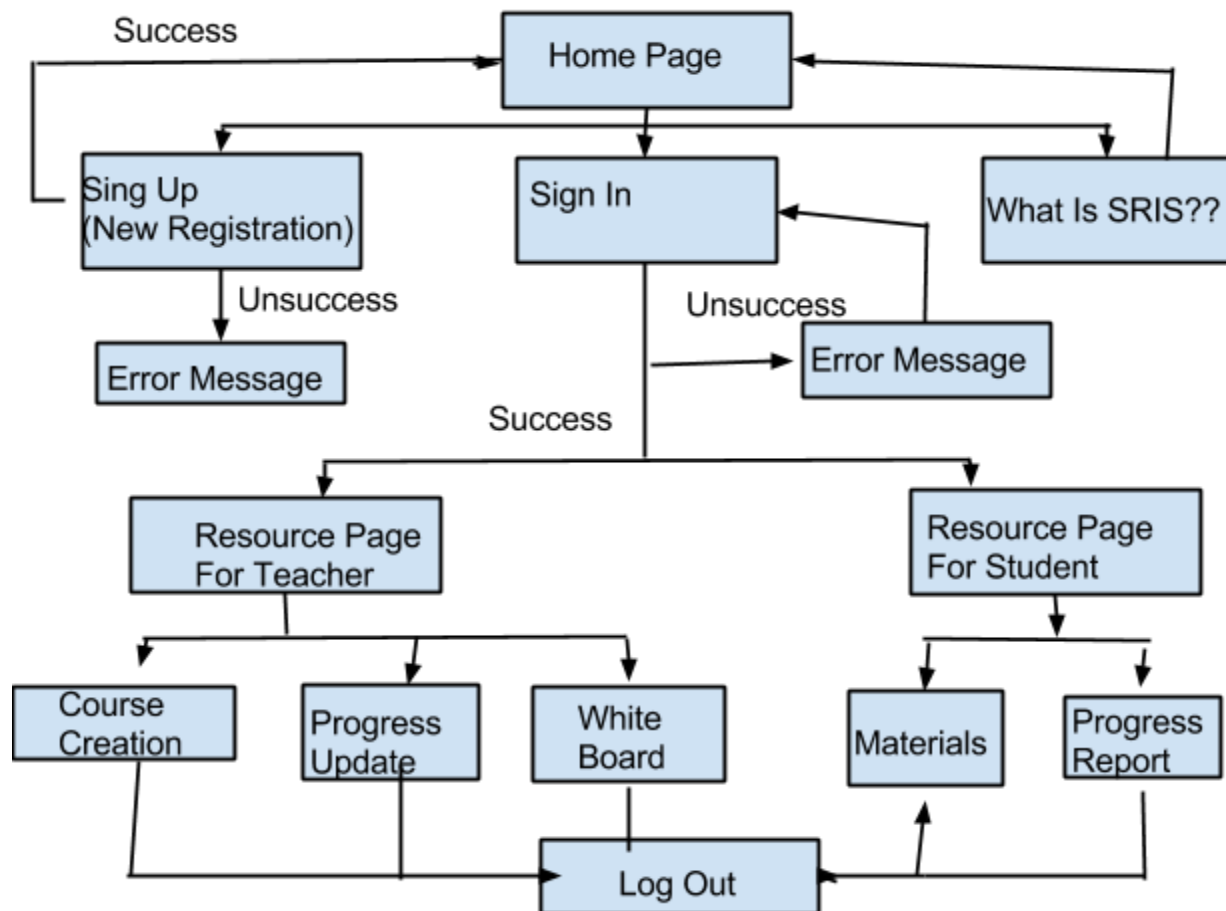


Fig 4.2.8 Web application block diagram

In our project, the home page is represented by the index.php file which is first interface layer of our site. Users can choose three possible actions, sign up, sign in and information? The Signup form allows users to register in the system. A new user may be a teacher or a student and their respective access control to the resources is given to them and the sign in form checks the registered user from database if the user has registered or not. If both registration and login process fails it leads to an error message. Successful registration processes retrieve to home page and successful login redirects to the resources page. We have defined teacher and student fields in registration process. By querying with these data, we are able to differentiate resources for student and resources for teacher. A teacher can create course, upload notes and use whiteboard access for interactive classroom functionality. Students are only able to see their own progress report and notes and the materials needed for him and can download.

4.3 Database Management System

Database - A database is a persistent, logically coherent collection of inherently meaningful data, relevant to some aspects of the real world for example details of a student. The DbMS is about Managing and structuring the collections of data held on computers. A database consists of an organized collection of data for one or more uses, typically in digital form.

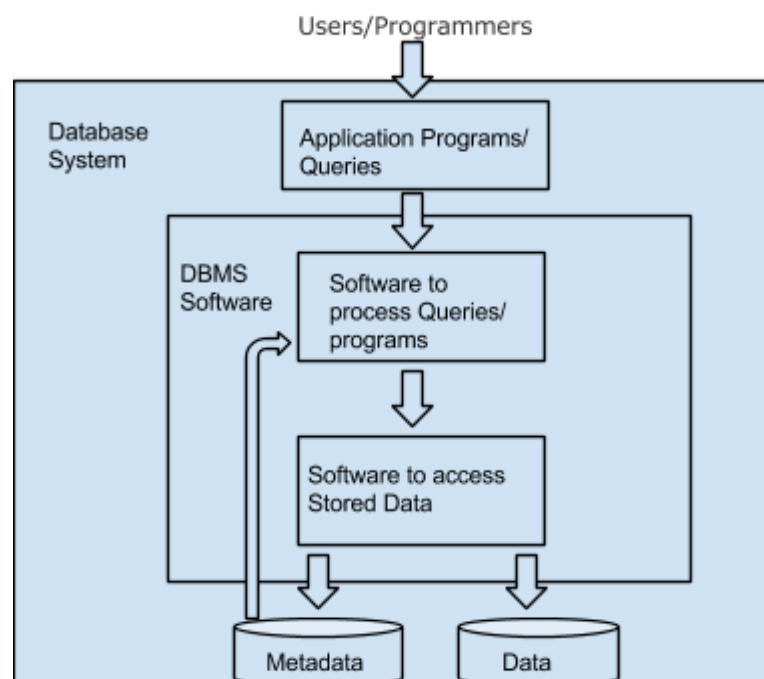


Fig 4.3 Database Management System

4.3.1 Components of DBMS

A database management system (DBMS) consists of several components. Each component plays very important role in the database management system environment. The major components of database management system are:

1. Software
2. Hardware
3. Data
4. Procedures
5. Database Access Language

4.3.1.1 Software

The main component of a DBMS is the software. It is the set of programs used to handle the database and to control and manage the overall computerized database. DBMS software itself is the most important software component in the overall system. Operating system including network software being used in network, to share the data of database among multiple users. Application programs developed in programming languages such as C++, Visual Basic, php that are used to access database in database management system. Each program contains statements that request the DBMS to perform operation on database. The operations may include retrieving, updating, deleting data etc . The application program may be conventional or online workstations or terminals.

4.3.1.2 Hardware

Hardware consists of a set of physical electronic devices such as computers (together with associated I/O devices like disk drives), storage devices, I/O channels, electromechanical devices that make interface between computers and the real world systems etc, and so on. It is impossible to implement the DBMS without the hardware devices, In a network, a powerful computer with high data processing speed and a storage device with large storage capacity is required as database server.

4.3.1.3 Data

Data is the most important component of the DBMS. The main purpose of DBMS is to process the data. In DBMS, databases are defined, constructed and then data is stored, updated and retrieved to and from the databases. The database contains both the actual (or operational) data and the metadata (data about data or description about data).

4.3.1.4 Procedures

Procedures refer to the instructions and rules that help to design the database and to use the DBMS. The users that operate and manage the DBMS require documented procedures on how to use or run the database management system. These may include.

- Procedure to install the new DBMS.
- To log on to the DBMS.
- To use the DBMS or application program.
- To make backup copies of database.
- To change the structure of database.
- To generate the reports of data retrieved from database.

4.3.1.5 Database Access Language

The database access language is used to access the data to and from the database. The users use the database access language to enter new data, change the existing data in database and to retrieve required data from databases. The user writes a set of appropriate commands in a database access language and submits these to the DBMS. The DBMS translates the user commands and sends it to a specific part of the DBMS called the Database Engine. The database engine generates a set of results according to the commands submitted by user, converts these into a user readable form called an Inquiry Report and then displays them on the screen. The administrators may also use the database access language to create and maintain the databases. The most popular database access language is SQL (Structured Query Language). Relational databases are required to have a database query language.

4.3.1.6 Users

The users are the people who manage the databases and perform different operations on the databases in the database system. There are three kinds of people who play different roles in database system

- Application Programmers
- Database Administrators
- End-Users

4.3.1.6.1 Application Programmers

The people who write application programs in programming languages (such as Visual Basic, Java, php or C++) to interact with databases are called Application Programmer. Database Administrators A person who is responsible for managing the overall database management system is called database administrator or simply DBA.

4.3.1.6.2 End-Users

The end-users are the people who interact with database management system to perform different operations on database such as retrieving, updating, inserting, deleting data etc.

4.3.1.6.3 Relational DBMS

A relational database management system (RDBMS) is a program that lets you create, update, and administer a relational database. Most commercial RDBMS's use the Structured Query Language (SQL) to access the database, although SQL was invented after the development of the relational model and is not necessary for its use.

The leading RDBMS products are Oracle, IBM's DB2 and Microsoft's SQL Server. Despite repeated challenges by competing technologies, as well as the claim by some experts that no current RDBMS has fully implemented relational principles, the majority of new corporate databases are still being created and managed with an RDBMS.

To say that the databases are everywhere would be an understatement. They virtually permeate our lives: Online stores, health care providers, clubs, libraries, video stores, beauty salons, travel

agencies, phone companies, government agencies like FBI, INS, IRS, and NASA — they all use databases. These databases can be very different in their nature and usually have to be specifically designed to cater to some special customer needs.

4.4 Communication between server and clients

4.4.1 Websockets:

Websocket is a protocol to provide full duplex communication over single TCP connection. Websockets represent a long awaited evolution in client/server web technology. Real time communication between client and server is very easy with this protocol. In recent times many web applications like online multiplayer gaming, chatting, and mailing choose to use this technology. In practice it combines two protocols, TCP and UDP. It breaks data into chunks and transmits to and through server which is principle of UDP and this connection is as reliable as TCP. Payload data can be split up into multiple individual frames. Only data fragmentation is allowed not control frames. The logic for joining frames is roughly this: receive first frame, remember opcode, concatenate frame payload together until the fin bit is set. Assert that the opcode for each package is zero. FIN bit is set when transmission is finished and the device wants to terminate the connection. After receiving data, server broadcasts received data to all clients that are connected to that particular website with the help of broadcast function. You don't have to code from ground level because it provides API libraries. We have read so far in JavaScript platform, node.js is runtime environment and library called socket.io which are necessary basic platform to develop application that works on real time environments.

The main concern about websocket is security. In overall websocket solve the connectivity problems but not security problems so some security features should implemented on browser. Several open issues remains but good design and proper implementation of browser eliminate most of the security difficulties. The security a lot depends on transport layer security encryption (TLS). Generally TLS provides secure communication between client and server. Once the malicious service able to run javascript code inside the web browser, it also able to initiate websocket connection to the arbitrary services. Then attacker can utilize existing channels to control the web browser in real time within the limit of javascript. Websocket protocols is independent from HTTP protocol but using TCP port 80 and handshaking before establishment

of connection shows some similarities. Websocket does not follow the traditional way of request response convention like in HTTP. Once clients and server connected, connection remains active until the process is finished. Both endpoints may send data asynchronously to each other. In contrast traditional approach relies on polling. That means client opens new TCP connection and makes HTTP request to receive data from server. For every data this process is repeated every time and we can say easily it is slow process. But in websocket technology multi user handling process is little bit complex because of long lasting connection between previous client.

5. Works done so far:

1. Wireframe designing and prototyping of the web application

Wireframe designing is also known as page schematic or screen blueprint represents the framework of a website. Wireframes are created for the purpose of arranging elements to best accomplish a particular purpose in our case to design a learning environment. The wireframe depicts the page layout or arrangement of the website's content, including interface elements and navigational systems, and how they work together. The wireframe usually lacks typographic style, color, or graphics, since the main focus lies in functionality, behavior, and priority of content. Wireframes can be pencil drawings or sketches on a whiteboard, or they can be produced by means of a broad array of free or commercial software applications.

We used Just in mind prototyper for creating a wireframe prototype for our project's web app.

2. Feature selection and application designing.

We visited most of the online interactive courses and reviewed their features. We also queried our peers with the features that they want to see in online educational environments. From these data that we collected, we have categorized our features as essentials and extra features. The selected features categorized as essential features are listed below:

- Discussion Module

A module that allows interactive discussions with rating and reporting features.

- User privilege

Allowing users to control privilege of the materials that they share

- Sharing documents

Document sharing facilities to allow sharing of documents and files between users.

- Course creation system

A module that allows instructors to create interactive course catalog and add resources related to the course for learners to access.

- Attendance system

An interactive attendance management system for classroom attendance.

- Virtual Whiteboard

A Web virtual Whiteboard is touch-friendly online whiteboard that lets us to use our computer, tablet or smartphone to easily draw sketches so that a teacher can easily present the course matter in an effective way, collaborate with others and store the content of whiteboard as an image format.

- User registration and login into the system.

Role management helps us to manage authorization, which enables us to specify the resources that users in our application are allowed to access. Role management lets us treat groups of users as a unit by assigning users to roles such as student, analysts, teachers, and so on. These two interfaces help to make users and lets them visit the site's information. We have data collection of every user and accessibility through it. So registration and login part are basic but the building blocks of a web based system.

While managing students and teachers registration and login part, we have done some works about access method and database structure for users (teacher and students). Although we have faced many problems at the time, regarding security and database access; we were able to create an adequate management system. We have a grasp on the idea that we are trying to implement but we were not that acquainted with the programming language especially the server side scripting languages. PHP is preferred language for a web based management system. For this particular project section, we can say PHP login system.

There are two fields to fill up to get logged in email and password. Only two fields are being checked by query and if it returns true, user will be successfully logged in otherwise user is redirected to the login page with an error message. Both fields should be filled otherwise it generates an error; this was done by field validation. The most important thing about the login section is session. Session is a variable that is used to store data of user and this data is checked every time user enters into next page. If that user was logged in and right user it shows next page otherwise it returns to the home page. Except for the logout action one cannot redirect back to login page, if it is tried the user will be thrown back to the previous link..

In registration section, we have defined name, email, roll no, and subject, check box to select teacher or student and password fields in the form. We have used some validation code to place correct information by user and not to repeat same email repeatedly that means one email address gets one account. By clicking submit button, information is sent to the database for storing. We have also made use of the session variable to check registered user and to execute website fast by not connecting to the database every time the user sends a request.

3. Designing of online survey.

For acquiring feedback and to get real time information on the present context of elearning and market analysis we have designed a questionnaire for online survey.

4. Team collaboration in online platforms

We lacked the luxury of a common workplace to develop our project. Hence we were entitled to use team collaboration tools to the maximum. Explicitly github was used for code collaboration, asana was used for task management, facebook was used for social network, brand awareness and google drive was used for document sharing.

GitHub is a web-based hosting service for software development projects. We used this service to achieve code collaboration among the project partners. We have also created an official page on facebook for brand awareness and sharing information and progress to people that share the similar interest in elearning and edutech. Also, a blog on tumblr is dedicated towards informing

prospective users of our project to stay informed on the project progress and idea sharing. The blog is directly linked with our facebook page.

5. Research on e learning, server side communication protocols and input devices

We did an extensive research on the perspectives of e learning edutech. We visited countless online resources and read numerous research paper on the matter. Some of them are listed on the appendix. In order to achieve our goal of creating a collaborative learning environment we were required to research in server side communication protocols and for the user input during the class session we were subjected to look for feasible input methods.

The extra features are as follows:

- content library
- video conferencing
- audio conferencing
- Chat
- Dashboard
- Session recording and playback
- Badges for accomplishment

6. Works to be done:

Although we have come quite far from where we started, there is still works that are remaining to reach our target of a collaborative learning environment. The works that are remaining to be done are as follows:

1. Web application integration with the sris server.

The applications that are developed independently need to be brought together to form a system which functions with the sris server.

2. Amplifier, input device designing and circuitry management.

The hardware section of our project is still untouched we need to do physical tasks to bring together electrical components to build a device capable of interactivity within the classroom.

3. Power source implications and energy efficiency research.

In order to make our device compatible with solar cells so that our system can be used in the scenario of solar and in rural areas we need to focus on power source and energy efficiency.

4. Booting raspberry pi with an open source operating system.

The Open Source community provides excellent support. We will need to harness their help to assist us with the booting and setup of the raspberry pi computer.

5. Domain registration and server space acquisitions.

Finally we will need to register for our domain and get server space if we are to launch our system and contribute to the education scenario of Nepal.

a) Work Schedule for the completion of the project:

The gantt chart for list of planned events for the tasks are described in the previous section is as follows:

Task	Week 1	Week 2	Week 3	Week 4	Week 5
Attendance					
Course Creation					
Hardware implementation					
Power source					
Beta testing					
Final testing					
Report and presentation					

Table 6.1: work schedule