EduScope: A New Learning System

Final Report Submitted to Internet Society (ISOC)

(Submission Date: 4th September 2010)

The project called “EduScope: A New Learning System” obtained funding from ISCO in November 2009, under the community development program. The work on the project was initiated in January 2010. Below is a detailed description of the work and effort that has been put on this project.

Introduction to the Project:

Pakistan is home to a significant proportion of the population that survive beneath a poverty line valuated as the cost of basic food and essential non-food items. As a consequence of rampant poverty and government's exceptionally low spending on education (which amounts to less than 3% of the GDP), the net primary school enrolment remains barely over 50 percent. With education sector in such a condition, the question of imparting knowledge and training to underprivileged children to survive in this digital age is simply hard to answer.

This project aimed to compensate for the low spending on education and overall lack of IT infrastructure for educational purposes by creating a “virtual classroom” at a street-corner, where underprivileged children are exploring and experiencing the rapidly expanding dimensions of the Internet age, in spite of their poor financial standing impeding their progress.

The objective is achieved by embedding a Secure Computer System on the outer side of the boundary wall of a charity school (Ripah Trust, Rehmat-e-bad, Rawalpindi, Pakistan) and giving restricted Internet access to the children of all ages. The children are able to access on-line virtual classrooms, online children competitions, on-line educational games and many other different activities available for children on the Internet.(This Internet access is restricted to only those on-line activities that are related to children.)

The basic purpose of embedding the system in the wall was to provide round the clock access to the system for the children. The system is free to access and is not supervised by an attendant. The children are allowed to use the computer system at any time. This had helped in developing a sense of availability of a computer system, in the children belonging to the families who simply cannot afford a computer. The computer system embedded in the wall is referred to as “EduScope” Another important purpose of this project was to enhance and nurture the self learning abilities in children. By nature, children are blessed with a much stronger learning ability.

The main theme of the project was to provide a KIOSK style computer workstation for underprivileged children. Each workstation provides access to a pool of information, organized and arranged in a manner that could be easily understandable by children, without and through the Internet. As the systems are installed in a an open environment, they are robust enough to withstand long usage periods and the underlying software is efficient and interesting enough to engage children, maintain their interest and contribute toward building their character and knowledge base.

Introduction to the Partners & Team Members:

M. A. Jinnah University, Islamabad was a key partner in this project as it provided the in kind services for the project to be carried out. The University is run under a non-profit educational trust, is keen to pursue and facilitate any initiative for educational upbringing of unprivileged children, using state of the art technological aids.

EduScope Team :

Prof Dr Amir Qayyum: a professor at M. A. Jinnah University, Islamabad with a Doctorate degree from University of Paris-Sud, France. He worked as a project manager on this project. Complementing his area of expertise with an educational welfare project is considered by him as a perfect match to contribute in the society.

Ms Ambreen Sheikh: worked as a Project Co-ordinator on this project, a key member in the project, She has a Masters degree in Computer Engineering and is an active member of the research community. During this project she used her technological abilities for the advantage of the society.

Mr. Imran Khan: worked as a Software engineer on this project.

(Mr. Usman Shaukat & Mr Shakeel Ahmed also worked on this project temporarily). More details about the team members can be found at http://corenet.org.pk/eduscope/team.php

The project was divided into various inter-related tasks or phases, grouped into a number of project modules. Following are the main modules of the EduScope system:

● **EduScope Steel Case & Computer Hardware:** This module was concerned with building a kiosk machine which is robust, and provides enough resources for our software to work properly. All the selection and buying of computer hardware also comes under this project module.

● **EduScope Content Search:** This part of the project was concerned with designing, finding and organizing the educational content related to the children aged between 5-12 years, which was placed on the system.

● **EduScope Network:** this module is concerned with the connectivity of the systems with each other and with the Internet.

● **EduScope Software:** Specially designed software / portal is a part of this learning system. It involves a light weight OS, customized according to our needs, and software which is a kind of encyclopedia or library, which holds the content categorized in a meaningful manner.

1. EduScope Hardware

The first task was the identification of suitable computer hardware for EduScope work stations. It should be kept in mind that the EduScope system is designed to be installed by making a hole in a wall, where the system is placed inside the wall but it is accessible to the users from the outside. Some basic research and market surveys were done, and we came up with the following recommendations:

a) LCD Screen

- LCD screen will be placed inside a wall
- The screen will be facing outward, in order to give access from outside (street side)
- The backside of the screen will be inside the wall, connected with the computer system
- A high grade glass will be put over the LCD screen, to protect the screen

b) Keyboard and Mouse/Trackball

- These two peripherals will be outside and accessible to the users
- The users will use them to the full extent
- The keyboard will be placed slightly below the surface so that its keys do not pop out of the surface
- Two options for keyboard are:
    - Either we buy cheap keyboard and track pad in bulk quantity, and then replace them whenever needed

○ Or we buy a high-end, industrial grade keyboard and track pad (we opted for this choice)

c) PC Components

- Surveying the local market, we've found that the price difference between Atom based system and Core 2 Duo is not too much. So we opted for Core 2 Duo systems in order to facilitate the computing needs
- Hard disk space can be between 160 GB to 320 GB. We opted for 320GB in order to allow sufficient space to store educational and multimedia content, if required
- RAM should be 2GB min, to facilitate memory hungry multimedia applications
- Graphics Card with option of 256 to 512 MB memory. We opted for higher memory to facilitate smooth graphics display

d) Steel/Iron Case

- We must build a sturdy metal case for our system, to protect the system from damage and avoid the risk of theft
- The metal case should be fixed in the wall opening
- All the peripherals + PC should be placed in the metal case
- Easy access to keyboard and track pad should be provided in this metal case

List of components of EduScope systems purchased

Components for EduScope System ONE		Components for EduScope System TWO	
Item	**Quantity**	**Item**	**Quantity**
Processor Intel - E7500	01 – Purchased	Processor Intel – E7500	01 - Purchased
Motherboard Intel - DG41RQ	01 – Purchased	Motherboard Intel - DG41RQ	01 - Purchased
RAM – 2GB	01 – Purchased	RAM – 2GB	01 - Purchased
Hard Disk – 320GB	02 – Purchased	Hard Disk – 320GB	02 - Purchased
LCD Monitor – 18.5"	01 – Purchased	LCD Monitor – 18.5"	01 - Purchased
Casing - Gladiator 600	01 – Purchased	Casing – Elite 335	01 - Purchased
Speakers - Creative A-35	01 – Purchased	Speakers - Creative A-35	01 - Purchased
Web Cam - Creative – 1.3MP	01 – Purchased	Web Cam - Creative – 1.3MP	01 - Purchased
*Waterproof Keyboard + Trackball	01 – Purchased	Waterproof Keyboard + Trackball	01 - Purchased
UPS	01	UPS	01
Batteries	01	Batteries	01
Steel Case	01	Steel Case	01

KeyBoard + Track ball:

Special keyboards were imported for this project from china. Following is the photo of the keyboard that was imported and used for the project.

EduScope Metal Case

3-D Image of the EduScope Steel Case

Metal cases are built keeping in mind the hardware it will contain and the environment where the EduScope will be deployed. The metal cases are sturdy and vandal proof. Special emphasis is made to keep them water and dust proof as well. The hardware components will be placed securely inside the metal case and will not be accessible to the users. The only hardware that the users will be directly accessing is the metal keyboard and its integrated trackball. The LCD screen will be secured by mounting a thick 12mm clear glass on the front side.

The figure below shows the basic structure of the metal case. There will be a metal cover/canopy on top of the system, which will serve two purposes:

- It will serve as a secure lock option for the EduScope system. When the system will be switched off, this cover can be locked making LCD and keyboard inaccessible.
- As the EduScope system is intended only for children, this metal canopy hanging above the system horizontally will make it difficult for adults and tall users to use the EduScope system without bending their knees.

The speakers will be placed on both sides of the EduScope system, inside the metal case. There will also be a web camera just above the LCD screen for capturing pictures or video of the children activity for statistical, monitoring or even identification purposes.

All the system components will be easily placed inside the metal case and will have proper ventilation for trouble free operation. The components can be locked inside the metal case offering proper security. Currently, most of the installation of the steel case has taken place successfully, Given below are some latest pictures.

Site Before the Steel Case is Installed

Site After the Steel Case is Installed

1) After the steel case is installed but without the computer inside.

2) The steel case with the Computer and other devices placed properly inside it.

3) Behind the wall and inside the building. Inside these orange cases the CPU and the UPS are placed.

4) Inside view of the Orange case, here the CPU, LCD Screen, Speakers and the UPS are clearly visible.

5) Electrical wiring inside the steel case + Fan for keeping the case cool.

6) Wireless Internet Device.

2) EduScope Content Search

This module included, searching the internet for different open source educational software and also searching the local market for the educational content in the local language. The content is very carefully designed, keeping in view the age of the children, the language understanding of the children and the educational background of the children.

Following are few of the software that are made part of the EduScope. This list below shows screen shots of the software that are for kids between 5 years – 8 years old

1) GCompris (Educational Package)

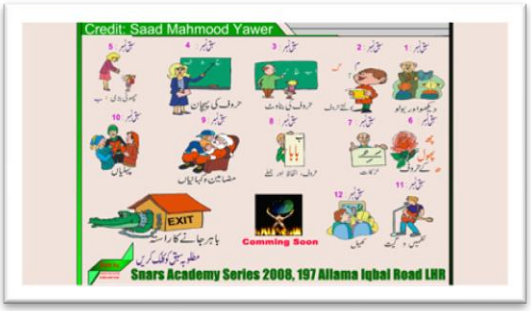
2) Childs Play (Educational Package)

3) Kid Genius (Educational Package)

4) Agil's Coloring Book

5) Tux Paint

6) Potato Guy



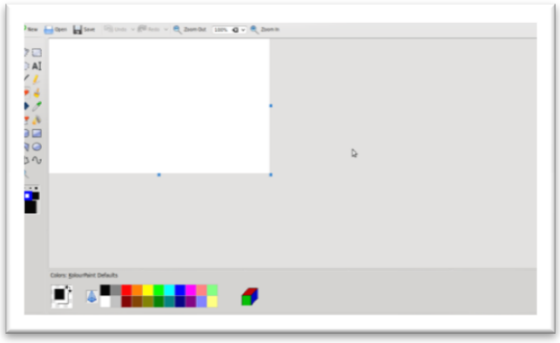
7) SNARS Educational Suite in Urdu

8) Ri Li Game

9) KLetters

10) Urdu Package

The following list shows the screen shots of some of the soft wares that are for the children between the age of 9 years and 12 years



1) KColor (Paint software)

2) Atlas Marble

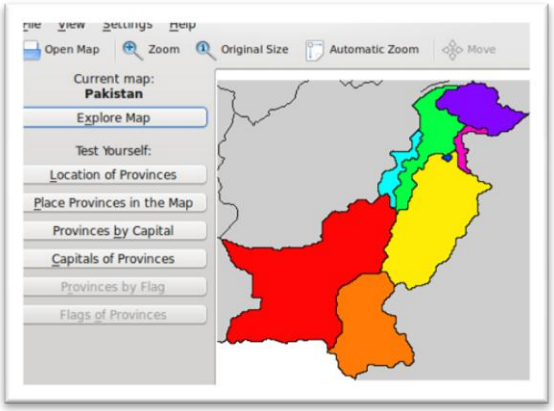
3) KanaGram

4) Celestia

5) GBrainy (Logic & Puzzles)

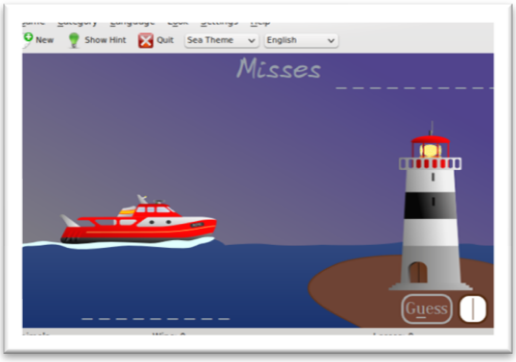
6) Wikipedia (restricted)

7) KBrunch (Mathematics)

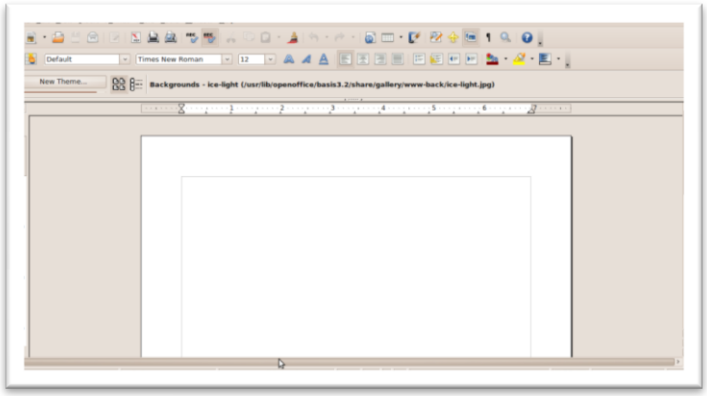


8) KGeograpy

9) Typing Tutor



10) Hang Man (Game)



11) Open Office

A significant portion of the content that is made part of the EduScope software, was also searched as a part of this module, this content mostly contained flash movies, helping children learn about different subjects like History, Geography, Sciences, Mathematics etc. There is also content related to teaching children about discipline in the society and home.

It is tried that maximum content is available through the EduScope software in both English and Urdu language. A hierarchy of categorizes is made and followed which will help the children of all ages to easily search the content of their interest, using the EduScope software.

4) EduScope Software:

Specially designed software / portal is part of this learning system. The software is designed keeping in view the learning abilities and learning trends of the children of Pakistan.

a) Operating System Architecture

The operating system was one of the major aspect of our system. We needed a robust, light weight, simple yet customizable OS. After going through a number of open source light weight OS, we chose Edubuntu Linux. The choice was made because of the following reasons:

- It is light weight yet robust (built on Ubuntu).
- It hosts a number of educational packages for kids. This greatly diversifies the content we will be able to provide.
- Edubuntu has been successfully deployed in schools around the world. The experience shared by those already using it greatly help us to improve our own system
- It can be customized according to our needs and policies.
- It is open source operating system and freely available.
- The Edubuntu (Education Suit + Ubuntu) was thus selected and deployed. The OS was customized according to our requirements which are detailed in a later section. The OS is composed of two parts:

  i) The Ubuntu OS : Ubuntu is an open source Linux based OS. It has a very friendly user interface. It provides a lot of options for customization of its interfaces. It supports a large variety of hardware and software. In our system, we have used Ubuntu 10.04 released in April 2010

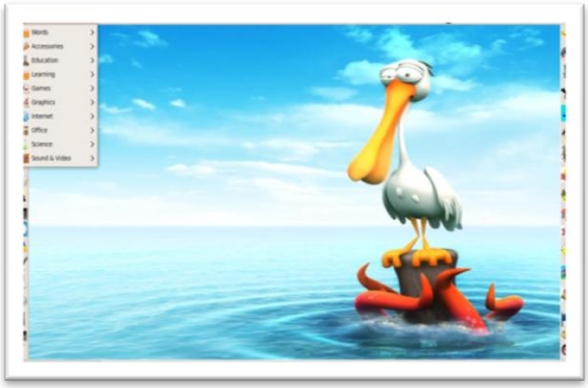
  ii) Educational Suit (Edubuntu) : Edubuntu is a Linux distribution targeted for schools and other educational environments. It is a complete operating system, built on the popular Ubuntu distribution that includes an office suite, web browser and many educational applications. It includes educational games and fun stuff for children, pre-school and primary school kids.

The two computers placed in the wall are named as

- The Car.
- The Bird.

Following are the screen shoots of the desktops of both computers.

The Car



The Bird

b) Eduscope Content Management System (CMS) Architecture

The second key component of our software is a Content Management System. This CMS provides content to users according to their age and interest. The system is targeted towards children of age 5-12 years. So the CMS was designed to be helpful: self-explanatory icons and graphics are used to make the CMS user friendly. The CMS is composed of 2 interfaces:

- One is the user interface which provides access to the children to view content stored in the system.
- Second is the admin panel which provides access to the administrator to update the CMS, upload the contents, etc.
- The CMS also has the option to be updated automatically and remotely. The data is stored in a remote server and workstations can synchronize themselves with the remote server regularly. The CMS has the following responsibilities:
    1. Provides a GUI for user interaction
    2. Able to contain and present diverse type of data (text, multimedia, web etc)
    3. Extensible, upgradeable and update-able from both locally and remotely.
    4. Provides login option for different groups of users
    5. Designed to be robust, efficient and fault tolerant

c) CMS Composition

CMS is a web based system developed using PHP / MySQL. It can be accessed through any web browser. Apache server is installed locally. PHP and MySQL server are also hosted on the local system. Apache server serves PHP pages when requested through any web browser. All the data comes from MySQL database. The main reason behind deploying each service locally is to make the system workable, even if no Internet or network connection is available. The system also has a remote update and control feature. The system synchronizes itself with a remote server, when scheduled. This way, the system can be updated regularly without physically accessing the system. The CMS holds different types of data files which include:

- Text Files (UTF-8, PDF, DOC etc)
- Video Files (flv, avi, mpg, mov)
- Audio Files (mp3, wav, fla)
- Images (jpg, bmp, png, gif)
- Flash Games and Applications (swf)

For each category of files, specific player is built or embed into our CMS:

- Mplayer, for video files (flv, avi, mpg)
- VLC, for video and audio files (mov, mp3)
- Flash Player 10.04 (swf)
- Images and pdf files are natively supported by the browser
- A custom JQuery Gallery (Image set)

Following are few of the facts related to CMS in a compact form

Admin Panel

1. **Categories Management**

   - Categories Management

   Entries : category id, language id, title, image, status, date
   Options: Add, update, delete

2. **English Contents Management**

   - English Contents Management

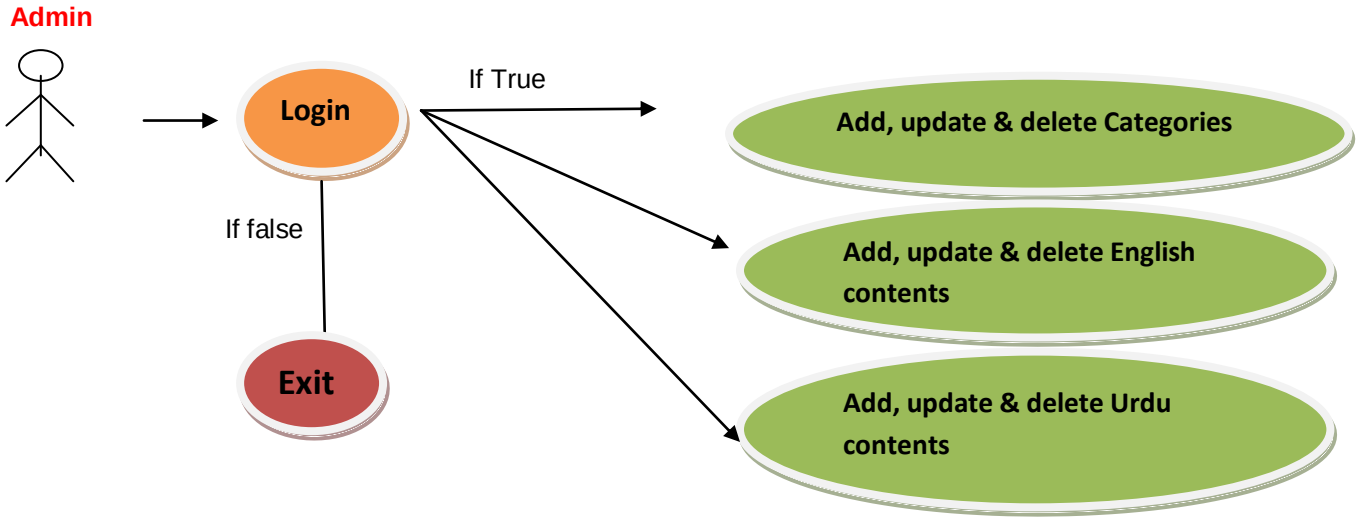
   Entries : Content id, Age id, content type, content title, video/audio file, image, status
   Options : Add, update, delete

3. **Urdu Contents Management**

   - Urdu Contents Management

   Entries : Content id, Age id, content type, content title, video/audio file, image, status
   Options : Add, update, delete

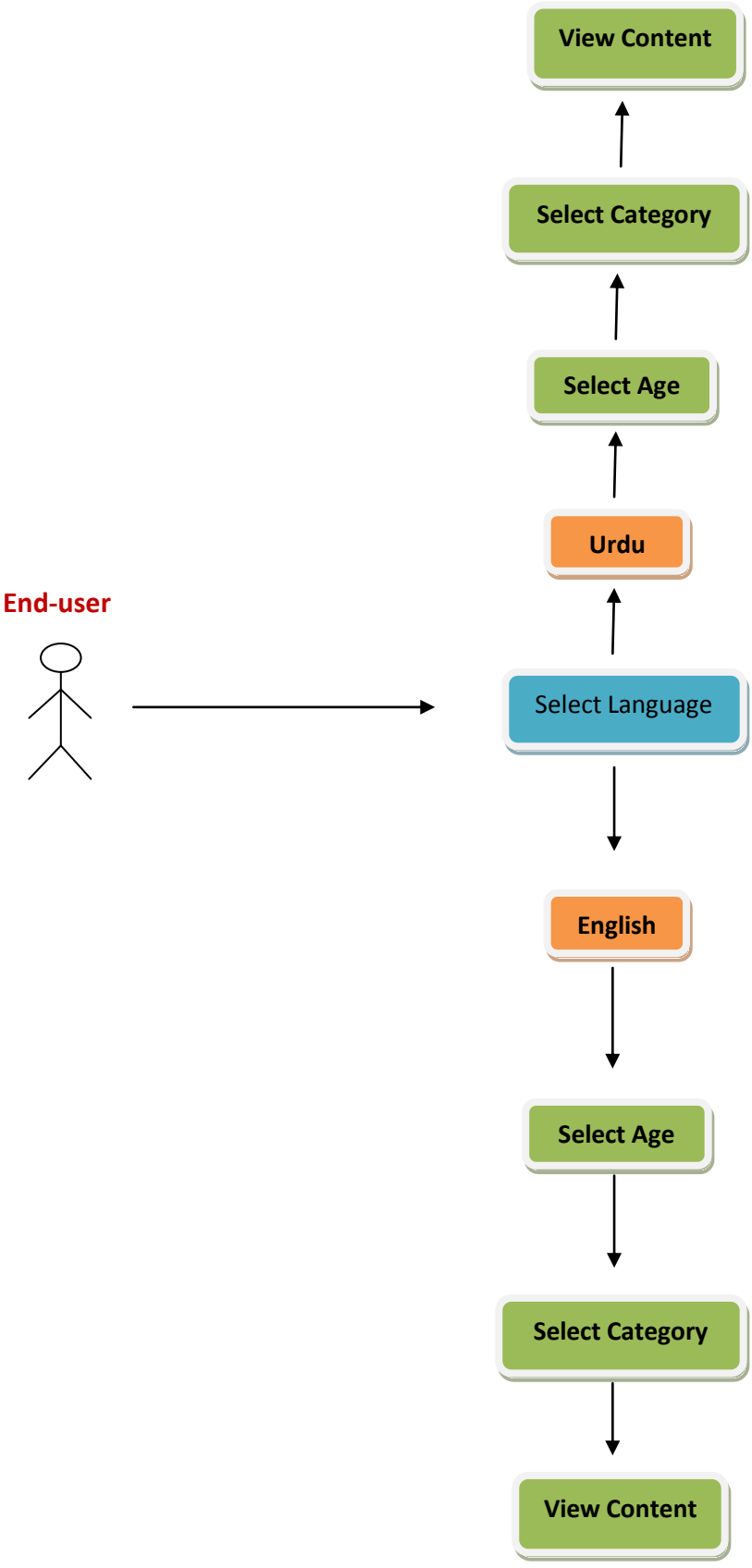
ADMIN USE CASE DIAGRAM



Front-End

1. **Select Language**
    - English or Urdu
2. **Select Age**
    - List of All Ages from 5 years to 12 Years
3. **Select Categories**
    - List of All categories according to the selected language
4. **View Contents**
    - View contents in the form of Text, images, Audio and Videos

Front-End USE CASE DIAGRAM



Technologies

- PHP5
- XHTML
- CSS
- JavaScript

Databases

- MySql

Tools

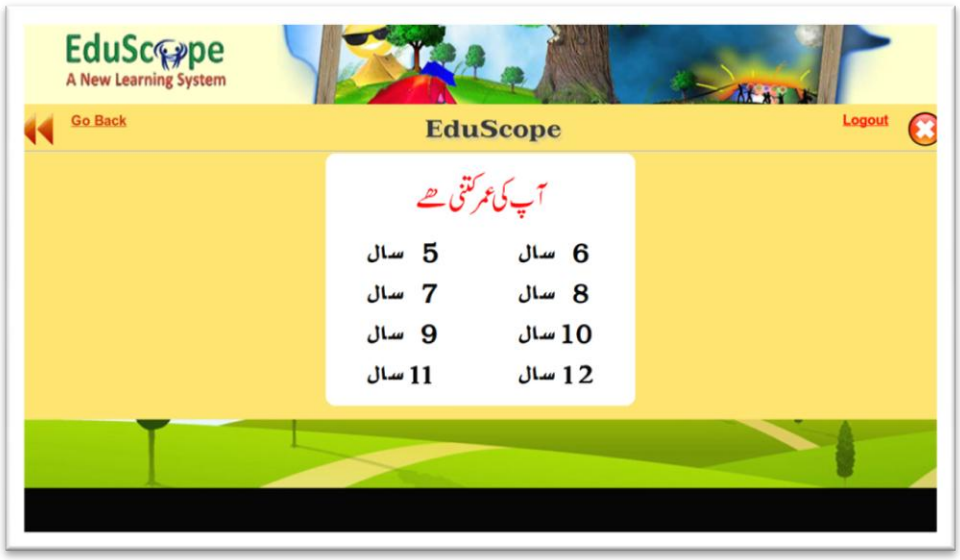
- Adobe Dreamweaver CS4
- Adobe Photoshop
- WAMP Server

OS

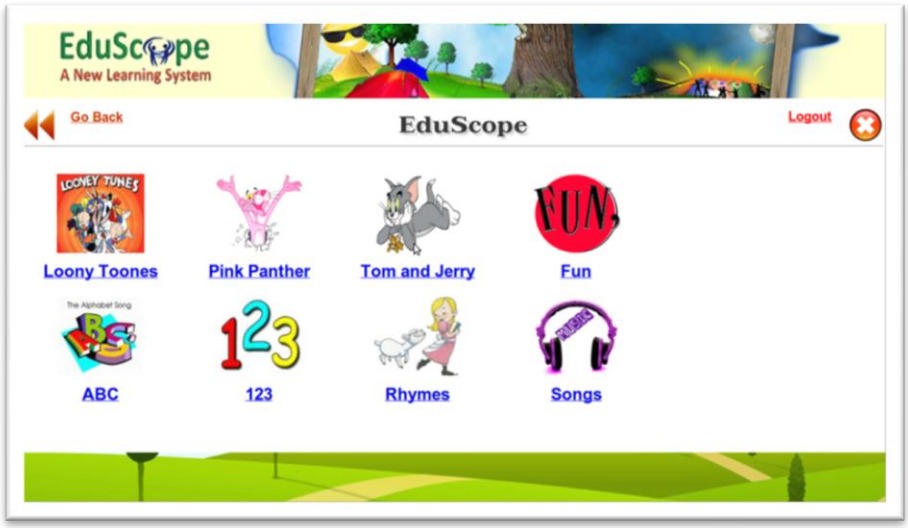
- UBuntu 10.04

Few of the screen shoots of the EduScope portal are given below

a) The above screen shoots shows the starting page of the EduScope Software, the children here will chose the language of choice English / Urdu



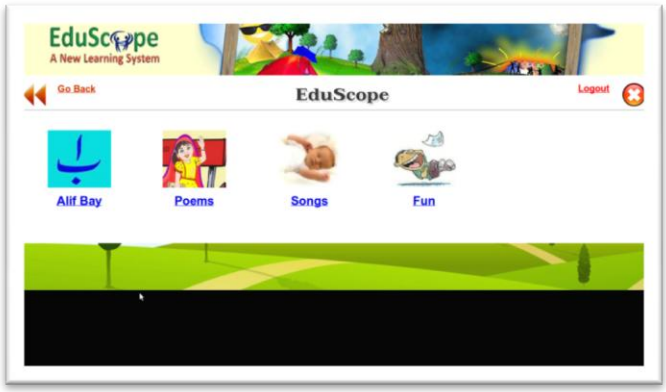
b) Choosing any language will display the above page, here a child will be able to select his age and the content will be displayed to him according to his age.



c) After choosing the age, the child will be shown different categories according to his age. The above screen shot shows, the child selected the language as English and chose the age = 5.

d) If for example a child clicked on the category Rhymes, he will be displayed a list of rhymes that are present in the database. When a child will clock on any rhyme name from the list, the respective video will be played.

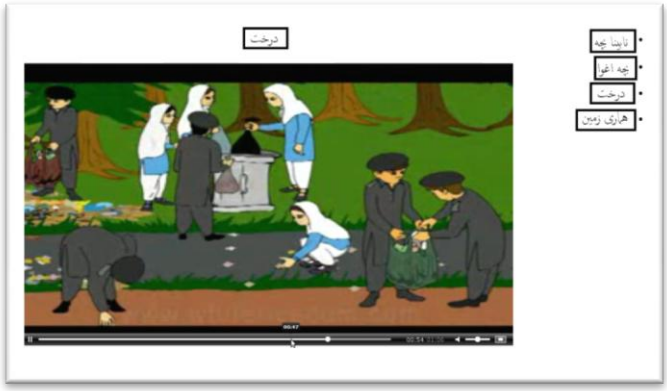
Following are more screen shots and categories from the EduScope Software.



Categories in Urdu

Urdu Rhyme

Urdu Story

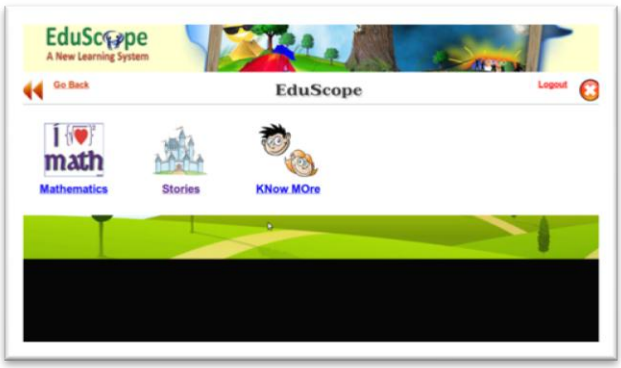


Urdu Story

Some More Categories for other Age Groups.

Some More Categories for other Age Groups.

Some More Categories for other Age Groups.



Some More Categories for other Age Groups.

Following is the over view of the EduScope Project in Photos.

View of the area “Rehmat-e-baad”

Final Touches

EduScope – The Car

EduScope - The Bird

Together (The Car & The Bird)

The Keyboard Used

The Street

The Ribbon Cutting Ceremony

Dr. Amir explaining the EduScope to the local Community

More Photos –

Publication:

The idea and the thought that was behind the project EduScope – A New Learning System, was written in a form of research paper and was accepted in 2nd International Conference on Education Technology and Computer ICETC, Shanghai, China 2010.

http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=5529446&tag=1

Future Work:

The team at CoReNet (Center of Research in Networks and Telecommunications) www.corenet.org.pk is currently writing a proposal to ISCO, Under their community grants program to initiate the second phase of the EduScope. The second phase of the project will be more focused on collecting, designing and constructing the educational content in Local languages. This is just a beginning, this project has a potential to bring a change in the life of the under privileged children of Pakistan. The team at CoReNet is motivated to take this project a long way.

Special Thanks to ISOC (Internet Society):

In the end the team at CoReNet would like to say a special thank you to ISCO for their support and encouragement. The approval of grant from ISOC for this project was a huge encouragement and it helped the team member to realize an idea/thought, a thought that has promised to bring a change in the society.