

ABSTRACT

In the pandemic situation, many students committed suicides mainly due to lack of smart phones which was needed for online coaching. Many of the cases were from rural India where students had less access to smart phones with poor internet connectivity. This paper provides a new framework for online teaching where the content delivered by the faculty is automatically converted into a text document and audio files and stored in a repository. All the contents needed by the students can be retrieved by the students through Short Service Message (SMS) at any time of the day. This paper proposes a novel architecture where the students can choose the option of listening to live classes through a smart phone or they can retrieve the text document from the repository during later part of the day without the need for smart phone. All the lectures given by the teachers along with the doubts and homework are recorded and stored in a repository. This benefits the family with two or more siblings and rules out the mandate of smart phone for every kid within the same family. Also, the proposed model helps the students from getting addicted to smart phone usage.

Index Terms: Faculty Teaching Methodology, Online Teaching Tool, Poor Internet Connection, Teaching Framework.

I. Introduction

In today's world where there is no assurance of when a sudden outbreak of a disease can happen, we have to be prepared for every situation [1]. As a preventive measure to suicides among the low economic group in India, this paper provides solution to attend online classes without smart phones. The proposed solution also caters the need of people with poor internet connectivity. The main advantage of eLearning is that the contents can be accessed at any time and can be shared among a group of individuals. The individuals who can concentrate, and have the interest to learn are extremely benefitted by the e-learning approach.

SURYA. K

*Assistant Professor
Department of Computer
Science and Engineering
Shiv Nadar University, Chennai*

The online framework has its own disadvantages as well. Some of them are:

- A framework for learning is mandatory, which consist of hardware and software.
- Knowledge of using certain devices is needed to attend online teaching.
- If there are many kids within a family, then the cost of a class increases as each of them need an individual device for connecting to classes.
- Distraction due to games and misleading advertisements available in smart phones.
- The trainer must be trained to use the online framework as well.

The effectiveness of online teaching by conducting a survey among a group of individuals suggest that government must take measure in meeting the requirements of online teaching such as internet and the devices required among the low economic group [2]. This paper [3] provides a mini-Learning Management System (LMS) which works without internet connection. But the main disadvantage of this model [3] is that it is designed by a Raspberry Pi board, which has no pre-installed heat sinks or cooling fans and it cannot be used for a longer period. Also, the cost of Raspberry Pi board is costlier, and maintenance also poses a problem. If the board is dropped or something spills, it becomes totally un functional. As a solution to overcome this problem, the model proposed in this paper uses a mobile phone with basic calling and texting facility which can be purchased as a low cost than Raspberry Pi board. The main motive of the work is to provide a cost-effective web-based learning to economically downtrodden community in India. So, the work proposed in this paper considers the important features that are mandatory in providing effective lectures through online mode. The rest of the paper is structured as follows, Section II gives the literature survey associated in the field of work, Section III gives the proposed framework, Section IV talks about the functioning of the proposed tool, Section V gives the results obtained for the simulated model and Section VI concludes the work along with future enhancements.

II. Literature Survey

The literature work provided in this paper aims at reviewing the existing online tools for teaching as well as the potential drawbacks of these tools. It also includes the challenges faced by students during the pandemic and can be broadly divided into the following categories namely:

- Existing Online Models for Teaching
- Struggles of Students during the pandemic

A. Existing Online Models for Teaching

The need for online models and how they can be used effectively and the need for online teaching are summarised in this paper [4]. There are many models which are used for web-based learning or online teaching. Some of the models used for online classes are discussed in these works [5], [6], [7], [8], [9]. The online model proposed by Mizoram university [10] indicates that students must be allowed to think critically to meet all the objectives and outcomes of that course. This model proposed by Mizoram university developed multimodal approach to enforce the course objectives [10]. A blended approach consisting of offline and online teaching methodology using emotional recognition has been suggested in this work [11]. The steps to be followed in combining online and offline teaching methodologies for effective understanding by the students are explained elaborately in this work [12]. The behavioral aspects of students in online classes and the need for enforcing critical thinking by having cognitive learning-based approach are summarized in this works [13], [14]. Machine learning based online teaching models to facilitate the maximum interaction and knowledge sharing are discussed in this work [15]. A new learning management system based on the hybridization between four learning theories, namely the traditional pedagogy, the behaviorism, the cognitivism, and the social constructivism has been proposed in this research work [16]. By predicting the learner's pattern of understanding by deep learning a model for e-learning system was developed in this work [17].

B. Student Struggles during pandemic

The adaptability of the students for web-based learning are summarized in these works [18], [19]. The struggles faced by students involve transition from normal classroom teaching to online mode, technology usage and lack of human interaction as before during the regular teaching in different countries are summarized in these works [20], [21], [22], [23].

C. Statistics on Internet Access to students in India

The UNICEF report stated that amongst the south Asian countries, internet access is available to 74.6% students in Sri Lanka, 69.7% students in Bangladesh, 36.6% in Nepal, 9.1% in Pakistan, 8.5 per cent in India, and 0.9% in Afghanistan [24]. In India about 50% of the population does not have access fast digital connectivity [25]. The problem of providing high-speed connectivity to more than 50% population of India is serious issue that needs to be addressed. This paper [25] gives the

use-cases along with the various government initiatives and projects, challenges, and technologies required for rural connectivity in India. This paper also provides the possible solutions for implementing high speed internet connectivity across rural India [25]. The comparative study on the pattern of internet usage among college students in Mumbai are studied in this work [26]. The survey [26] indicated that majority of the students were comfortable in accessing internet through their mobile phones. A survey-based approach was used in collecting data to study the pattern of internet usage and device availability among college students to develop new web learning model [27].

D. Suicidal Statistics of Students in India during COVID Pandemic

This study aimed to understand the association between student suicides and online education through a thematic analysis of the media reports [28], [29], [30]. These suicidal cases were reported across 14 states in India, with the maximum number being from Tamil Nadu with 31%, and the reason was the inability to access online education because of the unavailability of smartphones or internet facilities [28]. The pandemic activated enormous mental pressure on their school-going children.

Some students have ended up committing suicide to escape the mental torture inflicted through the insensitive policies [31]. From the sources of statistics [28], [29], [30] for suicides during the COVID pandemic, we can conclude that problems such as reduction in finance not only disturbs the basic requirement needed sustainable living but disrupts the mental health of the people among all age groups.

The young adolescent children in schools and colleges are subject able to more mental stress due to lack of interaction and psychological counselling. This requires the need to develop novel Learning Management Systems for eLearning with features that solve the problem of mental stress and helps students to maintain a balanced emotional life.

Based on the literature survey, we can conclude that stress, lack of money and lack devices needed for online classes triggered suicidal attempts among students.

Also, the ultimate need of the hour would be developing an online Learning Management System (LMS) such that it is catering the needs of low economic group in India. So, in this paper we have developed a Learning Management System with basic functionalities to accomplish effective online knowledge sharing among the students studying in rural India.

III. Proposed Framework

This section describes the components of the proposed online framework as given in Fig 1. It contains the following entities namely.

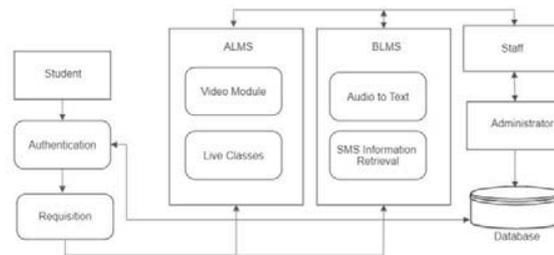


Figure 1 Block Diagram of LMS

- Users: The users can be either students or staff members of that class.
- Administrator: The administrator module maintains the helpdesk and tool management activities. This module also contains the training manual for the students and staff members. All the functionalities of the tool are uploaded in the helpdesk section by the administrator. The administrator also maintains a repository containing the names of all students and staff within that institution.
- Authentication: Every user both the student and staff have a user name and password which is shared to their mobile number by the administrator.
- Requisition: The student can request the teacher for basic version of LMS due to poor internet connectivity or zero connectivity by SMS from their registered mobile number.
- LMS Transition: This module has two types namely Advanced Learning Management System (ALMS) which contains all features that can be accessed by students with high internet connectivity. Another module called the Basic Learning Management System (BLMS) has limited features that are necessary for understanding the concepts taught in class.
- SMS Information Retrieval Module: This module receives requests and gives reply as per the methodology proposed in this work [32]. The text file contents are sent through a link which will be delivered to the recipient in parts. The student can also send SMS to the staff who can respond back to the queries.

- Audio To Text Conversion Module: In this module a
- Text file is created for all the contents delivered through advanced LMS [33], [34].
- Video Module: This module's feature is accessible by the students who request access to classes ALMS with all features.
- Live Class Module: This module is only accessible to students who requested the access of classes through ALMS.

IV. Functioning of Tool

This section gives the sequence of message passing and interactions among the various entities of the proposed framework (Fig 2). In the proposed tool, the student can select either ALMS or BLMS based on their mode of device. If the student has a smart phone, they can choose ALMS and connect to the live online classes. They can interact with the teacher if the session exists. They can view the entire class in video. At the end of each session a text file is created for the entire lecture given by the corresponding staff and stored in a repository.

By choosing the next option BLMS, the student can only get message in text form only after the end of online classes. The delay of the message sent to the student occurs only if they request the material in the mid of the live online classes. If the request is made for BLMS only after the end of the live online session, then the text messages are broken in to chunks and sent to the requesting student. The student can send the request for any classes based on the subject code of that subject being taught. The request can also be made through SMS by mentioning the time of the online live session.

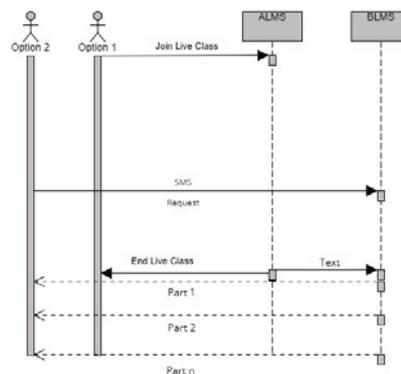


Figure 2 Tool Interaction

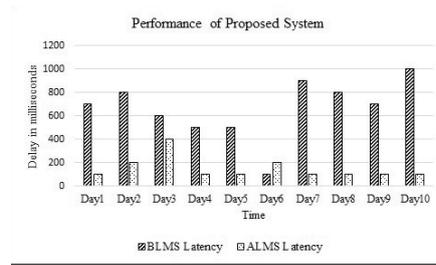


Figure 3 Performance Analysis

V. Results and Discussion

The proposed framework has been simulated using Cloud Sim which is an open source interface to simulate the various networking entities [35], [36]. The number of users simulated are given in Table I.

Table 1 Tool features

Entity	Number
Staff	10
Students	200
ALMS Server	20
BLMS Server	15
Datacenter	1

The BLMS and ALMS with the required entities and functionalities are implemented and the queries are sent across both the versions of LMS. The Table II gives the percentage of request given by the students for ALMS and BLMS for ten different days by a random selection. The performance of the proposed BLMS is compared with ALMS using the delay taken for response. The graphs in the Fig. 3 gives the delay taken by BLMS and ALMS for a random period of ten days.

Through the results we observe that the delay for reply through the BLMS is more than that of ALMS. The solution proves that, though the delay of the BLMS which is designed for low-speed connectivity and for operation without smartphones, the entire content is delivered as text messages which helps the students to understand what is taught in class. So, we can conclude that the

proposed solution is highly appreciable for people in low economic groups as well as in areas with poor internet connectivity.

Table 2 Percentage of request for alms and blms

Percentage of Request for two versions		
Time	ALMS	BLMS
Day 1	20 %	80 %
Day 2	40 %	60 %
Day 3	50 %	50 %
Day 4	30 %	70 %
Day 5	45 %	55 %
Day 6	75 %	25 %
Day 7	25 %	75 %
Day 8	35 %	65 %
Day 9	15 %	85 %
Day 10	10 %	90 %

VI. Conclusion and Future Work

The proposed work contains a framework and sequence of interactive messages between the users of online learning management system. The solution provides a text information of the contents given in lecture during the live online system. The students with poor or no internet connection can receive the notes through SMS based information retrieval. The notes sent through SMS based information retrieval system just converts the speech given in lectures in a text format. The future work is to select the important information alone, and still enhance the quality of notes that paves way for better concept understanding by the students. Also, the proposed Learning Management System will be enhanced in future by the introduction of online counselling module that works through Artificial Intelligence algorithms thereby providing 24 x 7 online support for students. This enhancement helps the students to maintain stress free life which acts as a precautionary measure against suicide.

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