

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/330472864>

Online Collaborative Approach of Interactive Antenatal Lectures for Expectant Mothers

Conference Paper · November 2018

DOI: 10.1109/IEMCON.2018.8614823

CITATIONS

0

READS

116

6 authors, including:



Grace U. Nneji

Oxford Brookes College of Chengdu University of Technology

48 PUBLICATIONS 447 CITATIONS

SEE PROFILE



Sarder Shamir Shakher

University of Electronic Science and Technology of China

5 PUBLICATIONS 4 CITATIONS

SEE PROFILE



Happy Nkanta Monday

Oxford Brookes College of Chengdu University of Technology

50 PUBLICATIONS 574 CITATIONS

SEE PROFILE

Online Collaborative Approach of Interactive Antenatal Lectures for Expectant Mothers

Grace U. Nneji
School of Information and Software Engineering
University of Electronic Science and Technology of China
Chengdu, China
ugochinneji@gmail.com

Jianhua Deng
School of Information and Software Engineering
University of Electronic Science and Technology of China
Chengdu, China
Jianhua.deng@uestc.edu.cn

Sarder S. Shakher
School of Information and Software Engineering
University of Electronic Science and Technology of China
Chengdu, China
shuvoshamir@live.com

Happy N. Monday
School of Computer Science and Technology
University of Electronic Science and Technology of China
Chengdu, China
mh.nkanta@gmail.com

Basil C. Mbonu
Department of Computer Sciences
School of Physical Sciences
Federal University of Technology, Owerri
Imo State, Nigeria
mbonubasil@gmail.com

Mercy C. Nneji
Department of Mass Communication
School of Social Sciences
University of Nigeria, Nsukka
Enugu State, Nigeria
amakamercy1@gmail.com

Abstract— Antenatal classes are sometimes called parentcraft which help to prepare expectant mothers for their baby's birth, feeding the baby and to look after the baby. It is the best way to ensure expectant mothers stay healthy during pregnancy as well as to deliver confidence and information. This paper looks into the current state of antenatal education. It investigates the way antenatal classes are accessed by expectant mothers, the challenges they face in getting access to these classes and their attitudes towards these classes. For most women, it could be stressful and very inconvenient to attend physical antenatal classes. An online collaborative approach of interactive antenatal lecture for expectant mothers is proposed to replace these classes by providing live streaming lectures, discussion and interactive sessions between users. In order to accomplish this task, some face-to-face interviews were conducted. Questionnaires were also distributed. This paper adopted the Structured Systems Analysis and Design Method (SSADM) for the specification, development, and implementation. The web based system is implemented using PHP framework as Back-end, Front-End using HTML, CSS, JavaScript, XAMPP Server and MySQL was employed to handle the database structure. The web based system was implemented and tested using carefully thought out test cases which were successful. The proposed system offers antenatal education to expectant mothers no matter their location as well as a platform for discussion between expectant mothers, midwives, or anyone at all; sharing useful information amongst themselves and giving advice and encouragement to one another.

Keywords— *Antenatal system, expectant mother, mobile devices, hospital, web based system, interactive lecture*

I. INTRODUCTION

Antenatal classes is one mediation that can be used to educate pregnant women about risk factors that increase infant mortality, thereby decreasing risks for infant mortality [1], [2]. Antenatal classes provides essential opportunities for health care providers to educate pregnant women regarding health promotion and risk reduction during and after

pregnancy as well as enhancing healthier pregnancies and decreasing adverse birth outcomes [3], [4]. However, more education and support for high risk pregnant women is paramount [5], [6]. Reproduction can be said to be the most important function of any organism as without it there would be no continuation of life [7], [8]. Hence, proper preparation for pregnancy and the early formative weeks of children is essential for expectant mothers. Antenatal lectures help expectant mothers focus on their pregnancies [9], [10]. It also exposes expectant mothers to the highs and lows of parenthood. Antenatal lectures cover a lot of topics including the developing baby, changes for the mother, giving birth and meeting the baby, caring for the baby, the health and well-being of the mother and other useful information to the user [11]-[13]. Antenatal lectures are a great way to prepare for the arrival of babies. The proposed system bridges the gap between the expectant mothers and the classroom through the online platform irrespective of their locations.

II. THE EXISTING SYSTEM

The majority of antenatal education is gotten by attending physical antenatal classes. These classes may have different sessions which may include evening sessions, weekend sessions and other possible times. There might also be one-off refresher classes for experienced mothers. Today, the educators facilitating the programs in hospitals are predominantly midwives, with physiotherapists continuing to be involved in some areas [8]. Occasionally early childhood health nurses/maternal and child health nurses are also involved. The educators may have observed education sessions as a part of their basic training but very few have had any specific training in group facilitation or presentation skills. In fact the majority of educators are deficient in education skills, particularly adult learning. There are antenatal education training courses available but many are expensive and time-consuming [9].

A. Advantages of the Existing System

- It allows women to attend antenatal classes with their spouse for emotional support

- Attending physical classes could be seen as a way of exercise to stay healthy during pregnancy.

B. Disadvantages of the Existing System

- Many women have no access to antenatal guidance: this is due to the fact that these classes might be time-consuming or stressful to attend fully.
- There is a dearth of qualified tutors in this area: Getting a diploma in childbirth education is expensive and time-consuming and not many midwives/nurses may be able to go through with such a program.
- Attending a physical class is inconvenient for many expectant mothers: This is because of the fact that the classes cannot be held in all locations at all times.
- Privacy issues: Most attendees/expectant mothers may not be comfortable asking some questions in public since Antenatal classes are usually held in groups. Also, some women might want their husbands around for emotional support in such classes. This might not be possible for the husband.
- There is no existing alternative to physical classes available.

III. PROPOSED SYSTEM

The Antenatal Lecture system is a web based application which helps expectant mothers access antenatal materials and facilitates anonymous interaction between them and other expectant mothers. Antenatal tutors may also register and be of help on the forums by interacting with the expectant mothers. Some topics on the forum will be pinned to the forum home page depending on their relative importance. These topics can only be pinned by the administrator(s). All system information is maintained in a database, which is located on a web server. The website will store the video lectures on the local server.

A. Advantages of the Proposed System

The merits of the proposed system are numerous.

- There is greater accessibility. The web app can be accessed by anyone with access to the internet and/or a mobile phone. With this fact, many expectant mothers will have access to antenatal education.
- There is reduced Cost. The expectant mothers would have access to the education without need for any tuition fees.
- There is room for socialization. It provides opportunities for expectant mother to meet one another and begin to form supportive networks.
- There is room for better privacy. Expectant mothers will be able to ask any kind of questions and make any kind of comments

anonymously.

- The app will provide knowledge that will help parents in handling life with a new baby as well as through the early stages of the baby's life.

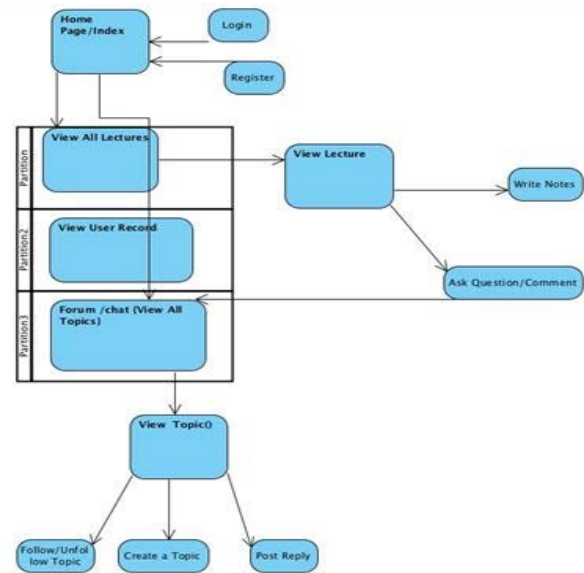


Fig. 1. High level model of the proposed system

B. Disadvantages of the Proposed System

- It can be very difficult to understand some of the parts of anatomy and the birth process.
- The online childbirth class misses out on some of the hands-on activities.

IV. SYSTEM METHODOLOGY

The methodology used is Structured Systems Analysis and Design Method (SSADM).

In the requirement, the 'user' or 'she' is referred to the expectant mother.

A. Functional Requirement:

1) Function Requirement 1.1

ID: FR1

TITLE: Access the website

DESC: A user should be able to access the website through its URL on either a computer or a smartphone.

RAT: In order for the user to use the application

DEP: None

2) Function Requirement 1.2

ID: FR2

TITLE: User registration

DESC: Provided the user has been able to access the website, then the user should be able to register through the site. The user must provide username, email, password and other information.

RAT: In order for the user to register on the website.

DEP: FR1

3) Function Requirement 1.3

ID: FR3

TITLE: User Login

DESC: Provided the user has registered, then the user should be able to log in to the website.

RAT: In order for a user to log in to the website.

DEP: FR1, FR2

4) *Function Requirement 1.4*

ID: FR4

TITLE: Edit Profile

DESC: Provided the user is logged in, then the user should be able to edit his/her profile by clicking the edit profile

RAT: In order for a user to log in to the website.

DEP: FR3

5) *Function Requirement 1.5*

ID: FR5

TITLE: Password Retrieval

DESC: Provided the user has registered, then the user should be able to retrieve his/her password through email.

RAT: In order for a user to retrieve his/her password

DEP: FR1, FR2

6) *Function Requirement 1.6*

ID: FR6

TITLE: View Lectures List

DESC:

The lectures can be viewed in a list. Each element in the list represents a particular lecture. Each element should include the title of the lecture, the description and an icon representing if it is a visual lecture or a textual lecture.

There will be maximally 25 lectures displayed. If there are more than 26 lectures then the user clicks one of the pagination buttons below the page to move to another page.

The user can search the lectures on the site by typing in the search bar located at the top right corner of the page.

The lectures will be shown according the newest.

RAT: In order for a user to view all the lectures available

DEP: FR3

7) *Function Requirement 1.7*

ID: FR7

TITLE: View Lecture

DESC: Provided the user is logged in to the website, he should be able to view a particular lecture by clicking its link in the lectures list page.

RAT: In order for a user to view a particular lecture's contents

DEP: FR3

8) *Function Requirement 1.8*

ID: FR8

TITLE: View Forum Topics

DESC: Provided the user is logged in to the website he/she should be able to access the forum section by clicking its link. The topics are arranged according to the time of update. Some threads are stickied and will remain at the top of the list. Only 30 threads will be displayed on a single page.

RAT: In order for a user to view the topics in the forum

DEP: FR3

9) *Function Requirement 1.9*

ID: FR9

TITLE: View Topic

DESC: Provided the user is logged in to the website he/she should be able to view a particular topic by clicking its link in the forum section. A topic contains replies that have been posted.

RAT: In order for a user to view a particular topic

DEP: FR3, FR8

10) *Function Requirement 1.10*

ID: FR10

TITLE: Create Topic

DESC: Provided the user is logged in to the website he/she can create a new topic from the view Forum topics. He/she needs to provide the title and the first reply of the topic.

RAT: In order for a user to create a topic.

DEP: FR3, FR9

11) *Function Requirement 1.11*

ID: FR11

TITLE: Post Reply

DESC: Provided the user has opened up a topic, he can post a reply to the topic. Every reply has its text, the username of the user who posted it and finally the time of the reply.

RAT: In order for a user to post a reply to a topic.

DEP: FR3, FR9

12) *Function Requirement 1.12*

ID: FR12

TITLE: Like Post

DESC: Provided a user has opened up a topic, you can like any post/reply within it.

RAT: In order for a user to like a reply.

DEP: FR3, FR9

13) *Function Requirement 1.13*

ID: FR13

TITLE: View User Profile

DESC: Provided a user has logged in he/she should be able to view any user's profile (including theirs).

RAT: In order for a user to view the profile of any user (self-included).

DEP: FR3

14) *Function Requirement 1.14*

ID: FR14

TITLE: Follow Topic

DESC: A user can choose to be notified whenever a particular topic has a new reply.

RAT: In order for a user to be notified about new replies to a particular topic.

DEP: FR3

B. Non Functional Requirement

1) *Regulation*: the forum will be regulated by moderators. Moderators are users who have the user role of moderator. The moderator is able to hide posts and ban other users who violate forum rules. Users who go against the terms and conditions of the forum should be able to receive bans. Users are able to draw to the attention of moderators, posts that are

offensive.

2) Security: access to the site will have to be authorized by entering a user name and password. A user can retrieve his/her password if it is misplaced by entering their email.

3) Storage: storage will be efficiently optimized to make for the lowest level of redundancy while providing the best user experience.

C. User Interface Requirement

A first-time user of the application should be met with a registration page when she loads up the application as shown in figure 2. If the user is already registered she is able to log in at the top right corner of the page.



Fig. 2. Login/Register Page

If the user has logged in recently or has her details stored in the browser, she should be able to enter one of the two sections: the forum or the lecture area as shown in figure 3.



Fig. 3. Home Page

Every user will have a profile page where they can view their email address, password and other information, as shown in figure 4, they can click the edit button to edit their information.

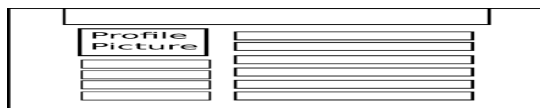


Fig. 4. View Profile Page

Figure 5 shows in detail the contents of the navigation bar at the top of the page. It contains the site icon and name, the 'my dashboard' button which when clicked, brings down the dropdown menu also shown. The numbers beside the menu items will denote the amount of change that has occurred (for example having 2 beside mentions means that the user has been mentioned twice). The navigation bar also contains the username of the user and finally the log out button. Figure 5 shows the lecture page which contains a list of enrolled lectures first and then other lectures below, this is triggered by clicking the lectures button as shown in figure 2. The user can search/filter for lectures using the search bar at the top right corner of the page. The search results are populated depending on the title and description of the video. Each result item contains the title of the lecture and the description.



Fig. 5. Navigation Bar

Clicking on the title of a lecture opens the lecture page (figure 6) which shows the lecture, either textual or visual.

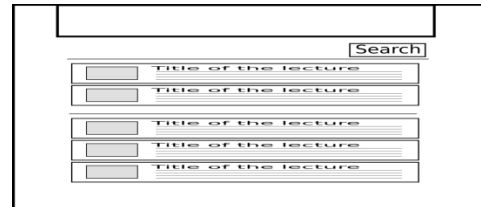


Fig. 6. View Lectures Page

From the home page dashboard in figure 3, if we click the forum image we are taken to the forum section (figure 8).

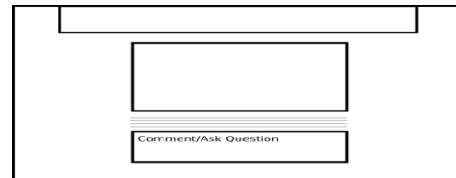


Fig. 7. View Lecture Video Page

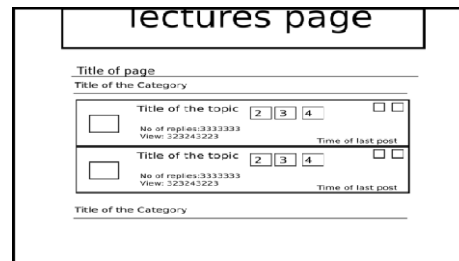


Fig. 8. View Forum Topics

On this page we see all the existing topics. Each topic has the title of the topic, the number of replies and the number of views also the time of the last reply posted to the topic. The stickied topics (topics that remain at the top of the list because they have been given special status by the administrator) are at the top of the list. The position of the other topics is determined by the last update time of each topic. Clicking on a topic will take the user to the topic page as shown in figure 9. This page contains all the posts on the topic. Each post has the time of post, the post text and the username of the user who posted it. Clicking on the username will open the user's profile, as shown in figure 4. Each post can also be liked or shared. At the beginning of every topic you'll see a follow button which you can click to add the topic to your followed topic list.

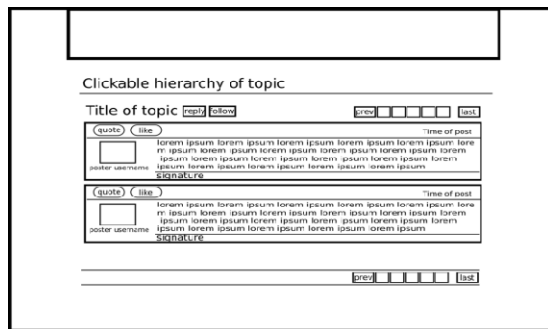


Fig. 9. View Forum Topic

At the top of the page on the navigation bar, you can click the followed topics button to open the followed topics page, as shown in figure 9. This page shows all the topics that the user is following. If a topic has a new post there is a lighted icon indicating that. Also there is a number appended to the followed topics button, which tells the total number of posts that have been made to the followed topics of the user. At the top of the page, the user can click the icon/name of the site to return to the home page dashboard, the user can also click the log out button to exit. The user can also click the arrow beside the icon/name to quickly switch between the forum and lectures sections.

V. DEVELOPMENT OF LOGICAL DATA MODEL

The development of the logical models began with breaking the program into its two constituents: the forum and the lecture page. The lecture page includes video lectures and the users who log in to access them. The forum contains topics/threads, posts, private messages, followed topics, followers, users and other users. From this, the following models were extracted; User, Lecture, Thread, Thread, Category, UserRole, Post, PrivateMessage, FollowedTopic Follower, Following Topic.

A. Source of Data

Data were gotten from various sources. Interviews were conducted, observation and conclusions were made. The lecture videos were sourced from different internet sources. It is an interactive app and usage will be online and real-time.

VI. SYSTEM DESIGN AND IMPLEMENTATION

A. Language Justification

This paper was developed using the PHP Framework.

Key features of Play framework include:

- Model View Controller (MVC) Architecture.
- Database, Community and Documentation Support.
- Automate common Web Development Tasks.

B. Input Specification

The inputs to the program include the following:

1) *User Information Inputs*: These are the personal information that the user inputs to the program. They include the following: username, email address, password, first name and last name.

2) *Forum Inputs*: These are the data entered into the forum. They include topics, posts and private messages between users.

C. Output Specification

The outputs of the program include the Lecture videos, the topics and posts on the threads as well as private messages received from other users.

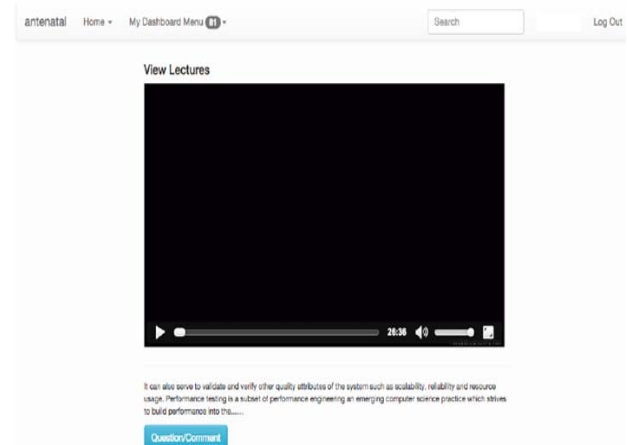


Fig. 10. View Lecture Page

D. Database Specification

The DBMS used in this paper is MySQL.

1) Database Schema

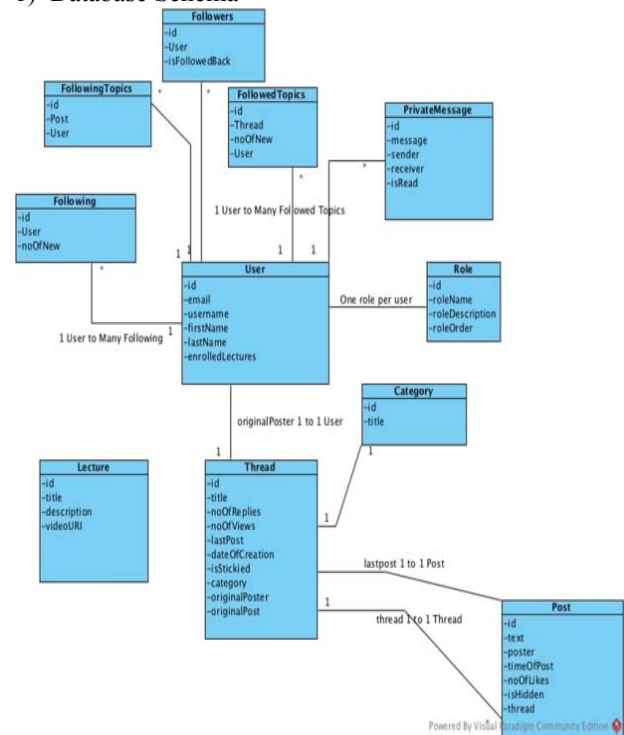


Fig. 11. Database schema/Entity Relationship Diagram

2) Program flowchart

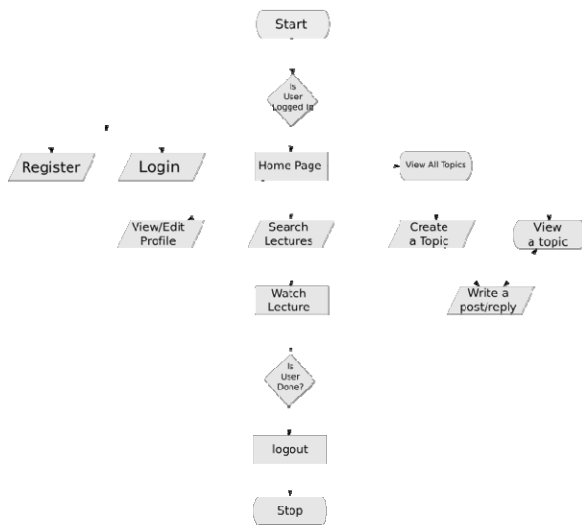


Fig. 12. Program Flowchart

E. Hardware Requirement

The web application runs on the internet hence the only hardware required apart from the computer used in accessing it are the hardware for providing internet access. These might include modems, WLAN modules, LAN modules etc. However, the website was developed on two systems, a Dell PC running Ubuntu 14.04 and MacBook air running Mac OS X.

F. Platform and System Requirement

The website is platform independent and can operate on multiple platforms with little to no modifications as it is served from the web server and hence will run on almost any internet enabled smart device. The website should however be accessed through a HTML5 capable web browser.

Formal requirements:

- Operating system: Windows XP Service Pack 2 and above. Linux Mint, Ubuntu, Fedora, Gentoo, and all other major Linux distributions. Mac OS X 10.6 and above.
- Web Browser: Internet Explorer, opera, etc

VII. SYSTEM TESTING

Testing was done to verify that the system achieves the goal set for it. The testing phases include:

- Unit testing
- Integration testing
- System testing

VIII. RESULT

The results show the advantages of the proposed system. It is observed that the online collaborative antenatal lectures offers flexibility and reliability to expectant mothers and more especially, it increases user's online participation in antenatal classes. Figure

13 and 14 show a chart of the survey conducted on both the existing method and the proposed system. A simple questionnaire was distributed to a group of expectant mothers to evaluate their experiences on both methods. The scale represents 0.5 to 20 persons. The survey questions are as follows:

- Would you agree that the proposed system could increase user's participation in antenatal classes?
- Would you agree that the conventional method is not as flexible compared to the proposed system?

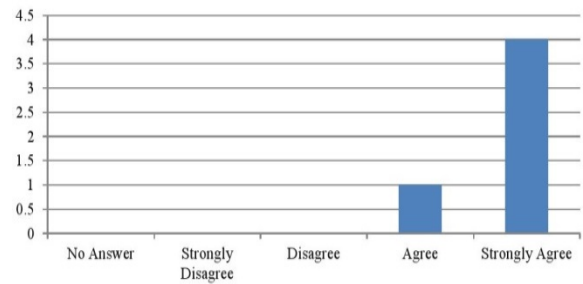


Fig. 13. Survey Conducted on the Proposed System

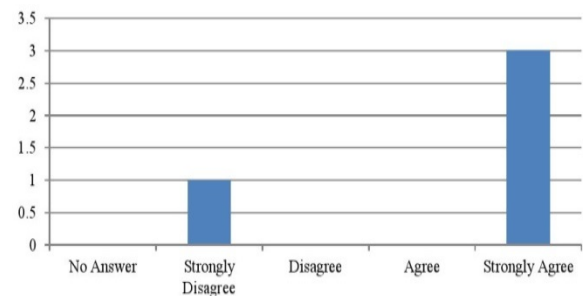


Fig. 14. Survey Conducted on the Conventional System

The web application ran optimally with all errors fixed. The lecture videos were fully accessible without any errors. Discussion through the forum was also optimal while users were also able to send private messages between themselves. The work was tested on three devices.

- MacBook Air Intel Core i5 4GB RAM.
- Dell Latitude E5410 Intel Core i5 6GB RAM.
- Samsung Galaxy Core Prime SM-G360H 1GB RAM

They were run on Google Chrome for the computers and UC browser for the mobile phone.

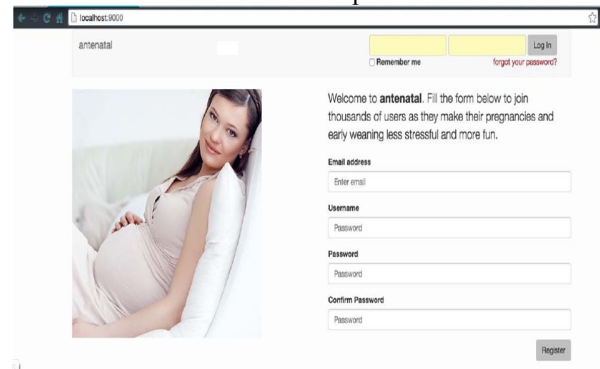


Fig. 15. Result of the Login Page

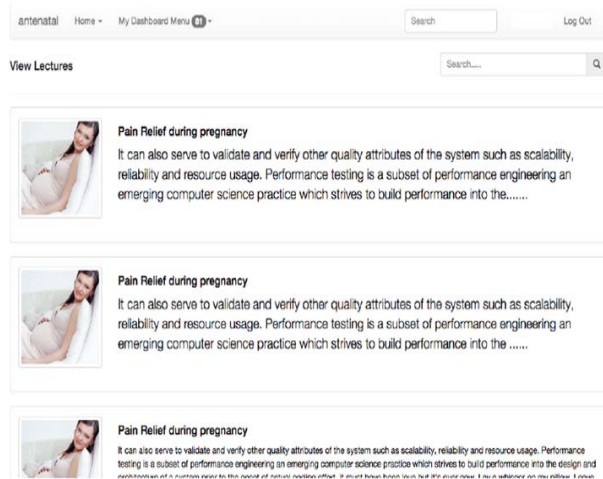


Fig. 16. Result of the View Lectures Page

IX. COMPARISON

It is observed that the proposed system is efficient compare to the conventional method of in-class lecture. Figure 13 and 14 present the results of the survey conducted for both the conventional method and the proposed system. User's experience was conducted to evaluate the efficiency of the proposed system over the conventional method. It's observed that most pregnant women preferred the proposed system due to its convenience and flexibility. The proposed system increases expectant mother's antenatal class participation by over 50%. This result shows that most expectant mothers find it convenient to participate via the proposed system.

CONCLUSION AND FUTURE WORK

This paper describes the combination of e-learning and message forum functions to form an e-learning system that tries to defeat some of the problems involved with the current form of antenatal education. An interactive forum to allow for interaction and communication between fellow expectant mothers and also between expectant mothers and tutors has been developed. It also helps to remove the barrier of formality and using the cloud of anonymity. Expectant mothers will be able to receive help from midwives and others without the need for appointments or the need to reveal their identities. Future work can consider improving the proposed system by integrating an intelligent recommendation system to better improve the efficiency of the system.

ACKNOWLEDGMENT

This paper is supported by the project of NSFC (ID: 61602098) and the project of Sichuan Science and Technology Department Talent Project (ID: 2018RZ0009).

REFERENCES

- [1] G. Saranya, G. Geetha and M. Safa, "E-Antenatal assistance care using decision tree analytics and cluster analytics based supervised machine learning," *2017 International Conference on IoT and Application (ICIOT)*, Nagapattinam, 2017, pp. 1-3. doi: 10.1109/ICIOTA.2017.8073617
- [2] E. Kimei and K. Kalegele, "Digitization of antenatal health card and integration with OpenMRS platform: System analysis and design," *2017 IST-Africa Week Conference (IST-Africa)*, Windhoek, 2017, pp. 1-7. doi: 10.23919/ISTAFRICA.2017.8101976
- [3] KM. Renault, EM. Carlsen, S. Haedersdal, "Impact of lifestyle intervention for obese women during pregnancy on maternal metabolic and inflammatory markers", *International Journal of Obesity advance online publication* 7, February 2017.
- [4] V. Horner and C. Mashigaidze, "Porting Bacis Decision Support System for Antenatal Care onto OpenMRS," *2018 IST-Africa Week Conference (IST-Africa)*, Gaborone, 2018, pp. Page 1 of 9-Page 9 of 9.
- [5] BB. Patel, P. Gurmeet, DR. Sinalkar, KH. Pandya, A. Mahen, N. Singh, "A study on knowledge and practices of antenatal care among pregnant women attending antenatal clinic at a Tertiary Care Hospital of Pune Maharashtra", *Med J DY Patil Univ* 2016, vol. 9, pp. 354-62.
- [6] M. Fuertes, A. Faria, M. Beeghly, Lopesdos Santos, P., "The effects of parental sensitivity and involvement in caregiving on mother-infant and father-infant attachment in a Portuguese sample", *Journal of Family Psychology*, vol. 30, no. 1, pp. 147-156, Feb 2016.
- [7] RK. Gupta, TN. Shora, AK. Verma, R. Jan, "Knowledge regarding antenatal care services its utilization and delivery practices in mothers (aged 15-49 years) in a rural area of North India", *Trop J Med Res* 2015, vol. 18, pp. 89-94
- [8] S. A. Onashoga, A. S. Sodiyi, T. O. Omilani and H. O. Ajisegiri, "A Mobile Phone-Based Antenatal Care Support System," *2011 21st International Conference on Systems Engineering*, Las Vegas, NV, 2011, pp. 410-415. doi: 10.1109/ICSEng.2011.81
- [9] M. Ryan, J. Hughes, Using Conjoint Analysis to Assess Women's Preferences for Miscarriage Management at Journal of Transport Economics and Policy, 2014.
- [10] S. Palomba, GB. La Sala, "American Journal of Obstetrics & Gynecology", *Menstrual preconditioning for the prevention of pregnancy complications in women with polycystic ovary syndrome (PCOS)*, 2016, [online] Available: ajog.org.
- [11] Britze, T. H., "The Danish National e-Health Portal - increasing quality of treatment and patient life", *Technology and Health Care*, vol. 13, no. 5, 2005.
- [12] "Everyday Life During Pregnancy", Retrieved from, 1995-2007, [online] Available: http://www.centersite.net/poc/view_d oc.php?type=doc&id=6138&cn=282.
- [13] G. Petrova, P. Bojkov, G. Spasov, "Design Web-based Personal health Systems - Models and specifics", *International Scientific Conference Computer Science*, 2008, 2008.
- [14] Schumacher, R. M., Webb, J. M., Johnson, K. R., "How to select an Electronic Health Record System that Health Professional can use", *A White paper by User-Centric Inc. 2009 publication*, 2009.