THE DESIGN OF SMART ENGINEERING STUDY APPLICATION (SESA)

ABSTRACT

"An engineer's mind works all around imagine and Construct". *In india, there is a big issue of teaching and understanding. The on-going teaching-learning process at engineering colleges is still traditional that is teachers deliver course materials, assignments, quizzes, and exams in the classroom. The delivery of information and institutional administration services is still done manually so it is slow and partially effective. The purpose of this application is to make smart learning of engineering subject, if the application is designed with* ***audio-visual effects with appropriate examples*** *to overcome various conceptual problems faced by engineering students. Smart learning will be a blended learning that combines traditional face-to-face methods with audio-visual presentation. The target of this application is to enhance the understanding capacity of engineering students and management of academic administration to improve education quality in Colleges. It can support learning in Colleges and create learning environment more effective, efficient, and paperless. The design of smart engineering application software using waterfall method which includes five stages, namely the identification of user needs, analysis, design, implementation, and testing.*

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INTRODUCTION

The on-going learning process in engineering colleges is still traditional face-to-face, where teachers delivers subject material on black or white boards, exams, assignments, tasks and the discussions within a particular classroom. If there are teachers who are trying but unable in making the concepts clearly to students, this app will help both of them to teach and understand the topics in audio-visual format. Even due to this application, students also will be independent in finding and understanding the topics of the subject. **The traditional learning model is teacher-centered** so that students tend to be passive in learning activities. This causes a lack of mutual relationships between teachers and students. Teachers as planners as well as implementers in teaching and learning activities need to know the difficulties experienced by students about the subject matter that has been taught, and that can be overcome through this application.

The problems in traditional learning systems require solutions to improve the quality of education in engineering studies. It is necessary to transform the traditional learning method into information and communication technology which **student centered** learning to improve students' understandability, competitiveness and independence in learning. Changing the habit of the traditional face-to-face learning process into a virtual class is not easy, because it requires teachers to make the content of the subject matter in digital form, the teacher is expected to create an interactive learning environment and conduct professional development programs.

The realization of learning is software as a learning service in the form of smart engineering study applications (SESA). This application can create a more interactive, efficient, dynamic learning environment and can improve students' learning motivation. This can be realized by formulating clear and specific learning objectives, developing structured learning materials, and facilitating the occurrence of mutual communication between students and teachers. SESA can provide integrated facilities that include lesson plans, learning schedules, teaching/study materials, tasks, assessment of learning outcomes, and can measure student achievement. Learning materials in SESA applications can be updated easily and Students can access this system easily every time so that student learning activities can be done anytime and anywhere.

SESA is a concept of developing **Audio-Visual learning** services applied to colleges as an interaction between administrative staff, teachers, and students. Smart engineering aims to create a smart learning environment that is not limited by distance and time by utilizing information technology. SESA have three main dimensions of information that is technology, people, and communities that are interconnected with each other to create a smart learning environment. Information technology includes hardware, Internet network infrastructure, and software as a service. People are teachers, students, administrative staff, and parents of students who interact with the college environment. Community is a mix between the application of information technology and people who use smart engineering study services to form a smart educational community.

SESA with online learning, focus on classroom management and learning activities as transformation from traditional learning model into online learning. Online learning activities undertaken by students i.e. students attend cyberspace for certain subjects according to a predetermined schedule. The distribution of study materials, tasks, quizzes, task assignments, exams, grades, discussions, and college announcements is done online.

LITERATURE REVIEW

E-learning should be considered as a means of learning rather than the mode of learning. Since e-learning is not a separate system of education by itself, it is to be only used a means of delivering the learning contents by being a part of the well-established education systems. The electronic form of learning used alongside of the traditional face to face learning has led to blended learning environments that improve the effectiveness of traditional learning even further. Learning is an interactive process that involves the learners, teachers and the contents. With the massive growth in WWW technologies, learning has become worldwide process where there are no restrictions on the time and place of learning for the learners.

The various real time communication application service like text, audio, and video will be continuously develop in the future to change internet technology-based conventional communication environment. The importance of real time communication is its capability to create virtual environment as the prototype of real world communication since it support text, face-to-face communication, and its capability to perform direct dialogues between participants. Textual, face-to-face communication and dialogs are able to create dynamic interaction environment since participants may perform face-to-face sessions, direct chatting, obtain direct feedback, present physical reactions from individual participant, and conduct text-based real time discussion. Each internet based communication service application requires application protocols design to arrange communication or transaction; hence, message or data packages are interchangeable among application programs through internet. The variety of real time communication application service that users require, need protocols design framework that enable developer to develop internet-based real time communication application service.

The online consultation application can support text communication, face-to-face communication, dialogue-based communication, and sharing seminar material presentation. The design of the online consultation application program consists of three parts, which are a server application program, a lecturer application program and a student application program. The importance of the real time communication in organizing online consultation system is its capability to create virtual environment as a prototype of real world communication, because it supports text communication, file presentation, face-to-face communication and direct dialogue between participants. The face-to-face communication and direct dialogue can create a dynamic interaction environment, because participants can interact face-to-face, directly talk to each other, obtain feedback, present physical reaction of other participants, and chatting using text communication.

The major purpose of experiment was to investigate students' learning enhancement on the web-based, adaptive learning system and the development of learning responsibility after the e-Learning. In addition, the learning statuses of students, such as misconceptions and conceptual changes, were also studied by analyzing learning records.

In Covid-19 scenario, Visual learning has grown dramatically over the past two years and has become an integral part of most of the higher education institutions. While this explosive growth has created exciting opportunities for both the institution and students, high dropout rates in online learning environments continues to be a major concern for all institutions. Research has identified lack of social and teacher presence in online courses as major factors leading to affect in student's studies. While it is easy to establish these presences in traditional classrooms, developing them in an online environment could be challenging due to absence of any face-to- face contact. The purpose of this preliminary study is to compare students' perceptions of social and teacher presences in online and traditional classroom. Thirty-four students enrolled in an online section and twenty-nine students enrolled in a face-to-face section of an undergraduate course participated in the study.

METHODOLOGY

Method of collecting data

The process of data collection can be done through observation and interviews in the College Advent as the object of research to collect data and information about the current learning system. Data and information studies include class divisions and lesson schedules, teaching and learning activities in the classroom, subject matter, class discussions, test execution systems, student learning outcomes assessment systems, and student presences.

Analysis

The analysis phase is the decomposition of the College's learning system and overall academic administration into simpler sections with a view to identifying and evaluating problems, opportunities, constraints, and college needs to implement the smart college system. At this stage, data and information analyzes are performed from the identification of user needs to obtain a complete understanding of learning processes, academic administration, academic administrative service mechanisms, delivery of information to students and teachers, and create report. At this stage have been determined requirement smart college system.

Designing the Smart Engineering Study Application

Based on the analysis of SESA application needs, we are going to model a design using object-oriented approach to capture and explain all user needs and transformation of analysis results into UML diagramming design (Unified Modeling Language). The aims of SESA modeling design is to describe the realization of smart engineering system in the form of use case diagram, activity diagram, and database design.

Making the smart engineering application

Making of smart engineering study application is to make the code of web based smart engineering application program using PHP programming language and MySQL database. The services provided by smart engineering applications are virtual classes, subject matter, discussion forums, online exams, assessment systems, upload / download tasks, and learning schedules. These services are interconnected and integrated in the smart engineering study application system.

RESULTS AND DISCUSSION

Analysis of Smart Engineering Study Applications

The analysis of smart engineering application needs based on the data collected at the Collages and the learning processes taking place in the classroom. The data needed to build smart engineering applications are student data, teacher data, subject matter data, value data, exam data, classroom data, and lesson schedule. Teacher activities in the learning process include teachers making course materials, explaining course materials, making questions to students, making exams, making assignments, examining exams and scoring, organizing and managing discussions. Students' activities in the learning process include students listening to teacher explanations, asking teachers, answering teacher questions, doing exam questions, and conducting discussions.

Smart engineering application system with virtual class is a web-based learning environment that utilizes information and communication technology for online learning and classroom management. Virtual classes contain digital content that can be accessed and exchanged from anywhere and anytime only by admin level. Learning activities undertaken by students ie students follow the virtual class for certain subjects according to the schedule, the interaction between students and teachers conducted through discussion forums, the learning process is set and controlled by the teacher.

The architecture of Smart engineering application *service*

Smart engineering application services can change the teacher-centered learning model into student centered learning. This causes students to be responsible for learning activities such as learning planning, student interaction with teachers, student interaction with students, and evaluation of the learning that has been done. Figure 1 shows the architecture of smart engineering application services with online learning system.

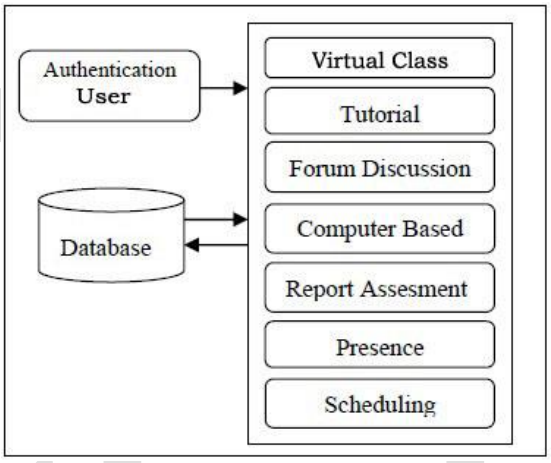

Fig. 1 The Architecture of SESA

The design of smart engineering study *application*

The design of SESA is needed to transform the results of analysis into the modeling diagram form as a basis for creating smart engineering application codes. Smart engineering modeling design uses UML (Unified Modeling Language) to describe all user needs and services provided by the application. Smart engineering modeling aims to describe the realization of the smart engineering system in the form of use case diagrams, activity diagrams, and database design.

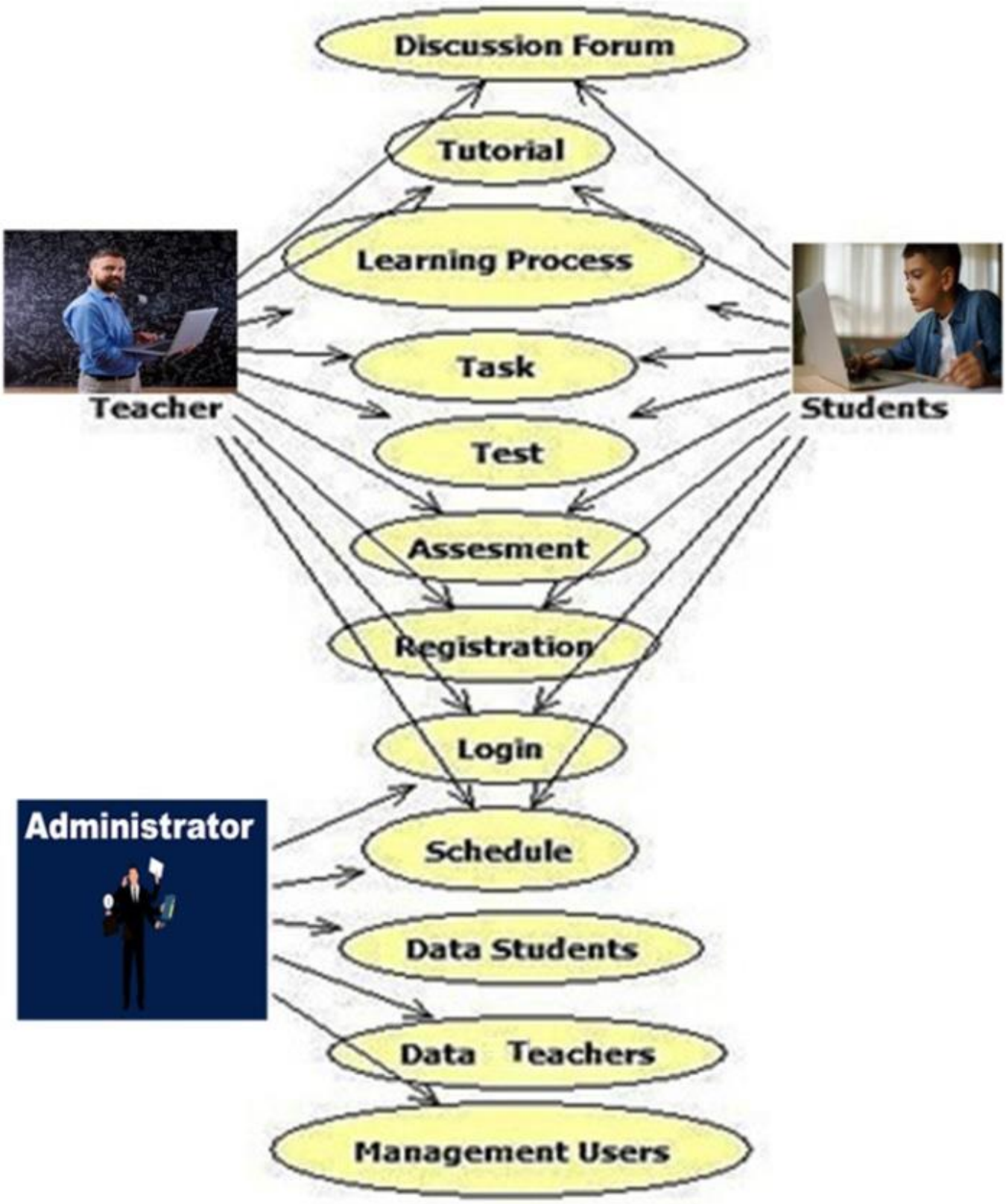

Fig 2. Use Case diagram of smart engineering

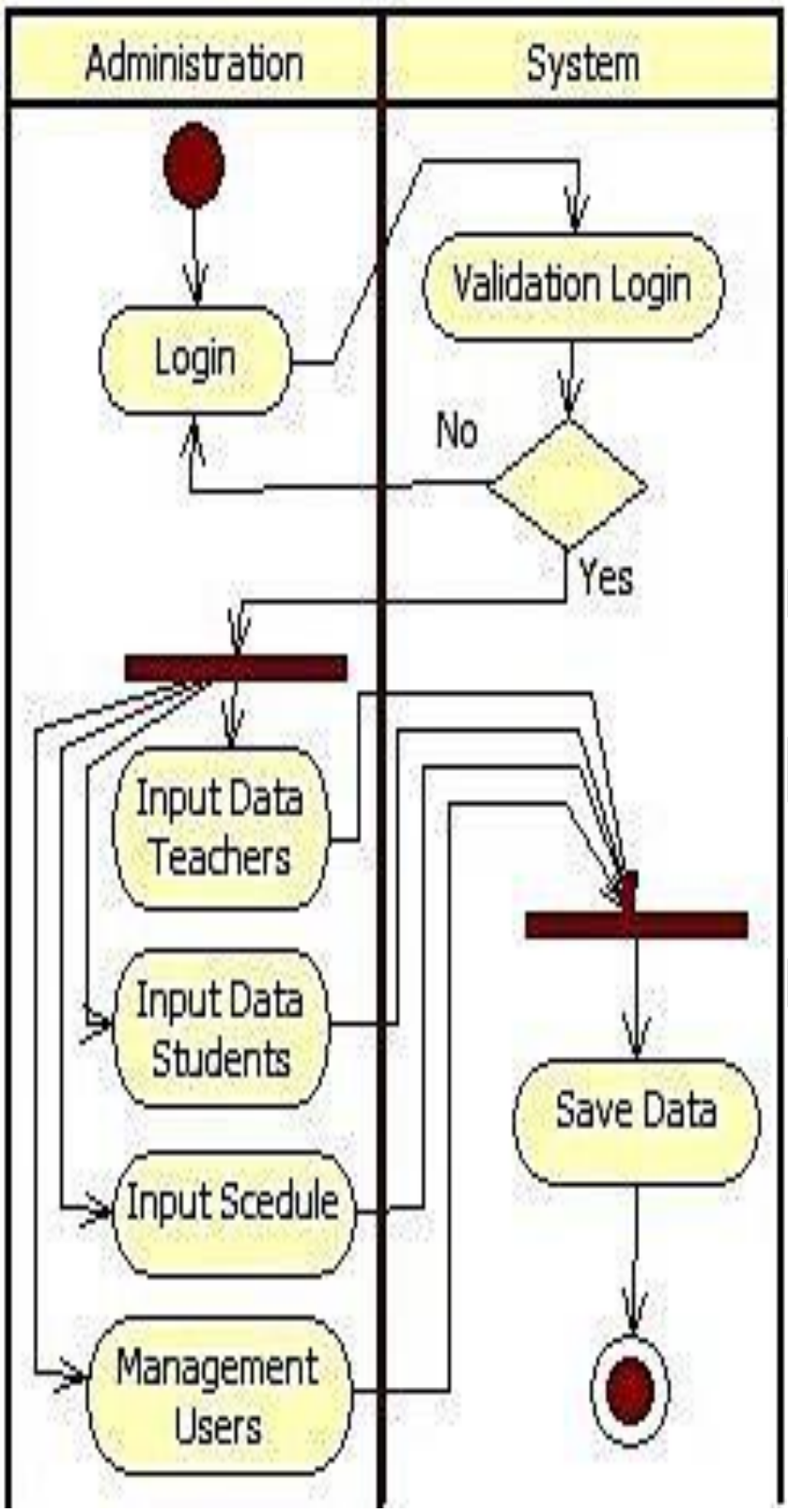

Figure 3. Activity diagram for administrator

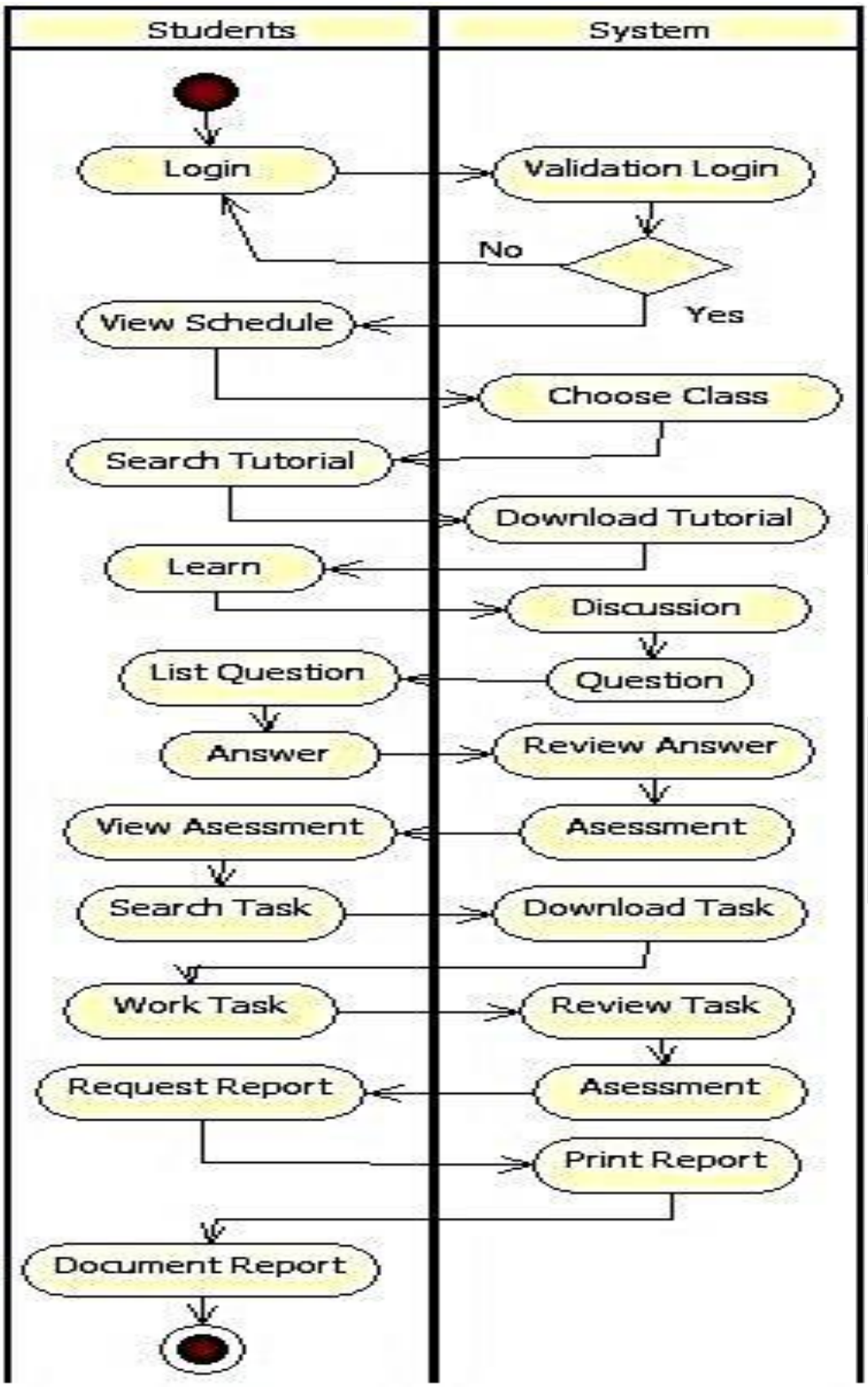

Figure 3. Activity diagram for student

Implementation of smart engineering application

Implementation of smart engineering application software is the college level software that can be use as a web-based learning application service with certain boundary lines. Implementation of smart engineering applications requires students to be active and responsible in managing learning activities. It can build the creativity and independence of students to improve the quality of education and encourage teachers to always develop and adjust the learning materials in accordance with the development of science and technology. The smart engineering application system includes three users i.e. administrators, teachers, and students. The user interface of smart engineering applications can be seen in the following figure.

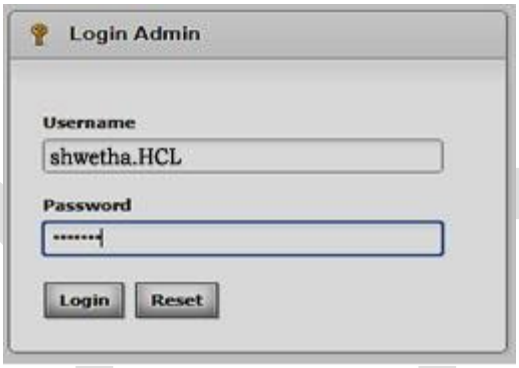

Figure 4. Administrator login

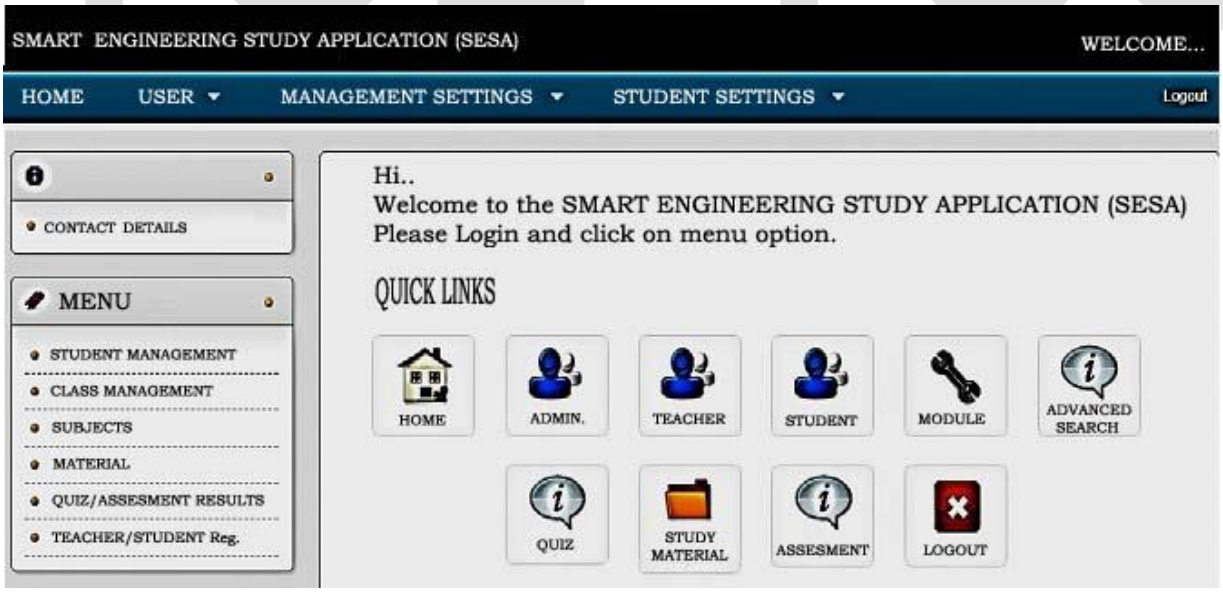

Figure 5. Control panel

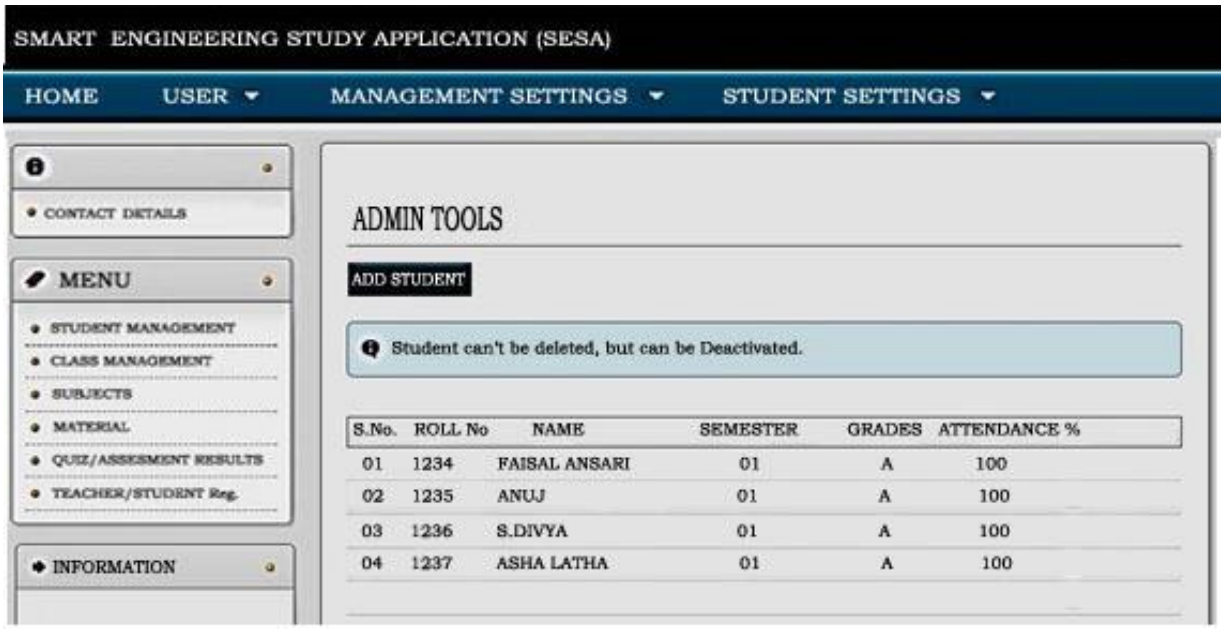

Figure 6. Student management

Discussion

Smart engineering applications include academic administration system and online learning that can improve the quality of education and learning services. Smart engineering application services include management academic administration, virtual class, discussion forums, online exams, lesson schedules, and student presence. The success of learning using smart engineering applications need to pay attention to several things as follows

- Smart engineering can create a conducive and interactive learning environment. It can be realized by formulating clear and specific learning objectives, preparing good learning materials, and facilitating the occurrence of mutual communication between students and lecturers.
- Smart engineering can provide integrated learning facilities that include tasks, lesson materials, lesson plans, assessment of learning outcomes, and can measure student achievement.
- Smart engineering is a design in which students can share their work and exchange experiences in applying the knowledge they have gained.
- Smart engineering can improve students' learning motivation because the learning model is packaged in the form of interesting and interactive multimedia.

CONCLUSIONS

- ✓ This research is one of the appropriate technology and its products in the form of smart engineering application software with web based online learning system that can be applied.
- ✓ Smart engineering applications can improve the quality of education with online learning model, because the interaction between teachers and students can be done whenever and wherever that is not limited by space and time. Learning materials, tasks, quizzes, task assignments, exams and anything else related to teaching and learning can be done online. This can create culture and learning environment that is effective, efficient and

paperless. Smart engineering does not mean replacing the conventional learning model in the classroom, but it is a blended learning that combines traditional face to face learning with online learning system to smart engineering.

- ✓ Facilitate in performing administrative services and delivery of information to students and parents about the progress and achievements of each student so as to improve the performance and quality of academic administration services.