A Conceptual Framework For Smart Education System For Postgraduate Students

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Abstract- In this era of technology, every field of life is being furnished with smart devices. Education system is one of the major domains in which smart devices can play an important role to run education system dynamically. The conventional methods of teaching involve the use of pen, paper and blackboard and physical presence of the students in the classroom is mandatory in such systems. If the student fails to attend the class physically, he/she faces difficulties to cope loss of learning due to absence. The customary methods of education are never best suited for the distance education. In this paper we present Conceptual Framework for Smart Education System for Postgraduate Students (SESPS), which addresses most of the issues of the conventional teaching system. The proposed SESPS is aimed to promote an environment where learners learn anytime and anywhere. The proposed SESPS makes provisions of seamless learning styles such as formal learning, informal learning, individual learning, physical learning or digital learning according to pace, needs and interest of learners.

Keywords: **S**mart education system, Seamless learning, Distance education

I. INTRODUCTION

In the traditional methods of acquiring education, students have to attend school, college or university every day and obtain education with the aid of pen paper or black board. The traditional methods of teaching are less flexible for seamless learning such as formal learning, informal learning, individual learning, physical learning or digital learning. If for some reason the student is unable to appear in the class, the student experiences troubles to manage the harm due to nonappearance. In the customary methods, there is no flexibility of learning anywhere and anytime environment. As the educational institutes are facing financial crises nowadays, the provision of distance education may be a good aid for financial aid. The traditional methods of education are never best suited for the distance education.

The rapid technological changes in Information & Communication Technologies (ICT) have provided a new paradigm of learning or teaching with use of Internet and smart devices. This speedy technological shift in ICT has sowed seeds for acquiring seamless education learning such as formal learning, informal learning, individual learning, physical learning or digital learning by learners on their own pace, desires, and concerns. This makes provisions of learning anywhere-anytime through use of Electronic Learning (E-Learning), Internet learning or Mobile Learning (M-Learning). This smart learning process takes place on the go by using mobile devices such as smart phones, tablets and laptops.

The proposed Conceptual Framework for Smart Education System for Postgraduate Students (SESPS) provides the smart educational system, in which the learners can acquire the knowledge and get their degrees anywhere and anytime principle.

The basic goal of proposed SESPS is to promote an environment where learners learn anytime and anywhere. The proposed SESPS may promote higher education specifically in employed personnel who are interested in getting higher degrees.

The proposed SESPS is comprised of the following components:

- classroom equipped with cameras to record the teacher's movement
- remote student board which shows the pictures of online remote students
- teacher's smart board to support teaching and local students present in the classroom such as showing slides, pictures and videos
- it also provides a digital white blank page for extra explanations if needed to write on that blank page with smart pen

This board also shows the video of the remote students if teacher allows him/her to take control over the floor. The proposed SESPS also provides teachers to upload teaching or learning materials and students to download that material. The proposed SESPS also allows students to submit assignment or solutions. The proposed SESPS allows the teachers to control the system by voice control. For enhanced security the proposed smart education system provides biometric system through thumb impression and at least 8-characters password and same is used for the login into the system.

The rest of the paper is organized as follows: Section II presents related work, while Section III discusses the proposed system. The Section IV elaborates the design of smart classroom system, whereas Section V concludes the paper along with the future directions.

II. RELATED WORK

In the article [1], the authors suggested that smart education can be offered in e-learning and blended learning with facilities of quick, flexible and always available fashion. The main goal of the research is to offer a systematic approach to address key features of smart education. The researchers provided a theoretical framework for smart education. The researchers have suggested that all educational services build for smart education should be implemented in the form of mobile application software. As the mobile applications software allow the teaching and learning regardless of the spatial localization of the desktop computer.

In the study [2], the authors have deployed and presented a prototype, where a teacher can conduct class of local students in smart classroom. The system also allows remote students from different locations to participate in the class synchronously similarly as the local student present in the class at the same time. The system proposed a prototype of smart classroom containing two wall size projectors. One of those two projectors is used as media board which is touch sensitive board and works similarly as a board used in ordinary classroom to display teaching content. This media board is synchronized with remote student client software which reflects the changes made by teacher on student client software.

The study [3] considers the higher education system into smart-education and traditional universities into smart-universities. It emphasized the necessity of the shift from traditional and e-learning to smart-education according to the needs and requirements of new era and simultaneously achieving the aim of quality training of specialists. The researchers have suggested that with the help of ICT technology, the smart education must meet requirements and

necessity of the new technologies i.e. the mobility of content should become an essential principle of the new concept for learning everywhere and learning wherever it is convenient for the learner.

The researchers [4] proposed a novel way of learning, which they referred as micro-learning through usage of mobile device. The proposed Micro Mobile Learning system (MMLS) supports multiplatform including Personal Computer (PC) terminal and smart phones. The system incorporates speech recognition, explanations in video annotations, text search, clustering analysis. Using proposed system learners can access micro lectures and other related micro lectures resources anytime-anywhere environment. The researchers have also concluded the learners who used the proposed system have improved their final grades and they showed interest to learn through the system. Some of learners reported that entertainment provided by mobile devices sometime divert them form learning.

The study [5] suggests a blended framework for effective learning. The blended framework includes classroom learning, online learning and M-learning. The suggested framework in perspectives of smart M-learning includes Just-in-Time Learning, Micro learning, Reach-back/Review, Schooling in asynchronous mode, conferences in synchronous mode, Feedback and monitoring, Quizzes & mock tests and survey and reporting. Finally, the researchers have conducted an online survey from students toward acceptance of M-learning. The result of such survey showed a positive attitude towards accepting mobile devices as learning tool.

The authors [6] presented the trends in education in modern way that is Smart learning prevailing in higher education by the implementation of Smart learning and its standardization in education. The researchers have introduced the role of smart class in teaching and learning. The researchers emphasized that teaching through digital instructive material such as animation and videos have transformed the way teachers teach and students learn with innovative and interactive learning process. The smart classroom is equipped with computer and audiovisual equipment such as Personal Computer, Overhead Projector, Wireless Internet Access, DVD Player, Touch screen Control system and Smart Board. The researchers have also provided a brief introduction to the tools used for smart education such as Learning Management System (LMS) and M-Learning.

In the study [7], the authors proposed a research framework for smart education. The researchers have well defined smart learners and smart pedagogies or teaching methods for their conceptual framework. Researchers have used four-tier architecture for smart pedagogies or teaching methods that supports smart learning in class based generative learning, group based collaborative learning, individual based

personalized learning and mass based generative learning. The researchers also proposed ten key features for smart learning environment needed for 21st century learning.

The study [8] presents a report on the results of a recent offering of an iPhone Application Development course at Sheridan College, Ontario, Canada. After getting students' opinions about course and analyzing the student's performance, it was reported that the students enjoyed the iPhone course and performed very well, and the majority of students feel the iPhone course is beneficial to their studies.

In the study [9], the researchers have proposed an integrated smart education system for which Structured Plug-in Integrated Teaching and Learning Assistance (ITLA) system. The system supports cooperative, sharing, participative learning. In proposed smart education system teachers and students can participate all the way through effective personalized and customized education. The overall objective of the proposed smart education system to create an environment where students can learn through personalized content anywhere anytime for participation in lectures and better environment for teachers.

In the study [10] the researchers intended that with the use of portable or handheld devices the learning would occur at user's will on anytime-anywhere basis. To achieve this goal the researchers have used Pervasive Learning(P-Learning) which a new form of innovative technology for learners where learning can occur at user's will on anytime-anywhere basis. The main objective of study is to investigate the specific factors influencing whether students are willing to accept and use these new technologies (P-Learning) or not. The goal of this research was to develop a sustainable P-Learning model so that researchers, ICT experts, higher education institutes in developing countries improve overall education process because student's acceptance towards P-Learning effects its practical implementation.

In [11] researchers state that various models and frameworks have been suggested to adopt P-learning but all have some limitation. In the said study the researchers have proposed cost effective theoretical model for P-learning model based on cloud computing as efficient solution to education system.

In [12] the researchers found that in   21st century with innovative learning trends where learners want to learn without constraint of place and time. A new learning trend named as P-Learning is getting a leading method of learning where learners learn on anytime-anywhere basis. researchers have proposed how P-Learning can be helpful to geographically scattered and handicap person via use of recoded and/or live lectures without physically attending the class providing facility of learning on anytime-anywhere basis.

III. PROPSED SYSTEM

The proposed SESPS is designed using the smart education system methodology proposed by Zhu et al. [7]. It is comprised of three components, which include smart pedagogies, smart learning environment and smart learners as shown in Figure 1. Smart pedagogies are smart teaching methods, smart learning environment may contain smart devices as mentioned in Section I, while smart learners are the students having basic skills of using smart educational devices.

Based on the smart education system methodology, the proposed system is comprised of three modules.
Smart environment module includes: (a) Teacher's smart board (b) Camera (c) Lecture recording system (d) Remote student board (e) Sound system for voice streaming to the local and remote/distant students and recording remote/distant students and recording (f) Smart phones (g) Laptops/PCs.
Smart pedagogies module includes digital methods and material such as (a) PowerPoint presentations (b) Recorded lectures (c) Electronic notes (d) Smart skilled teachers
Smart Learners module includes: (a) smart skilled local students (b) smart remote students.
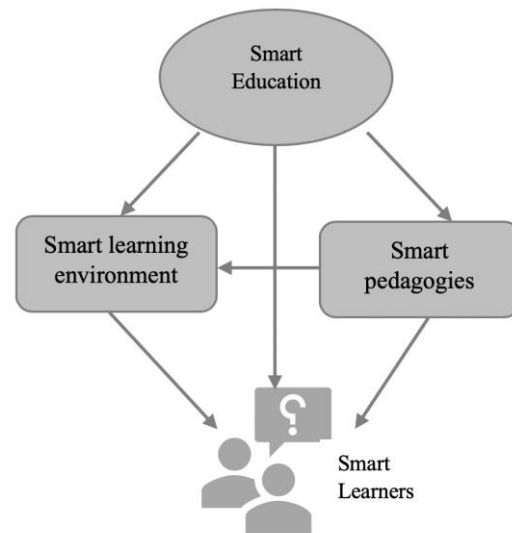

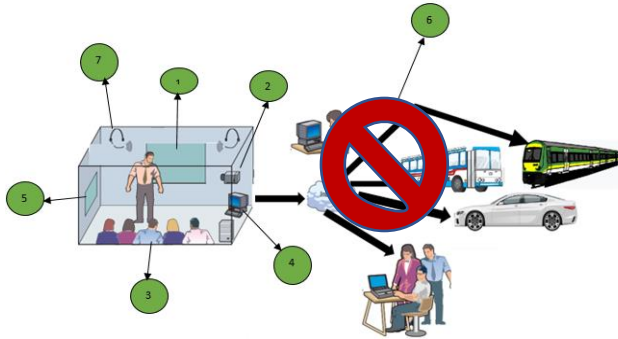Figure 1. Smart Education framework [7]

Figure 2. Conceptual framework of proposed SESPS

The proposed SESPS is comprised of the three modules as discussed above and the components of each of the module are shown in Figure 2. The depiction of each number given in Figure 2 explained here and the categorization of each component in the three modules of smart education system is discussed. **1**. Teacher's smart board **2**. Camera **3**. Local students **4**. Lecture recording system **5**. Remote student board **6**. Remote students and **7**. Sound system for voice streaming to the local and remote/distant students and recording

The proposed SESPS is comprised of the three modules as discussed above and the components of each of the module are shown in Figure 2. The depiction of each number given in Figure 2 explained here and the categorization of each component in the three modules of smart education system is discussed. **1**. Teacher's smart board **2**. Camera **3**. Local students **4**. Lecture recording system **5**. Remote student board **6**. Remote students and **7**. Sound system for voice streaming to the local and remote/distant students and recording remote/distant students and recording. Fig 2 shows that there is no need of physically traveling to the classroom for remote students. The only requirement for them is to have smart skills, smart devices such as mobile phone or laptop and internet connection.
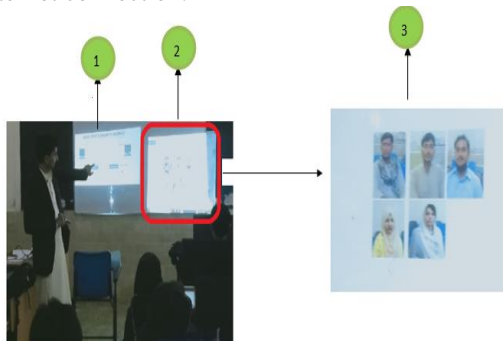

Figure 3: Physical view of a classroom of proposed SESPS

As shown in Figure 3. smart classroom is comprised of **1.** Teacher's smart board **2.** Remote student's board and **3.** Zoomed view of Remote student's board can also be observed in Figure 3. As

Figure3 Smart classroom for smart education system for proposed SESPS

Teacher's smart board for the proposed SESPS shown on Figure3 This board consists of slide show in the running class, list of remote/distant online students.

IV. DESIGN OF SMART CLASSROOM

In this Section, we elaborate the design of various components of the proposed SESPS.

A. Teacher's Smart Board

Teacher's smart board is comprised of slideshow of the current lecture located at center of the boar and list of online students located on the lower right corner of the board. Figure 4 illustrates the scenario when teacher asks a question or gives a task to the students. When any student login to the system using student client application, he/she is added to list of online students and displayed on lower right corner of the Teacher's Smart Board and shown by green circle indicator. When the teacher asks a question or instructs the students to solve a question or problem, this box shows list of students who wish to answer the question in blue circle indicator. When teacher gives permission to the student to take control over the floor, student's video with audio is displayed on the top left corner of teacher's smart board.

During conduct of class teacher can perform various regarding lecture, which are discussed below.
Open File: During running of current lecture this option allows teacher to open already uploaded new lecture
Save: If teacher presses this button whatever teachers is writing on smart board is saved along with video in the video recording system.
Close: This option closes the current lecture
Log out: This option allows teacher from logout form current lecture and system
Next: This option changes one slide to next slide in the slide show
Previous: This option changes one slide to previous slide in the slide show
First: This option lets teacher to go at the 1st slide in the slide show
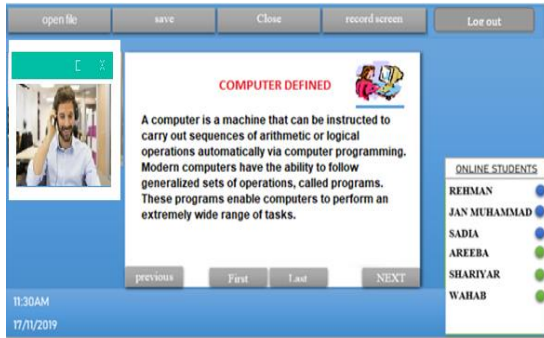*Last:* This option lets teacher to go at the last slide in the slide show

Figure 4. Teacher's smart board for the proposed SESPS

B. Design of Student's smart board

Major part of the student's board is the teacher's video and current lecture's slide show. The student's client application as shown in Figure5 provides following options to the students

Highlighter: student raises his/her wish to answer the question by clicking/Tapping this button.

Video call: If a student wishes to answer the question asked by teacher, he click or tap this option and his/her video with audio will be shown on teacher's smart board.

Audio call: If a student wishes to answer the question asked by teacher but do not have strong signal for video transmission, he/she clicks or taps this option
and his/her audio. will be heard on through sound system of the class

The classroom for proposed SESPS is also equipped with following components.

Camera: The proper video recording can be performed by camera as teacher moves in class at specified place or location to get proper view of class to the remote/distant students

Lecture Recording system: All the devices like sound system, camera, teacher's smart board are connected with lecture recording system to save it in the database and also same is streamed to the remote/distant students.

Sound system: The sound system is installed in proposed classroom for following reasons:

- Recording the voice of the teacher and produce the same during class so that all local students can hear it clearly and stream it to remote/distant student can hear it clearly as well.
- Recording the voice of the local student and produce the same during class so that all local students can hear it clearly and stream it to remote/distant student can hear it clearly as well.

- Recording the voice of the remote student and produce the same during class so that all local students can hear it clearly and stream it to remote/distant student can hear it clearly as well
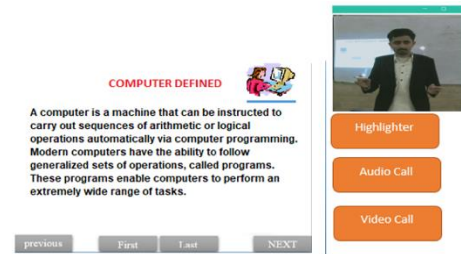.

Figure 5. Student's smart board for proposed SESPS

C. Design of smart teacher's functionalities

Teacher is one of the major components of the proposed smart education system. In order to be the part of smart education system, the smart teacher has to registered in the system. For enhanced security the proposed system is powered by registration process for smart teachers. The teacher enrolls his/her thumb, provides at least 8-chracter password and fills the form by providing personal details such as Name, Father's Name, National identity number, postal address and permanent address & professional details such as Designation, Department, Experience, Area of research and interest. To make system easier teacher also trains the system through voice commands. To train the system teacher reads some words or phrase(s) so that system can identify pronunciation accent of the teacher. Currently these commands are limited to *change slide, previous slide, play/pause video and end class/session, logout*.

Once, the teacher has successfully registered, he/she can deliver lecture in proposed SESPS. The process begins by first logging into the smart environment. On Login page teacher enters password and verify himself/herself by scanning thumb impression. If teacher's login is successful, the proposed SESPS

provides following options/facilities to the teachers

First step after successful login, teacher uploads the lecture. This step requires to upload or save the lectures to be delivered in the class all at once or it also provides an option to upload lecture before start of the class. The proposed system supports to upload lectures in the most commonly used formats such as DOC/DOCX, PPT/PPTX, PDF, Video format, Image format. A teacher can also upload teaching or learning material, books, course syllabus, and assignments

Teacher may resume previous lecture or open/ upload new lecture. After resuming lecture or opening new lecture or uploading new lecture and opening it, its displayed on the teacher's smart board. During the class a teacher can:

- Conduct class

- Answer questions to local and/or remote students during class
- Provide control of floor to local and/or remote student

If the current lecture is ended but teacher has to conduct the new class in the same room, he/she doesn't need to logout start lecture again. The proposed system provides the facility/option to conduct the lecture in the same room. The sequence of steps involved for new class or subject is as same as depicted in flowchart given in Figure 6.

D. Design of smart student's functionalities

The first step for student to become a smart student he/ she first need to be registered. The student enrolls his/her thumb, provides at least 8-chracter password and fills the form by providing personal details such as Name, Father's Name, National identity number, postal address, permanent address & department information, Roll number, Class information, degree or course information, year of study.

Once the student has successfully registered, students need to be logged in. The process of student login and activities is illustrated in flow chart given in Figure7 On Login page student enters password and verify himself/herself by scanning thumb impression. If student's login is successful, the proposed system provides two option to the student named as *Synchronous mode and Asynchronous mode*.
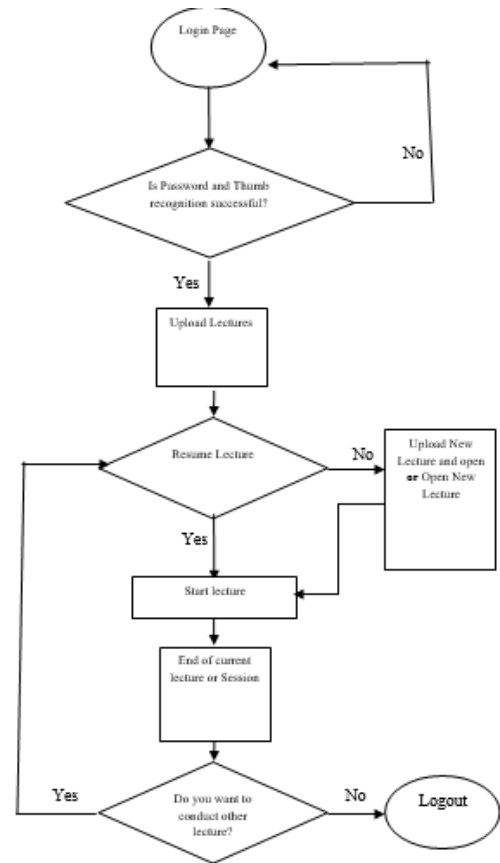

Figure 6. Teacher's login and activities proposed SESPS

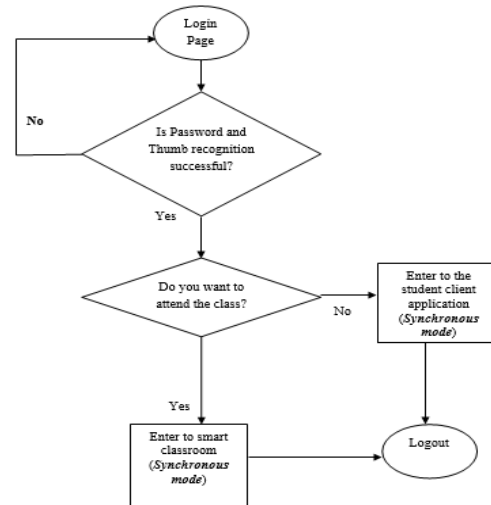### E. Design of smart student's functionalities

Figure 7: Student login and activities flow chart proposed SESPS

If student chooses Synchronous mode, the proposed system provides following facilities to the students.

- Attend class
- Request to take control of floor to answer the question
- Request to take control of floor to conduct the class
- Publish the screen.
- Solve in class problems or assignments
- Take part in class activities or group discussions

If student chooses *Asynchronous mode,* the proposed system provides following facilities to the students.

- Ask question after class
- Answer question after class
- Download learning material
- Download assignment
- Submit assignment
- Download books and course syllabus

F. Design of Administrator's functionalities

It's worth to note the role of the administrator for the proposed system. The administrator has responsibility of managing and controlling the proposed system.

The roles of the Administrator include**:**

- Add/Delete or Update the Departments
- Add/Delete or Update the Program
- Add/Delete or Update the Courses in the Program
- Add/Delete or Update the Classes in the Program
- Add/Delete or Update accounts for teacher with valid email and temporary password. Now the teachers have to register himself/herself with new password and thumb scanning.
- Add/Delete or Update accounts for students with valid email and temporary password. Now the students have to register himself/herself with new password and thumb scanning
- The Administrator have the authority to accept or decline the student teacher request if the Administrator feels some uncertainty.

- Assign subjects to the teachers.

IV CONCLUSION & FUTURE WORK

In this paper, we proposed a conceptual framework for proposed SESPS exclusively for postgraduate students. The proposed SESPS facilitates the employed personnel to acquire higher education remotely by the principle of anywhere and anytime. As for the employed persons it is difficult to attend class physically at a distant place, due to time management constraints. The students who have busy schedules at their workplace or who are in travel or who are unable to attend the class due to other reasons the proposed system also provide options to attend or participate the running class. The proposed SESPS helps anyone who wish to get higher degrees to fulfill his/ her dream. The proposed SESPS can also be adopted at school level as well as undergraduate level. The proposed SESPS is designed using smart education environment methodology. The proposed SESPS can enhance current education system and may have positive impact on improving literacy rate.

The proposed system has following limitations that can be resolved in future

- The proposed smart education system records the teacher's movements video using camera at particular place or location thus teacher's movement is limited.
- Since the mathematical or experimental annotations are not much easier, thus proposed smart education system has not yet employed mathematical or experimental annotations. The proposed smart education system is the best suited for English language only.
- Currently, the proposed smart education system supports the annotations made by remote students in video and audio format it doesn't support an option for students to publish their screens.

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