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[Improving on e-learning: a design for increased student participation]

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Abstract:

The introduction of networks and web technologies across institutions worldwide has the potential to transform different aspects of education. Web based learning [WBL], or electronic learning [e-learning], has begun to be exploited, but current implementations have arguably not tapped the full potential of e-learning to encourage greater student participation. Three areas of functionality are examined in particular - assignments, online examinations, live classroom - to determine where improvements could be made.

The design is then evaluated using a checklist devised for the purpose, and via a small scale qualitative research exercise using a well known questionnaire and analysis. Whilst indicative, the results of this study suggest such design and implementation features may improve e-learning through increasing student participation.

Introduction:

The importance of education in developed countries and developing countries alike is established, even if the challenges of delivery everywhere take on a different guise. Current generations of pupils and students are future generations of working age and their productivity will be determined by the quantity and quality of their education. Any survey of the educational landscape over the last quarter century would naturally include an account of the introduction of information technology, which, after early classes in computing, has developed from a vehicle for computer-based learning to the widespread educational and productivity platform it is today. With the advent of webbased technologies, and the introduction of networks across educational institutions, the possibilities offered by web based learning [WBL], or electronic learning [e-learning] have begun to be exploited.

As e-learning is taken up more widely, a successful integration of best educational practice and the +

facilities offered by web based technologies promises a variety of benefits for all stakeholders in the educational domain itself (improved student participation and motivation; improved teaching effectiveness; efficiencies in administration; ultimately, improved educational outcomes) and more widely (e.g. a dramatic reduction in the use of paper throughout the educational cycle promises to mitigate at least a part of the current environmental impact of education).

Objective

The objective of this project is to survey certain key areas of current e-learning provision, and to produce an improved design for certain areas of functionality. There are three functional areas of interest, in particular: namely, assignments, that concerns the setting and submission of completed assignments; second, online examinations; and last, live classrooms, which are the electronic or virtual equivalent of the classic physical learning environment.

E-learning concept and definition

The term "e-learning" (others include "web based learning" or "online learning") is used to describe the conjunction of learning methods and internet based technologies. It may be associated with educational programmes where learners and supervisors never meet face to face. This offers a high degree of flexibility for service users and availability of information is not restricted.

Learners may learn at their convenience, at time that suits their circumstances, and from any location they choose, there being no necessary geographical or physical constraint. The content so provided is student specific and tailored to the particular requirements of each learner. It is this dynamic nature that distinguishes e-learning from traditional modes of education. As learners (including distance learners) may access and utilise learning resources at any time, e-learning is argued to highlight a sense of personal responsibility and accountability.

According to the UK government's post-16 E-learning Strategy Task Force, there are "many ways to learn with the assistance of information systems linked with technology by tools which include the internet, intranet, wireless networks, PC (Personal Computer) and participation through TV conference" (DfES 2002:2). Learning resources are also used to define e-learning, as well as technologies: “E-learning offers students and teachers the opportunity to engage in electronically mediated interaction with each other and with learning materials. Learning resources (printed-based, graphical, audio-visual media) are largely made available electronically, either online or via CD-ROM” (O’Connor 2000 cited in Seale .J 2006). Other commentators have emphasised the distinctive process of e-learning: “E-learning covers a broad range of activities which involve the embedding or adaptation of information technologies within the learning process. These technologies can be diverse as a Web-based Virtual Learning Environment (VLE), use of email or the use of dedicated software” (Kelly et al.2004).

History

It has been argued that the concepts of distance learning and e-learning are closely related. Distance learning practices may be more than a century-old. There is evidence, for example, that in 1840, classes for shorthand were offered via a distance learning model. With improvements in the efficiency of postal services, distance learning gained a degree of popularity in England even before that, around the end of the 18th century. The particular term, "e-learning", was coined naturally, more recently, in 1999, at a Los Angeles seminar.

In the 1950s, one of the first televised college credit classes was offered by the University of Houston. It was broadcast by KUHT, the first public television station in the U.S. Every week, some 13 to 15 hours of content were aired. Most programs were broadcast at night which benefited student audiences - especially those who liked to work late. At the time, about one-third of the entire schedule was dedicated to educational content. Many thousands of lectures were taught on KUHT. Harvey White, a lecturer at Berkeley, produced some 163 lessons in high school at Pittsburgh's PBS station. In the academic year 1957-1958, thousands of students registered to access Whites' television lessons in public classrooms.

Another notable innovation in distance learning came with the adoption, by such institutions as the University of Illinois of Urbana-Champaign, of the PLATO system (or programmed logic for automated teaching operations). Organised via the internet, the PLATO system had many advantages. One significant benefit was that students could study lectures assigned to them, and communicate with a supervisor through online messaging. Equally, instructors could closely monitor student progress through online databases.

Britain's Open University (UKOU) was established in 1969 and marked a turning point in the evolution of distance education by creating a multiple media teaching institution, which included face-to-face lectures as well as broadcast material. Some two million students have been served since it opened its doors in 1971. To this day, UKOU is ranked in the top ten universities in the United Kingdom, based on independent evaluation of the quality of research and teaching.

Advantages and challenges of E-learning

An e-learning system offers a variety of benefits to students, instructors, and institutions. An immediate advantage is won in reduction of travel expense, time, and effort. Students can remain in one position, such as home, the office and airport, without any need to travel (Jones, 2010).

Another accrues in students' ability to source required information through the system. Although the onus shifts more onto the learner to find the information they need, this increased level of activity on their part is accompanied by economies of information access. The active student's learning is synthesised through their self-managed contact with educational content.

It follows that the role of the instructor is becoming more limited in comparison to that set out in more traditional conceptions. Students can access their work through a computer and an internet connection. Learners can participate remotely in chat rooms at any time. Assignments and tasks can be started, stopped, and resumed at students' convenience. Communication between teacher and student is rather two way, with students also able to exploit email, chat, and discussion boards or forums to communicate amongst themselves. This relative flexibility extends to the range of media that can be offered to learners to suit their learning styles and needs : text for reading, audio, and audio-visual material can all be marshalled according to a curriculum on the one hand, and student needs on the other.

E-learning systems also offer administrative efficiencies and facilitate instructors' and institutions' monitoring of student development. Nevertheless, successful learning outcomes require a number of key attributes in e-learners : a desire to learn and make progress; a certain degree of self-belief and autonomy; willingness to participate and engage fully and competence in communication skills. E-learning substantially consists of repeated student visits to a website for materials needed to finish assignments. Peers and tutors provide guidance to e-learners but absent are those informal opportunities

for interpersonal and particularly group discussion and clarification, which characterise traditional educational situations. Here, face to face communication affords learners the full range of verbal and non-verbal expression. E-learning tends to promote the importance of written forms of communication, and requires the risks of misunderstanding in the learner-base to be managed. Some of the key differences between the respective learning skills required and developed are shown in the table below, from A Clarke; some key advantages of e-learning over traditional models of education are shown.

Traditional skills	E-learning skills	Difference
Time controlling.	Time controlling.	e-learning provides great scope to control learning.
Taking responsibility for learning.	Taking responsibility for learning.	Traditional education places less responsibility on the learner compared with e-learning.
Planning.	Planning.	E-learners may enjoy greater freedom to select how and when to study.
Searching proficiency - offline (e.g libraries).	Searching proficiency - online.	Tools such as search engines provide a huge degree of information access compared to physical libraries.
Listening to supervisor and tutor.	Listening via video meeting or audio/audio-visual stimuli.	Listening is a high priority skill in most traditional learning formats, whereas it is less important in e-learning.
Evaluation quality- physical content.	Evaluation quality - online based.	Content published online is on average less subject to established quality assurance mechanisms than books and other more traditional educational content (e.g. peer review).
Writing - (e.g.) note-taking, doing exercises.	Writing (keyboard skills) for note taking and comment.	Writing is especially important for e-learning and participation in (e.g.) e-mail.
Self-Evaluation.	Self-Evaluation.	Peer to peer assessment by the learner is not possible in e-learning where results may be hidden.
Reading-mainly printed material.	Reading is a key skill in e-learning. Most information	Since a majority of the material is text, reading is a key skill in e-

	is presented as text displayed on a screen.	learning comparable to the roles of reading and listening in traditional learning.
Collaborating with others face to face.	Collaborating with others through communication software (e.g. email).	The key difference is time. A face-to-face group will often agree to a regular meeting so that tasks are achieved quickly. Online group members will each have their own time scales and may well live in different time zones, so that collaboration is often spread over a long period. Motivation is sometimes difficult to maintain.
Problem solving-individually or in small groups.	Problem solving-individually or in a group, at a distance	In e-learning, group members are at a distance; it is therefore difficult to judge the views of peers.

E-learning websites

Recent improvements in web technology have in turn improved e-learning websites. Some now offer a great range of different functions, or areas of functionality, whilst others offer a rather narrower product. Three functions or areas of functionality were selected and these are now elaborated.

Assignments

Assignments - the setting of, submission and receipt of completed assignments - are one of the core functions of an e-learning system. Considerations include the ability of the instructor or supervisor to tell whether a deadline for submission has been met. Clear indication of assignment status provides a basis for the building of trust between supervisor and learners.

Assignments feature two key tasks: the setting of assignments, and the submission (and receipt) of completed assignments.

- Confirm submission by sending email
- Automatic notices and reminders to students who have yet to submit work 24 hours prior to the deadline.
- Extend deadlines for agreed exceptions
- Automatic deduction for late submission
  Online examinations

Measurement of student examination performance is obviously a key part of an e-learning system. Yet implementations may fail to provide the functionality required to enable instructors and learners to view results, and use feedback as an input to improving future performance.

- Examination feedback

- Question setting and specification

Live Classroom

As it sounds, live classroom is an electronic environment equivalent to its namesake. The traditional classroom model stipulates a limited degree of participation by passive students and limits their scope to interact and pose questions to the instructor. A properly designed live classroom could greatly change this dynamic and bring about a two way interaction between supervisor and learner.

- Interactions between teacher and students
- Automated registration

System Attributes

Following on from the previous, a number of changes were made to improve the assignments, Online examinations and Live Classroom functionality. These are summarised in the table below.

Problem	Solution
System doesn't confirm submission by sending email	When students click submission for coursework they will receive an automatic confirmation email from the system and the submission will be logged on the system
Cannot extend deadlines for agreed exceptions	It will be possible for teachers and administrators to extend deadlines for agreed exceptions by selecting the student from the student list. In addition, they are allowed to set a new deadline and allow coursework to be sent later. Teachers will be notified of the change and students will not be penalised inappropriately..
Manual deduction for late submission	The system will now automatically deduct marks for late submission of coursework if students submit after the deadline and do not have permission. This student's record will be highlighted in red to indicate to teachers that the student has submitted late (the tariff will be indicated). In addition, teachers have the option to decide how many marks should be deducted for each day a submission is late. Also, teachers may now change

	marks awarded if students' circumstances warrant it.
Student does not have announcement of uploading new assignment and before the deadline	Students will be notified when teachers upload coursework via a system generated email including notice of the deadline. In addition, the system will send an automatica reminder to students 24 hours before the deadline to students yet to submit their work.
Students do not receive feedback from exams	Students can get feedback from completed examinations.
Teachers cannot set questions or specify examination content	Teachers may determine both the number and types of questions they wish to add for each student. Also, teachers may specify the marking scheme and marks awarded or deducted for correct answers, incorrect answers, and omissions.
There is no interactions between teachers and students	Students may interact with teachers by using chat or voice. Teachers may enable and disable chat. Students have to request voice contact and may cancel their request. Teachers may give or withhold permission for voice contact.
Teachers cannot tell how many students attend a class	The system will register how many students are present in live classroom (dynamically as students enter and leave) , notifying teachers accordingly.

Design

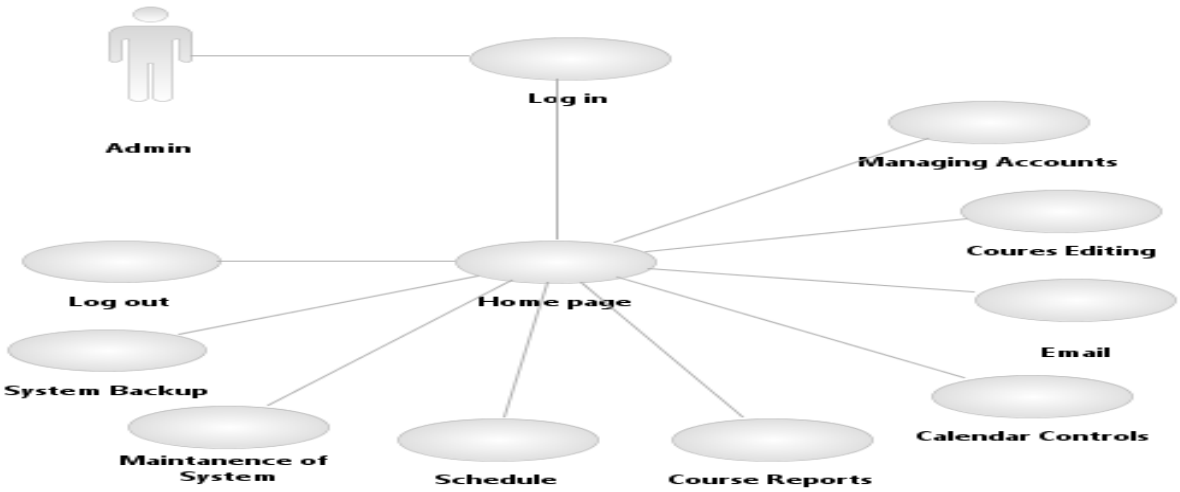
The system features a number of different classes of user, each of whom is granted privileges according to their place in the institution.

Naturally, system administrators occupy the highest place in the hierarchy, and are granted the highest level of privileges with almost all rights including the ability to grant or revoke privileges to or from any user below them in the hierarchy. This enables administrators to access the entire subject curriculum and 'look beyond the blackboard' to ongoing processes, including contacting individual users (e.g. students) in person at any time.

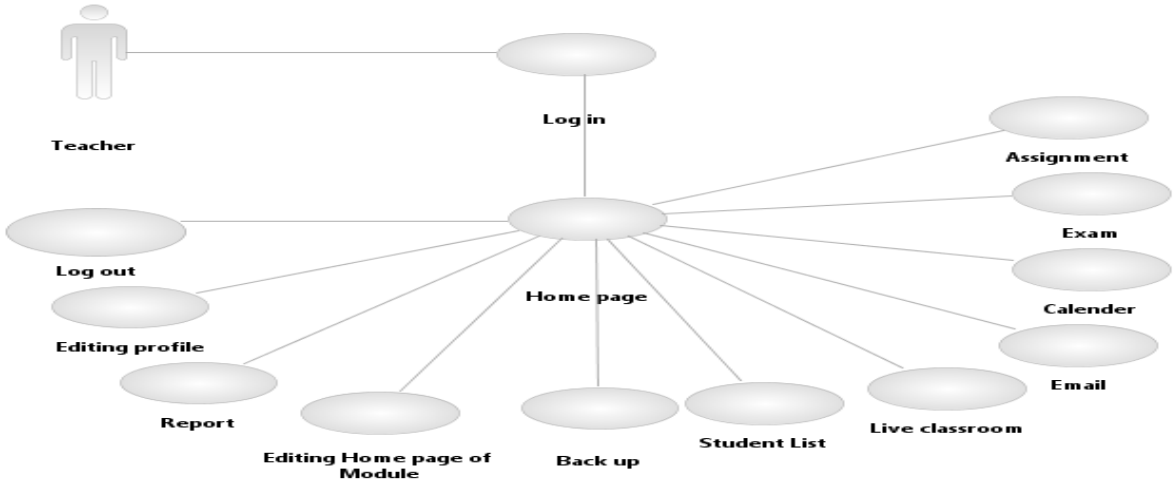
The second level of privileges is accorded to teachers who manage classes in person. Teachers have authority only over the classes they are teaching, but, here, they have full control over the curriculum in terms of management and teaching. Teachers need to respond to individual queries raised by students.

The lowest level of privileges is attached to students.

Use cases: administration



Use cases : teachers



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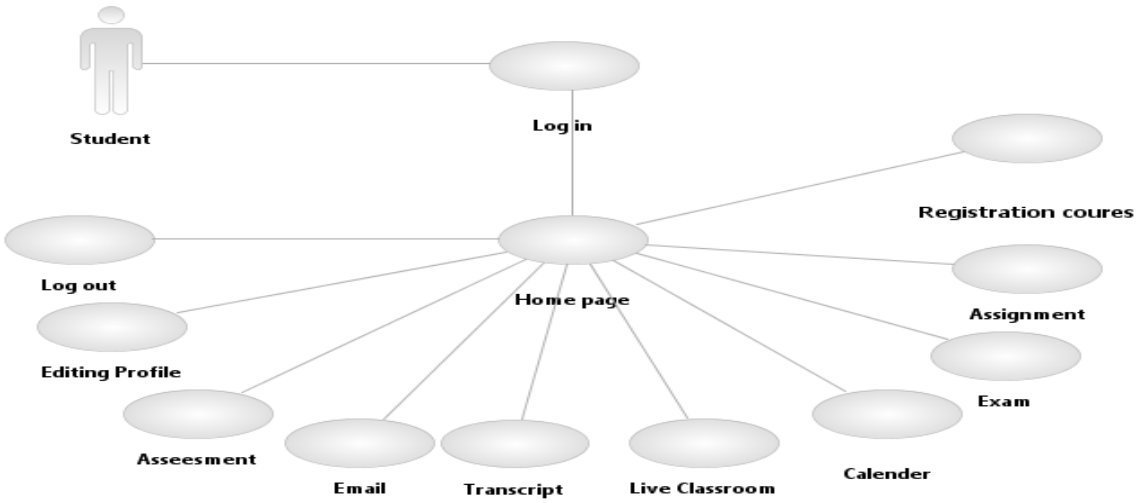
Use cases : students



Home page & registration form

Login

Create a new Account

User Name:
Password :
Login!
• Forgot your password

This is the home page of the website which allows administration, teacher and student to log in to their accounts. Users that have forgotten their password can click on a link here for a reminder (the system will send a new password to the user via email if their registration is confirmed). The page also provides standard links for registering new users.

Current User:

First Name	
Last Name	
Date of Birth	
Gender	Male Female
Address	
Post Code	
Email	
Mobile Number	
Qualifications	
Type	Administrator Teacher Student

Submit

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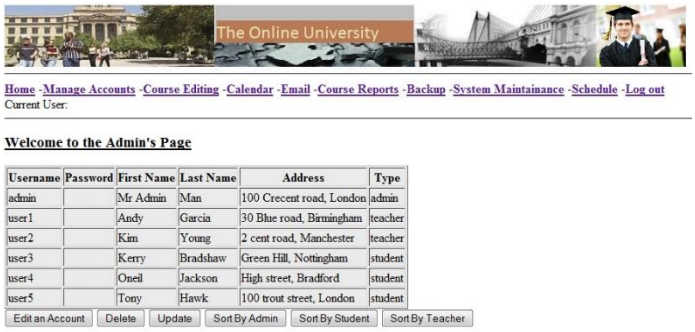
After users complete the registration form, the system generates a new account for the user. If a student account is specified, the system generates a username or student ID and password, which has to be changed the first time the user logs in to the website. When administration or teacher accounts are specified, the system instead sends the information directly to administration [admin] who can authorise the new account, and generate the required username and password. Similarly, passwords have to be changed on first entry to the website.

Administration page

The interface presents administration users with the options described below.

Managing account



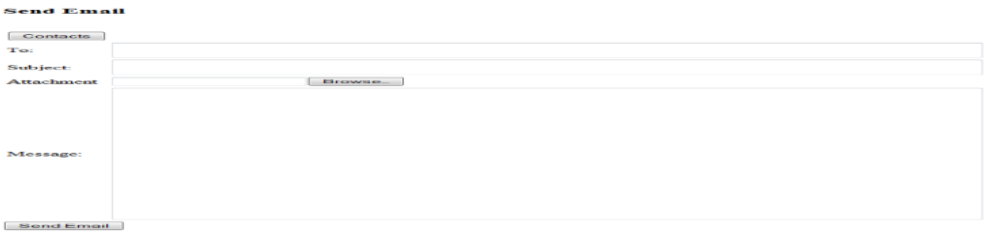
In managing account, admin has full control to edit and delete any user accounts. All account information may be changed here except username. Admin can sort users by type to make it easier to find individual accounts. In addition, admin can identify admin and teacher accounts whose registration is incomplete; these are highlighted in red text. After these accounts are authorised via update, the system generates and sends the new account details to admin. In the case of teacher accounts, the system checks whether courses have been assigned to the teacher via the course editing page. At this point, new account details are issued to the user.

Course editing

In course editing, admin can create new courses and link courses with teachers. Once matched, the system adds relevant courses to the teacher page and students are able to register for it. If any

information is missing, the course is not created. In addition, when admin creates courses, admin has to decide the method of assessment of the course and add other information related to the course such as description of the course

Email

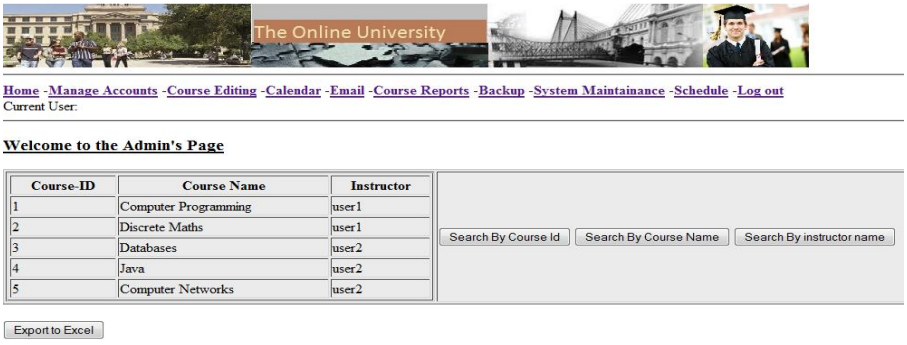


A key feature of the page is that, on clicking in the contact: box, admin is presented with a complete list of admin, teacher and student account names. All may be selected or specific users. The system sends email to the email addresses given by users in registration.

Calendar

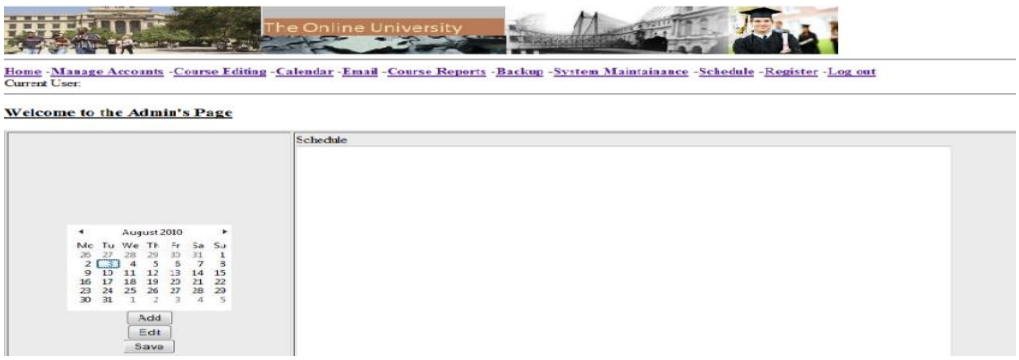
Admin may specify here the date of the beginning and end of each semester. The dates of final examinations may also be set here. Admin may also add important events which may be revealed to all users or specific admin, teacher and student accounts. These are identified by a different colour and bold type. Semester start and end dates are highlighted in green and final examinations in red; other dates of note are yellow. By mousing over the date, event information is displayed.

Course report



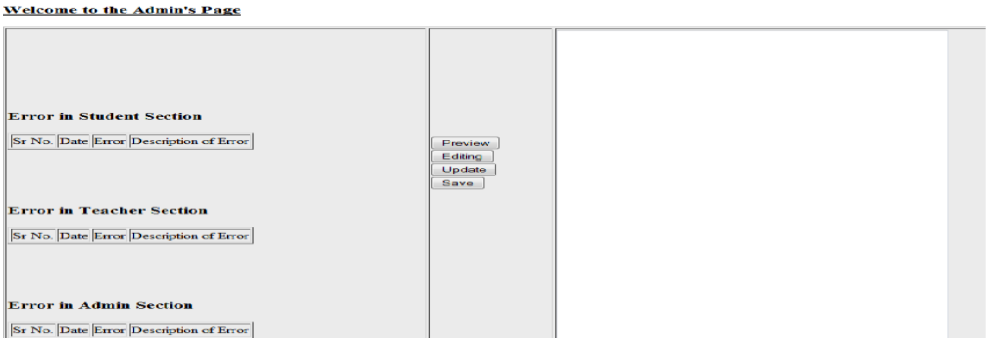
Admin can see different types of reports by course name or by instructor name. Reports may be exported to Excel.

Schedule



In schedule, admin may specify the date and time of live classes, using a list of teachers matched with courses. Admin may also attend live classes via this page, having the same control panel as teachers. Dates and times of final exams are added directly to the calendar.

Maintenance of system



System maintenance allows admin to monitor system status so that errors and maintenance tasks can be addressed using the buttons provided.

Backup of the system

In backup, admin may choose to backup all or part of the system. For example, on clicking Show All Exams, all exam questions for courses or a select number may be selected. The Update button allows system updates to be made.

Teacher page

On visiting the home page, teachers view a list of courses assigned to their account, and may view any of them. On clicking a course, the course homepage is displayed.

Teachers may change passwords, addresses and more in the edit profile option. Assessment methods for assigned courses may be viewed. Teachers may also view a list of students registered for their courses, and a count of total class size.

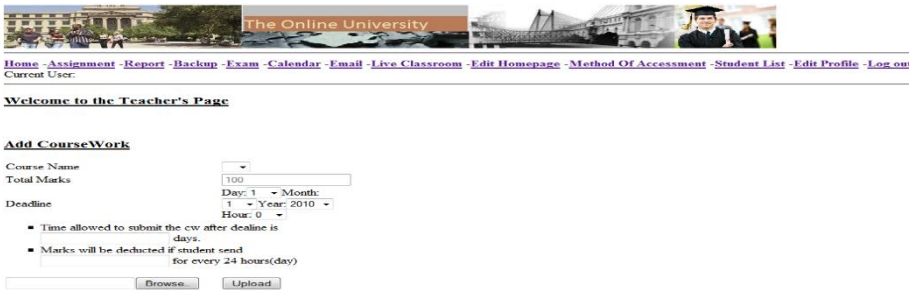
Teachers may also access pages in common with admin but their different access privileges mean different features:

- in calendar, teachers may add deadlines for coursework and mid-term examinations. These are added to the calendar with their colour code (blue for coursework and orange for mid-term examinations). As before, additional events of note may be added by teachers, and are displayed in yellow;
- in email, the list of contacts will include admin and teachers as well as students registered to the relevant courses;
- in backup, teachers may backup their own courses and make their own updates.

Assignment

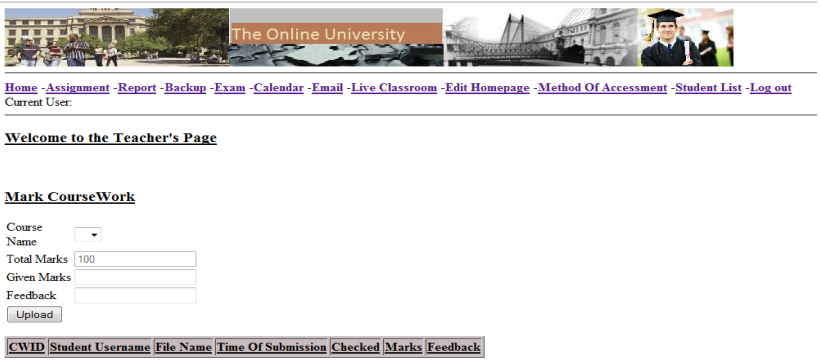
Assignment has a number of features, described below.

- Add Coursework



Teachers specify coursework using this form and click once to upload it. The system adds it to students and sends an email to them specifying the deadline and adding it to the calendar automatically. The system sends reminders to those yet to submit their work 24 hours before the deadline.

- Mark Course Work



Here, teachers may give written feedback to coursework submitted.
Late submissions are highlighted in red, so that marks may be adjusted accordingly.

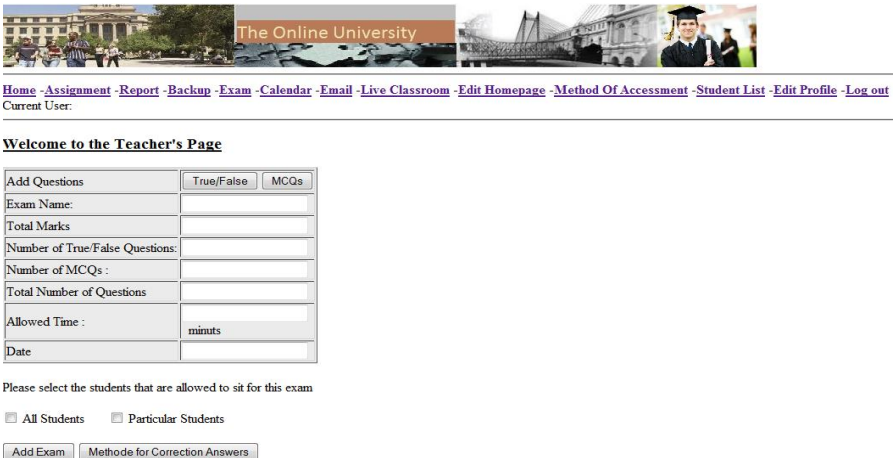
- Extend Deadline

Using this option, teachers can extend the deadline for particular students. Students receive details of the new deadline via email and the system updates the relevant records and pages (e.g. student calendar). The system default for late submissions is determined by teachers when coursework is created.

Exam

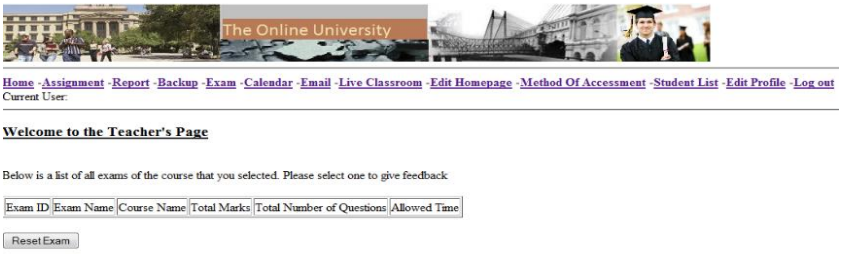
Have two options

- Create New Exam



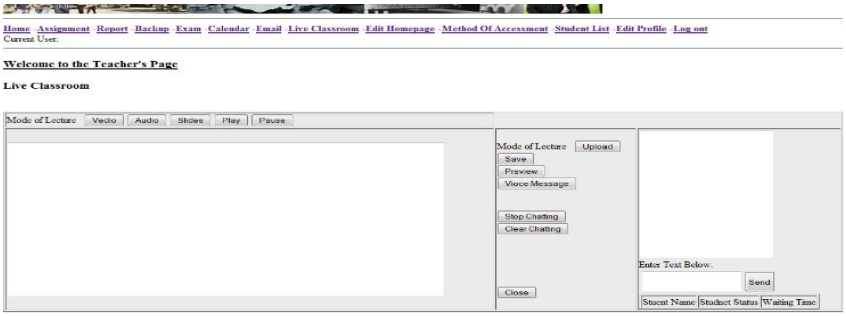
When teachers create a new examination, a course is selected. By clicking on the true/false button or MCQs button, teacher can add true/false and MCQs questions, and build an examination according to requirements.
Marking schemes may also be specified, as described in the design. Once added, details of the new examination are relayed to students and the calendar is updated.

- Feedback for an Exam



Here, teachers may review examination performance.
If teachers wish to allow students to resit examinations, the examination and student in question are selected, and a new examination date is submitted : this updates the calendar and deletes the mark achieved by the student in the first exercise.

Live classroom

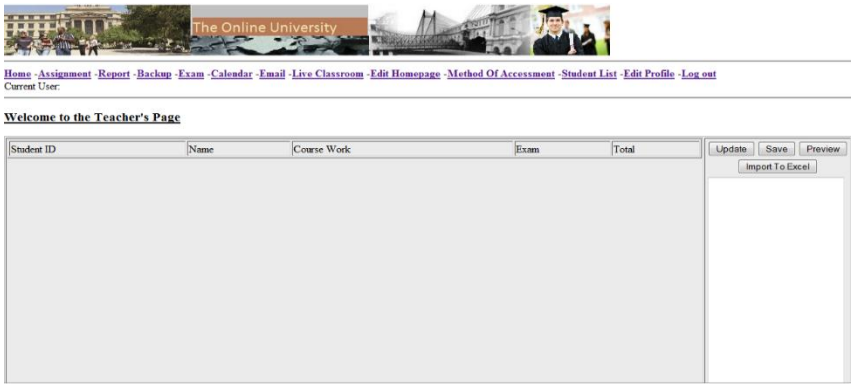


Teachers click on the link to start live classroom. Lectures are started, and the interface above presents teachers with the option to use video, sound, slides, and other content. Control is maintained throughout. Teachers may call a halt and clear chat for example. Teachers may view a list of students wishing to ask voice questions and allow them to go ahead. A dynamic count of attendance is displayed as students log in and out of the session.

Editing home page

Teachers may add content to the home page of their courses using this feature.

Report



Teachers may view reports for any students registered to their courses and can edit report content by clicking update. Reports may be exported to Excel.

Student page

Students, on logging in to their home page, see those courses they have been registered to.

Students can also access teachers' assessments of completed coursework and examinations.

Students share some pages in common with teachers but, again, their different access privileges provide for different features:

in calendar, students may view events added but may only add events visible to his or herself;

in email, the list of contacts will be those admin, teachers, and students associated with the courses students are registered to;

in method of assessment, students may look into the assessment plans for relevant coursework and examinations;

Edit profile provides students with the ability to change their account password and personal details.

Assignment

Students receive coursework when teachers upload it. Students are notified of course name, instructor, marking scheme, deadline, and other information.

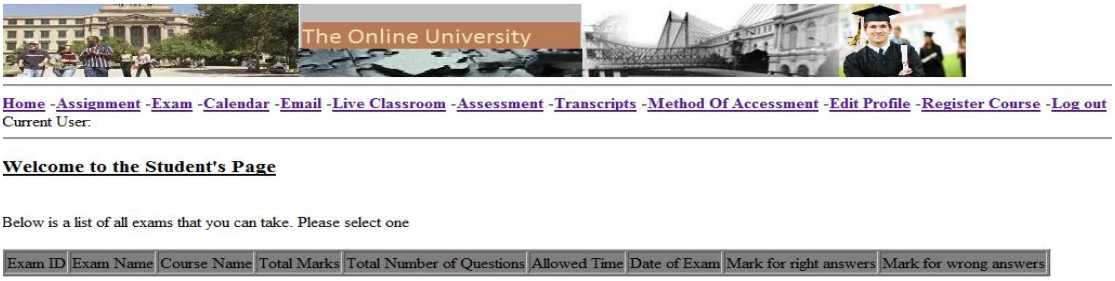
To submit completed coursework, students select course name, and upload the file : the system generates an automatic confirmation of submission with a date and time stamp.

There is a 10 MB limit for submissions. So that new submissions do not delete existing submissions**,** students may opt to add a new file in the knowledge that the system will check whether there is sufficient space to accommodate both. The date and time of the new submission is also recorded. Students may not submit work beyond the deadline as the course name is no longer displayed.

Exam

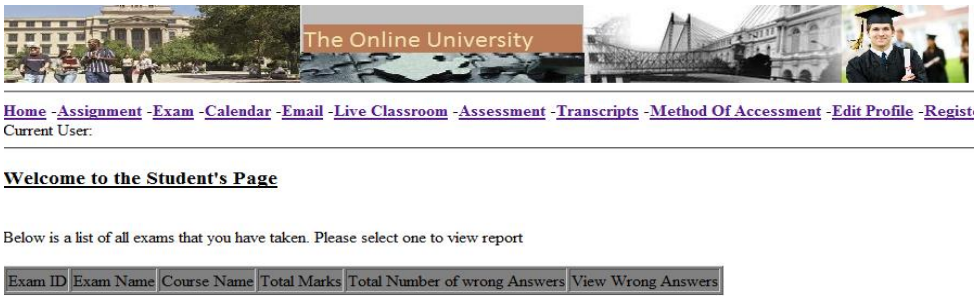
Students may either take an exam or view an examination report via the Exam link.

- Take an exam



Students may not access an examination prior to its start date. This information is made available to the student when teachers set the examination. Upon completion, the system corrects answers automatically according to teachers' inputs in exam setting. Marks are calculated according to the designated scheme. The examination itself is timed, and submission occurs automatically.

- View exam report



Following the examination, students access exam report to review their performance and view teachers' comments for incorrect answers.

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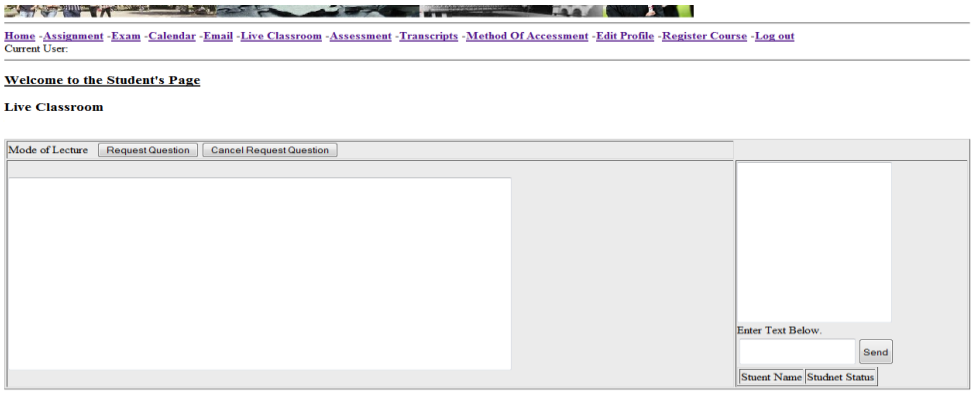
Live classroom



Students click on live classroom to join lectures. A lecture may not be accessed prior to its programmed start time. Students may interact with teachers in two ways : via chat or a request for oral questions. Students' requests will have a status of 'wait until teachers grant permission through their control panel. Students may cancel their requests.

Registration courses

Student registers for courses through this screen. Students can browse available courses and view course information by clicking on particular examples. Students may not add courses whose schedules overlap as the system checks that course choices are compatible. If compatible, the course is added to the register course list. Students may changes courses via the update button. Students complete registration by clicking on Save; the system adds courses automatically to students' and teachers' records.

Self assessment

In "E-learning Skills", Clarke presents a checklist for evaluating e-learning websites in terms of content, methods, feedback, support and assessment. The table below shows the nature of Clarke's standard in each of these areas on the left hand side, and the author's self-assessment of the website design to the right.

STANDARD	ASSESSMENT
Content: What does the content contain? The materials of the course have a specific design, are of publishable standard, and have to include interactive content.	Teachers may design the home page of each course they are registered to deliver. Material can be added to course home pages.
Methods: What are the learning methods employed? E-learning is a mix of traditional and non-traditional methods. How can the teacher communicate with students?	Teachers may communicate with students via live classroom. Live classroom provides options for students to pose questions or interact via chat or voice.
Feedback: What is the process of feedback? How do tutors provide feedback from completed assignments?	Feedback is provided on coursework assignments inside the e-learning website, and becomes visible to students on submission by teachers.
Support: what support is provided? Can students communicate with other learners as well as with teachers?	Email is just method used in the website to enable communicate between administration, teachers and students.
Assessment: how is the course assessed? Can courses be assessed online?	Students can get feedback from completed examinations, including marking and comments, inside the website.

The author is satisfied that the design meets Clarke's five standards

System usability research

Brooke, of Digital Equipment Corporation in the UK, has developed a questionnaire to assess the usability of any system. It features a likert scale, asking the interviewee to agree or disagree with ten propositions about the system under consideration, on a 5 point scale (Strongly agree, agree to an extent, neither/nor, disagree to an extent, strongly disagree).

A sample of ten individuals was asked to complete the questionnaire, after considering the system design. Whilst the sample selection and size may only produce indicative results, this was adequate for the purpose of the present study. These individuals comprised 5 male respondents and 5 female respondents. Four of the respondents were current users of e-learning websites. In accordance with Brooke's test, a score was derived from the ten responses. The score achieved was 73.5. The author's responses to the questionnaire are shown below (the author was not one of the ten respondents). Note that the scale ranges from 1-Disagree strongly to 5 - Agree strongly.

Question	Scale rating
I think that I would like to use this system frequently	4
I found the system unnecessarily complex	2
I thought the system was easy to use	4
I think that I would need the support of a technical person to be able to use this system	2
I found the various functions in this system were well integrated	3
I thought there was too much inconsistency in this system	2
I would imagine that most people would learn to use this system very quickly	3
I found the system very cumbersome to use	2
I felt very confident using the system	4
I needed to learn a lot of things before I could get going with this system	2

Conclusions

The objective of this project is to produce an improved design for certain areas of functionality in current e-learning suites: namely, assignments, that concerns the setting and submission of completed assignments; second, online examinations; and last, live classrooms, which are the electronic or virtual equivalent of the classic physical learning environment. This would represent a step toward improving student participation in e-learning environments, which promises to improve educational outcomes as e-learning environments are more widely developed and implemented.

It was not in the scope of the current project to address functions beyond those mentioned here, but to address certain weaknesses in current e-learning websites, propose a technical solution to these issues, and submit it to usability tests, albeit on a limited scale.

Self assessment using a well known checklist and a limited usability research exercise both indicate that the design meets the objectives set: the user interface is straightforward and easy to use; online assessment and automated feedback is provided for, as is live student-teacher and student-student interaction in a classroom situation; teachers have more control over assignments, and so on.

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