

A System for Assessment in Large Classes: SOAS

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ABSTRACT

For many years, conducting examinations of a large class of several hundred students implied substantial resources in terms of time, venues and paper. The idea of developing a Secure Online Assessment System (SOAS) was to ease the administrative and instructional workload in terms of preparing, conducting and marking examination papers. This is a collaborative teaching development project contributed by members at the Center for Enhanced Learning and Teaching and the Department of Finance under the umbrella project of 'Continuous Learning and Improvement through Teaching Innovation' funded by the University Grants Committee. Two rounds of usability tests were conducted both receiving satisfactory and constructive comments on our work as well as feedback enabling us to make improvements to the system and the assessment procedure. A designated computer laboratory equipped with SOAS is deemed necessary for online assessment venue-booking purpose.

Keywords

Marking online, online assessment tool, large class assessment, assessment, large classes

INTRODUCTION

The Secure Online Assessment System (SOAS) project was motivated by the desire to create an efficient and effective assessment system for a large class of several hundred students. Under the existing assessment system, I administer two examinations during the spring semester when the course is usually taught. Each examination requires

commitment of substantial resources, mainly in terms of time – the instructor's, teaching assistants' and proctors'. This system also makes it much harder to create and administer 'make up' examinations for students who have been absent for various reasons. A rough calculation suggests that currently we spend more than 300 man-hours on each examination. This time includes designing and ensuring clarity of questions, as well as the fact that they are based on materials covered in class, administering the examination in several large lecture theaters, hiring and training 25 to 30 proctors, and finally marking the examination in a consistent and fair manner. In general, a large amount of time is spent on designing a paper examination with an appropriate level of difficulty as the right questions must be chosen and typed up. On top of this, further time is spent on preparing several versions of examinations to ensure that students are not given an incentive to plagiarize.

We wanted to design a system that was efficient (does not require such a large commitment of resources), effective (provides a consistent and fair test to all students by creating randomized tests of 'equal' difficulty) and flexible (allowing students to take the test at various assigned times over one or two days). SOAS has been developed with the assistance of the Center for Enhanced Learning and Teaching (CELT) at the Hong Kong University of Science and Technology, based on the criteria specified earlier.

CRITICAL FEATURES OF THE SOAS

Preparation of Examinations

The most important feature of SOAS is to input a bank of questions. Currently we have created a test bank with several hundred multiple-choice, true/false and fill-in-the-blank type questions. Each question has been coded on the following dimensions and is identified by a number:

- i) Topics – For example: Present value, Future value, Discount rate, etc.
- ii) Levels of difficulty – Easy, Medium and Difficult
- iii) Natures of questions – Conceptual, Definition or Numerical
- iv) Types of questions – Multiple-Choice, True/False or Fill-in-the-Blank in Simple-Question Type or Compound-Question Type (i.e., questions breaking down into multiple levels)

An instructor could easily design an examination with different combinations of the above characteristics. The program allows the instructor flexibility to build a complete or partial common exam for all students. Even with the common examination, the software permits random sequencing of questions and answers appearing on the computer screen.

Alternatively, the instructor can use another feature of the software, which allows him to prepare a special customized random examination for each student after the student has signed to take the examination on a dedicated computer. These features of randomization should minimize opportunities for plagiarism, and/or leaking of exam questions.

Another feature of the software will allow the instructor to create a summary report of the examination to see if the prepared examination needs to be modified by level of difficulty, selection of topics or numbers of various types of question. Finally, the instructor can add, delete or modify questions. He can also change the classification of a particular question's level of difficulty by simply changing the digit in the numerical code controlling the level of difficulty.

Administration of Examinations

SOAS is also designed to facilitate the administration of examinations as it removes the necessity to have large physical venues for large classes. Relatively small venues, say, a room with 50 to 60 computer stations, will be adequate for a period of time, over two days, for example. During these two days students could take the examination at assigned times or on 'first-come-first-served' basis. The preferred mode, in our opinion will be to assign the students to specific time slots to avoid an incentive to delay taking the examination.

During the administration of examination only one or, at most, two proctors will be needed to check the identity of students, assign them to a computer terminal and to prevent any communication between students. It should be pointed out that from a technical standpoint, due to the randomization feature, each student would be answering a different set of examination questions, thus minimizing any incentive for communication. On the other hand, any examination candidates using PCs installed with SOAS would be technically hindered from using any other program or accessing the Internet. This is another fundamental way of preventing online communication or online searching during examinations.

Marking of Examinations

As a computer can grade the answers submitted by the student in real time, the student can be provided with immediate feedback, if desired. The system also allows the student to modify his answers by reviewing them before making a final submission.

Student's results and reports can be easily generated for instructors administering the examination using SOAS. Instructors may also generate students' marks easily by beforehand setting a mark allocation (or deduction) for any correct (or incorrect) closed-end question into the system. Some statistics, including number of correct/incorrect answers per question in each assessment, can also be displayed. Students' actions during assessment will be captured and a log of these actions will be available.

Furthermore, the computer will keep track of each examination (and questions) given to a particular student. An instructor may check the results for each student individually by using SOAS as it can show the questions assigned to and answers picked by each student. In other words, an instructor does not need to go through stacks of papers to find the right paper as, after using SOAS, the instructor may check the result of any particular student by simply extracting the examination questions and answers of a

specific student. Thus SOAS is an environmentally friendly system, as it would save paper – a requisite for any existing examination system.

TESTING OF SOAS

Two rounds of usability tests were designed, implemented and analyzed with assistance from CELT. The participants were teaching assistants, demonstrators and undergraduates from the Department of Finance taking the usability tests on 17 June and 11 July 2003 respectively. The objectives of testing SOAS with teaching assistants and demonstrators were basically to test the system features of both the instructor interface and the student examination interface, while testing with the students was carried out purely on the student examination interface.

Usability Test with Teaching Assistants / Demonstrators

A total of five teaching assistants or demonstrators tried the SOAS student examination interface as if they were students undertaking an online examination on finance topics. They followed the instruction sheets and finished the whole test of 60 simple questions and 1 compound question (question containing multiple parts) within 40 minutes. After they finished trying the student examination interface, they had the opportunity to continue accessing the instructor interface.

During the test, we have tested the following features and functions:

- using questions with different answer types: multiple choice, text-based and with attachment
- using simple and compound questions
- whether assessment can be continued after re-booting the PC
- randomization of questions and answer options
- submission of answers after time out

A thorough discussion was made among teaching assistants, demonstrator and staff from CELT right after this trial. Several refinements on the user interface were made.

Usability Test with Undergraduates

The Department of Finance has also tested SOAS in a FINA course offered during summer 2003. The participants were told that they were participating in a usability test with no impact on their final grades. The test was designed with a specific number of questions to be chosen from several topics, at different levels of difficulty and of various types – conceptual, definitional and numerical – and finally, of different forms – multiple-choice vs. true/false vs. fill-in-the-blank. We were able to prepare a common test with 50 multiple-choice questions in about three hours.

The test was saved in the SOAS server and administered to the students on a designated room installed with the SOAS system. As the number of students was rather small (i.e., 70), we were able to administer the test to all students by dividing them into two classes at two specified time slots in a computer laboratory.

Students were first briefed by the facilitator, a member of CELT staff, on the purpose of the usability test, confidentiality of the treatment of the evaluation data and possible withdrawal during any time at the usability test. The facilitator distributed an instruction sheet to each student, listing the procedures of attempting all 20 questions within the pre-assigned 30 minutes. Teaching assistants from the Finance Department and CELT staff continued to invigilate the test and made observation notes. After students finished the test, they then completed an online questionnaire (i.e., a post-task questionnaire) about the SOAS feature, usability and their opinions about the online test procedure. At the end, 58 out of the 70 students completed the post-task questionnaire, giving a response rate of 82.9%.

The results of tests were very satisfactory. Four-fifths of the students (81%) found the login process very/quite easy. Around 70% of students thought that the timer indicates very/quite clearly the amount of time left and rated the overall ease of navigation very/quite easy. Over 60% found it very/quite easy to skip or jump back to the desired question. The system worked as expected.

CONCLUSIONS

It has not been possible for us to test the system on a large scale due to non-availability of a dedicated computer lab with at least 60 stations for this purpose. We feel that before the system can be implemented in a very large class, such testing is essential to identify and correct last minute bugs. Further, we also need to increase the size of the test bank. However, this is a relatively easy task as several large test banks are available and can easily be loaded into the system after necessary coding of the questions. Once the system proves to be useful, we intend to make it available to others who would like to use it for assessment purposes. As a matter of fact, this system is to be adopted and enhanced by our colleagues in the Department of Information and Systems Management so as to fit their assessment purposes.

The key to implementing the system is to select and codify questions which test a student's understanding and critical thinking ability for a given subject.