

ENGINEERING INNOVATIONS IN DISTANCE LEARNING

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Abstract

Examples are presented here of engineering innovations in distance learning. A case for Massive Open Online Courses (MOOCs) will be made. The new Excelsior College MOOC, An Introduction to Cybersecurity, will serve as the backdrop for this. Introducing project - based team research into C++ programming will then be discussed. Introduction to C++ programming is required by five programs in the College of Technology at the University of Houston (computer, electrical power, mechanical, biotechnology, and computer information systems). This course has been delivered online. And from Prairie View A&M University experiences will be shared of an online course development with a focus on computer engineering related subjects. Enhancing students' learning process through mobile applications will also be discussed. Mobile learning has become an important trend for various subject areas including computer science and engineering at Southern University and A&M College. Finally, a case study of an online course in engineering and technology will be discussed that requires much innovation in the structure of the course content and in the course presentation to accommodate all learners.

A Case for MOOCS

While many people have heard of this growing trend in education – Massive Open Online Courses, or simply MOOCs, they have created quite a bit of controversy. Initially hailed as a savior for higher education costs a few years ago when several of the top tier universities such as Stanford, MIT and Harvard decided to start offering them, they have since taken a tumble in some circles from that pedestal. While hailed as an essentially free education, MOOCs took several classic courses, transformed them into online courses, and put them on the internet for everyone to participate in – for free! The class sizes are limitless and anyone with a computer, internet access and a desire to gain knowledge—anywhere in the world—could join in. While the MOOC movement has seen a good deal of success and numerous other colleges have joined in, the number of students completing the MOOCs shows a staggeringly low percentage. Here is provided an overview of MOOCs, how they originated, their current state, and where this trend might be headed. The new Excelsior College MOOC, “An Introduction to Cybersecurity,” running from January 24 to March 27, 2014 will serve as the backdrop for this, and the platform from which to discuss MOOCs from the perspective of a successful distance learning institution will be shown. [1]

Introducing Project-based Team Research into C++ Programming

Introduction to C++ programming is required by five programs in the College of Technology at the University of Houston (computer, electrical power, mechanical, biotechnology, and computer information systems) and has an annual enrollment of more than 440 students. The course is mainly delivered face-to-face, but one section of the course was delivered online in the past. The course is suitable for students with little or no programming experience, yet offers the depth and rigorous treatment of theory and practice demanded by traditional C++ courses. However, the current offering of the course in the Department of Engineering Technology lacks a research component. Given the nature of the course, students are normally given 6-7 programming assignments every semester, which allow them to practice what they learned in class. Funded by the Quality Enhancement Program (QEP), the course was revised to introduce research to students and broaden the scope of one or two programming assignments to become a term research project. Students are asked to collaborate in a team of 4-5 members to jointly search, identify, and solve a real-world problem. The problem may include industry or academic research. Since students who take this class are from five different programs, this background mix offers the potential of fostering interdisciplinary research work. Additionally, video clips are developed and uploaded to Blackboard to enhance student learning experience on the additional topics needed, such as effective library search, research methods, and writing skills. Lecture notes are developed on research methods, library search, and best practices, which are presented to students at the beginning of each semester. Based on this information, students are expected to find a problem and make a research proposal, which may involve an industry or academic (e.g., from a faculty member) problem. Team members meet with the Writing Center to receive further assistance on how to properly formulate their research proposal. Students are encouraged to find their own research questions based on their individual interests or career path. For example, students who work in industry may suggest problems that they may have noticed at their workplace. A list of suggested topics is provided to students to guide their search or to use as an example. Students are expected to review and report on existing literature and/or technical approaches that address their selected problem to make sure that their selected topic is not completely covered by another work and to gain background information. For example, students may be expected to compare the pros and cons of using different programming languages other than C++ for solving a given problem. Students learn how to cite others' work and the role of licensing agreements when adopting and extending existing software solutions. Once the topic is approved by the instructor, students develop a plan to solve the problem, using the knowledge and skills gained in the course. The plan must detail the strategy, role of each team member, interface, tools, and a schedule. The plan can be revised by the instructor to ensure the feasibility of the plan and identify any need of a contingency plan. It is expected that the proposed improvement will increase students' knowledge, skills, and interest in the topic, as well as to serve as an introduction to research. [2]

Creating Online Materials for Computer Engineering Courses

Recent fast growing computer techniques have made tremendous change to the way we live. Educational methods are also influenced by computers and computer networks. Educators have adopted all kinds of tools to enhance course curricula and teaching materials. As a result, computer based courseware development has been dominated for the past decades. Popular

teaching environments range from virtualization, gaming style, online courses, etc. Those new teaching and learning modules improved the teaching quality by breaking traditional class setting and encouraging more students' interaction. Nowadays online courses are offered in many art and science subjects while it is challenging to extend it to engineering territory because most of the engineering courses have hands-on experiments. Here is shared the experiences of an online course development with a focus on Computer Engineering related subjects at Prairie View A&M University. [3]

Enhancing Students' Learning Process through Mobile Applications

Mobile learning has become an important trend for various subject areas including computer science and engineering. These mobile devices provide an anytime, anywhere learning opportunity for students. Mobile technology has been increasing drastically and the popularity of smart phones has risen in the past few years due to its computational power and easy access of information. The ability to compute from remote locations has made transfer of information fast and easy. App Inventor from MIT has been used at Southern University and A&M College to develop their mobile app for the Android operating system. This application consists of two portals: the teacher portal and the student portal. By using the teacher portal, faculty members can develop questions for a particular chapter of a course on any subject. Through the student portal, students can view the questions and take a test. Depending on the nature of questions developed such as multiple-choice questions, the portal can grade it, analyze it, and display it in a graphical format to show the individual student's performance. A faculty member monitors students' performance and provides specific guidance accordingly. The focal point of this application is to increase the students' knowledge in a particular subject area by analyzing their mistakes in the test and/or quiz through the feedback from the instructor by using this application. Analyzing the mistakes, providing more instructions, and teaching the student based on those weak points, improves the overall learning experience and knowledge of the student. This mobile application strengthens the foundation of the students' learning process and improves the communication between students and faculty members. Both faculty members and students can communicate anytime through their hand-held mobile devices. The implementation of this application aims at taking advantage of mobile applications to communicate more effectively between students and faculty members. [4]

Innovation is the Name of the Game: A Case Study of an Online Course in Engineering and Technology

The advantages of distance learning and online education are well established in the profession. For this, many institutions of higher and continuing education in the United States and around the world have online systems and mechanism in place, delivering effective and robust online education to the learners. Here is discussed a case study of an online engineering course that requires much innovation in the structure of the course content and in the course presentation to accommodate all learners, including well-prepared and not-so-well-prepared ones. Included are course modules, recorded lectures, reading assignments, practice problems, assignments, quizzes, examinations, learning resources, and so on. This has been a three-phase online course, undergone three phases of revisions and improvements in three semesters using the students' feedbacks, some of which are also presented and discussed. The course is well delivered and

received, based on the provided feedbacks and anecdotal evidences. The overall assessment provided yet evidence that in the current distance learning environments, innovation is the name of the game. It is essential to keep the goal of the innovation in mind: The innovation is to make the learning more guided and robust in both content delivery and in the instructional methods. [5]

References

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