Creating On-Line Segments for Software Engineering and Software Testing Courses

The objective is to create online segments that can be integrated into multiple courses which may be partially taught online or all online for Software Engineering and Software Testing Courses. These segments will be shared among several universities. The overall project is a collaboration with Dr. Cem Kaner of Florida Institute of Technology.

The problem being solved is multiple. One problem is making a better course for students so that they can learn and retain more knowledge. For complex topics such as Software Engineering and Software Testing where the objective is not to memorize knowledge but to institutionalize the knowledge by actual performance. Because the students typically don't have a context to draw on from experience, it is very hard for them to switch gears in how they traditionally perform in a course which does not work as well in these courses. Waiting to the last minute to do assignments or skipping homework is deadly to their success in class. These courses as I teach them typically involve doing actual projects for real clients with real deadlines. The requirements and expectations are set by the clients and not the instructor although they may be tempered by the instructor. Validation that the student sufficiently masters the knowledge is significantly done by actual performance of the development and testing task. Additionally, students are required to work in groups which brings in the uncertainty of group dynamics. Also out of this work, I hope to develop variations of courses that are totally taught online. An additional aspect is that this area of knowledge requires learning a whole new vocabulary which is evaluated in the traditional manner that requires memorization but memorization without understanding is not effective so they also have to understand how to use and when to use the vocabulary in the process of performing creating their projects and having the knowledge required by industry when they graduate.

The target audience for these classes is typically upper division students including graduate students and technical staff in industry. Additionally, the target audience at my university is primarily minority students and students who may not have been exposed to computer courses in high school. ***

Existing courses are heavily lecture driven with the use of PowerPoint slides. Courses taught at other universities will most likely not have the requirement that students do real projects for real clients but they may have toy projects to do. When the students just review the slides, they miss a lot of understanding that was conveyed in the classroom and not always present in the books. Students who have not developed good study habits will struggle because these courses are very intensive but it is good preparation for graduate school.

These segments will be developed to be delivered through a variety of media which includes Blackboard or equivalent, video of recorded lectures, Concept Maps, Rainbow Nets, PowerPoint, use of Wiki's, use of pictures, animations, diagrams, and other visual media. The general philosophy is to use stories and examples liberally throughout the course and to put students in situations where they learn from other students. The reason for the heavy emphasis on visual presentation is that I've found that most of my students are visual learners but now we are adding sound of those that learning by hearing and all of the information is available in a text form for those that learn more effectively by reading. The emphasis on video taping all the lectures means that students can be required to view the lecture before coming to class in addition to reading the assigned chapters and now class time can be used for discussions and group work so that the students can learn from other students. The totally online version will have the equivalent group discussions and student collaborations using the appropriate

learning management system which may include a Wiki.

Since, this work will be the evolution of existing courses, it will be done in segments until entire course have this desired format and delivery. I will start with one topic at a time which will more than likely correspond to one chapter in a textbook but not necessarily. I will create the media presentation which will involve scripting the delivery of the lecture, enhancing the content with examples, stories, graphics, concept maps, and Rainbow Nets that illustrate the point or the concept and do the scripting. I will practice the scripting several times before delivery and then perform it. I have done this before when I worked for IBM and also for the University of Texas Software Quality Institute.

The following is a graphic syllabus:

http://cmapspublic2.ihmc.us/servlet/SBReadResourceServlet?rid=1200164030877_1764354202_8819&partName=htmltext

The following is a concept map of what needs to be done (incomplete)

http://cmapspublic2.ihmc.us/servlet/SBReadResourceServlet?rid=1200169897262_1753228086_10126&partName=htmltext

Motivation for using Rainbow Nets:

- **is easy to understand**
  - **is scaleable**
  - **does not suffer state explosion as complexity increases**
  - **can be changed easily and lends itself to incremental development**
- **can be partitioned into various elements so that the structure lends itself to parallelization for running in a multiprocessor environment with multiple threads.**

Example from IRONMAN COURSE

http://www.sematech.org/docubase/document/3028agen.pdf

Cmaps can be found and downloaded at the following site. http://cmap.ihmc.us/

Resources:
WTST Workshop
http://www.testingeducation.org/conference/wtst4/4thWorkshoponTeachingSoftwareTesting.html

References for Rainbow Nets

Modeling using Rainbow Nets
http://cursa.ihmc.us/servlet/SBReadResourceServlet?rid=1126302228391_566816909_3273

Rainbow Net for cattle movement

http://cmapspublic2.ihmc.us/servlet/SBReadResourceServlet?rid=1126302267557_1787307518_3339&partName=htmltext

http://adsabs.harvard.edu/abs/1992arm..symp..449J

http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?arnumber=187863

http://ieeexplore.ieee.org/Xplore/login.jsp?url=/iel1/24/2836/00087133.pdf

http://quanterion.com/RIAC/Library/Library.asp?ArgVal=27342-007

Cmap References:

Software Engineering
http://cursa.ihmc.us/servlet/SBReadResourceServlet?rid=1093378737149_2067774070_712&partName=htmltext

Transportation Model
http://cursa.ihmc.us/servlet/SBReadResourceServlet?rid=1126302267557_347122000_3337&partName=htmltext

References for Software Engineering

Object-Oriented and Classical Software Engineering, Seventh Edition, Stephen R. Schach. McGraw-Hill.

http://www.mhhe.com/engcs/compsci/schach5/
http://www.mhhe.com/engcs/compsci/pressman/
http://lifelong.engr.utexas.edu/sqi/sqi_newsletter/fall98.pdf
http://lifelong.engr.utexas.edu/sqi/newsletter.cfm