
AC 2012-3102: ONLINE TEACHING OF SENIOR PROJECTS

Dr. Alireza Kavianpour, DeVry University, Pomona

Alireza Kavianpour received his Ph.D. degree from University of Southern California (USC). He is currently Senior Professor at DeVry University, Pomona, Calif. Kavianpour is the author and co-author of more than 40 technical papers, all published in IEEE Journals or referred conferences. Before joining DeVry University, he was a researcher at the University of California, Irvine, and consultant at Qualcomm, Inc. His main interests are in the areas of embedded systems and computer architecture.

Prof. David Layton, DeVry University, Pomona

David Layton is an associate professor of English at DeVry University in California, where he teaches general literature, science fiction, composition (both beginning and advanced), ethics, and public speaking. He has a Ph.D. in English from the University of California, Santa Barbara (1994). His dissertation was about the portrayal of science in postmodernist fiction. He has published scholarly articles on science fiction, literature, television, film, and music. His most recent work includes a paper presented at two conferences about the design of university-level science fiction courses, using science fiction to teach the ethics of technology. He also gave a talk on Doctor Who and the critique of capitalism. At the end of 2011, his book on the humanism of Doctor Who will be published.

Online Teaching of Senior Projects

Abstract

The senior projects course is an important assessment tool for technology related majors. Almost every university uses this course for evaluating graduates. The requirements for onsite teaching can vary from university to university. Often, the course consists of research on a selected topic, design, presentation for review by judges (faculty, staff, and industry representative), and a final document. Although there is much information about senior projects requirements, there are no suggestions for teaching this course online. The following paper is a proposal of a model for purely online teaching of senior projects. The model addresses the specific needs of online instruction while at the same time meeting specific departmental expectations for senior projects and university pedagogical goals.

One of the authors of this proposal has taught the senior projects course for more than two decades using traditional onsite method of teaching. However, with today's trend of teaching courses online, especially with the challenges of teaching technical courses, the need to formulate an efficient online method of teaching senior projects courses and to replace physical interaction has a high priority. In this proposed method, the entire class will participate in one project and interact through mock interview. The project has many sections, and if a student fails to finish his or her part, this failure will not affect the entire project. Students from different locations are able to participate in the design and mock interview.

In this paper, the result of the authors' finding in this field, new requirements and recommendations for teaching the senior projects course online will be discussed. Different techniques such as web conferencing and group interviewing are employed to replace physical interaction.

1-Introduction

Online learning or e-learning has become an increasingly common choice for many people pursuing education. A Yahoo search with the keyword "senior projects" will result in more than ten thousand hits, and perhaps all refer to onsite teaching of this course. A search of education and professional journals shows multiple proposals for specific capstone and senior projects, but little about the special requirements for teaching such projects online. These results are evidence of a need to address the specific challenges and requirements for online teaching of senior projects. Online learning requires the student to participate and learn virtually via computer, as opposed to in a traditional classroom environment. Though online learning is not for everyone, it's important for prospective students to determine whether or not it's something they would like to pursue^{1,2,3}. The following are pros and cons for online learning:

Pros

(a)- Online learning provides flexibility because students are able to work when it's convenient for them. Students can do all the homework from any location as long as they have access to computer.

- (b)-A student can learn at his or her own pace.
- (c)- Degrees can be completed in less time compared to traditional universities.
- (d)- Students have fewer distractions, and it can be less intimidating to participate in the discussions.
- (e)-Students have the opportunity to connect with and work alongside students from other locations.

Cons

- (a)-Students who have trouble managing their time may find it difficult.
- (b)-Lack of interaction personally with other students and the instructor.
- (c)-Technology and/or technology issues may be a barrier for some students

2- Limitations of the onsite teaching of senior projects

Senior projects often consist of research on a selected topic, writing a proposal and status reports, design, presentation for review by faculty, staff, or industry representative, and a final document. The following are the limitations of onsite teaching of senior projects:

- (a)- Projects are isolated systems
- (b)- Most of the projects are not networked or not well connected
- ©- Projects are not compatible to form larger systems
- (d)- Projects are not optimized because the main goal is to make them working
- (e)- There is no measure for performance
- (f)- There is no concern about cost of the project
- (g)- There is no measure for energy efficiency

3- Onsite versus Online teaching of senior projects

Assuming students have an option to take this course onsite or online, Table 1 compares onsite and online teaching of the senior projects.

Aspect	Onsite	Online
Group	2-3 students/project	Entire class
Connectivity	Isolated	Networked
Theme	Any type	Cyber-physical
Platform	Microcontroller	Solution-driven
Evaluation Measure	Not defined	Power, Cost, Delay
Mock Interview	Not required	Required
Job description	Not required	Required
Final Document	One report/project	One book for the entire class

Table 1: comparison between onsite and online teaching of the senior projects

The table demonstrates two primary advantages of the online delivery method for senior projects in technical degrees. One is that it looks forward to the professional life of the student after graduating. The other is that the course design configures the students in a communications network.

4- Online Senior Project Model in Engineering

In online teaching of the senior projects course, the instructor defines a project for the entire class. This project has many sections and every student will contribute to at least one of the sections. Some students might contribute to several sections. The instructor or students can check other designs through a common Graphic User Interface. At the end of the term, based on a prepared job description for someone who will hire by a company to do such a project, students will be interviewed by peers and the instructor. All students will participate in a mock interview. Every student is responsible for writing at least one chapter of the final document (book).

Example:

The following project might be one possible choice for the students with Electronics/Computer Engineering Technology major:

Name of the project: Automation of the appliances in a house

This project controls appliances such as: Radio, TV, Garage door, Shower, Coffee maker, Microwave, Telephone, Refrigerator, etc.

Main Hardware: ZigBee or WiFi, IP gateway, Microcontroller.

Main Software: Graphic User Interface (GUI) has written using a high level language (JAVA, C++, C#, VBNET).

Every student will select one of the appliances for controlling. Through the internet, students can communicate with an IP gateway and then connect to their interface design for controlling an appliance. The entire class has access to main GUI and can select a particular device for control.

5-Action Items

Each student will design his or her section and make it ready for the day of the interview. Along with the project, a student should write a job description for someone who represents a company that might hire someone to do such a project. All students should participate in a mock interview. As an interviewer when a student is not interviewed, he or she can ask questions on job description, about a company, and about the project. Students will be interviewed by peers and the instructor. The class website should have capability to use different software for web conferencing similar to WebEX, Elluminate, or Adobe Connect for implementing this interview.

6- Grading of the senior projects

Grading for each student in the engineering class is based on the following items:

- 1- Design

- 2- Job description
- 3- Mock interview
- 4- Weekly message board activities
- 5- Writing one chapter of the final book

Checking the design

The instructor can check design and status of each section through a common GUI, which is linked to an IP gateway and the device. Grading for this portion is based on completeness, cost, efficiency, and timeliness.

Job description

Assuming a company needs someone to do such a project, a student should write a job description contains the following:

- 1- Must be specific about the job description
- 2- Degree and major requirement
- 3- Is it Digital or Analog? Not just hardware
- 4- Is it firmware? Driver? GUI?
- 5- Description must be written for a good company
- 6- Objective is to look for the best people

Mock Interviews

At the time of interview students should consider the following:

- 1- Job descriptions for someone who wants to do this project for a company
- 2- Student will be interviewed for those positions
- 3- Student has to justify why they should hire applicant
- 4- Student should demonstrate that applicant is well prepared
- 5- Student should demonstrate that applicant is a team player
- 6- Student should demonstrate that applicant is professional

Preparing for interview

- 1- Make the company attractive
- 2- Comments and vote on other classmates
- 3- Would you apply for this job?
- 4- Does the company have long term future?
- 5- Can it get and keep best people?

Weekly message board activities

- 1- Required every week
- 2- Content

- 3- Highlight of activities and time spent
- 4- Details of progress activities
- 5- Useful resource, discoveries, design findings
- 6- Acknowledge help received

Format for the Final Book

There is only one final book for the entire class. Class jointly will come up with one outline. Each student assigned at least one chapter to write. One or two students should also be assigned for editing the book. Following are the key points:

- 1- One final book for the entire class
- 2- Students jointly will come up with one outline
- 3- Each student assigned a chapter to write
- 4- Students should know the interface to the other sections
- 5- Students should read each other's document and ask questions

7-Online Senior Project Model in the Humanities

The proposed model for a senior project would work equally as well in Humanities major as it would in a technical or science major. An example is a hypothetical senior project in American Literature. In this case, the entire class would be working on creating a “case book” for a major American work, such as *The Scarlet Letter*.

As with the engineering senior project, the literature senior project would require all students to contribute to a final large document, a case book. Each student would contribute a chapter to the case book. Each chapter would look at a specific aspect of *The Scarlet Letter*, such as the characters, the setting, or the circumstances of its writing. Alternatively, each chapter could be an explication of the book from a different critical angle, such as historicist, feminist, psychoanalytical, and post-structural. One or two students would serve as editors for the final book, reviewing submissions for accuracy and clarity, eliminating redundancy between submissions, and ensuring a smooth final version.

In this humanities version of the senior project, the mock interview would be replaced with a defense of the work, in which the supervising professor, along with other professors, asks the students challenging questions.

Grading for each student in the humanities class is based on the following items:

- 1- Design and Organization
- 2- Quality of the Proposal
- 3- The Defense
- 4- Weekly message board activities
- 5- Writing one chapter of the final book

Checking the design

The instructor can check design, organization, and status of each section through a common posting area in the class. Grading for this portion is based on completeness, arrangement of the chapters, thoroughness of the research, and timeliness.

Organization and execution

Organization refers to the following:

- 1- Must have a table of contents
- 2- Must fulfill the standards for the degree and major
- 3- Chapters are arranged logically and progressively
- 4- The final book has an introduction
- 5- Chapters are balanced in size and scope relative to each other
- 6- The case book objective is met

Defense

At the time of the defense students should consider the following:

- 1- A thorough understanding of their part of the project
- 2- An understanding of the other parts of the project
- 3- A quality justification of why the students included what they did
- 4- A demonstration that the student is well prepared
- 5- A demonstration that the student is a team player
- 6- A demonstration that the student understands the theoretical, social, and historical contexts of the work in question

Weekly message board activities

- 1- Required every week
- 2- Content
- 3- Highlight of activities and time spent
- 4- Details of progress activities
- 5- Useful resource, discoveries, research findings
- 6- Acknowledge help received

8- Instructional Advantages

In addition to the advantages students will experience in this design, instructors will receive advantages of their own. A key advantage is that the design is flexible enough to conform to whatever education philosophy the instructor may have. Millheim⁴ identifies three such philosophies appropriate to online instruction: humanist, critical-humanist, and emancipatory.

Humanism in education philosophy focuses on learner needs, using student self-direction as the main educational strategy. The senior project design proposed here conforms to the philosophy

in that students learn to manage their own time and must take responsibility for the quality of their portion of the project, responsibilities that students have primarily set for themselves.

Critical-humanism in education philosophy incorporates student self-direction, but also focuses on aligning classwork with an understanding of the political and social influences upon what students are learning. In the course design described above, consideration of the ethical and social implications of the project can be one or more of the chapters of the final book.

Emancipatory philosophy in education seeks to empower students through an understanding of ethno-centric and class-specific problems related to what students are working on. In the course design described above, students may be asked to consider such issues as technological access, micro-communities, and cultural bias related to the design and delivery of the product on which the senior class is working. In the humanities senior project, students can be directed to consider how their work fits into a social critique related to ethnicity and social class.

The flexibility of the design allows for incorporating a broader part of the students' educational experience than just the technical requirements of the specific project. In writing book chapters, students will be incorporating their English composition education. In adding chapters about the cultural and social impact their product may have, students will be incorporating their Social Sciences and Humanities education into the project. By bringing in the broad range of the "well-rounded" education students are required to get, the instructor creates a true educational capstone.

The design of the online senior project also favors the formation of an online collaborative learning community. Tu⁵ argues that "Collaborative learning uses small groups of learners in the instruction encouraging them to maximize their own, and each other's, learning." The method is to use small-group activities to develop higher-order thinking. This method builds a community of learners who master knowledge by community behavior and by allowing the interplay of different learning styles. A longer project such as the senior project works well for a collaborative learning community in part because communities take time to build, and social interaction takes longer to develop in technology-based environments. As Tu sees it, a long-term online project is better suited to building a collaborative learning community than is a short one.

Additional benefits to the collaborative learning strategy are that such long-term projects promote active learning, making the student more responsible for his or her intellectual development, and that community creates a set of obligations that students more strongly feel than they would if working individually or merely cooperatively. Participants learn together, and so are likely to believe they are contributing to a more general welfare rather than merely their own personal welfare.

For the instructor, the collaborative learning community that the online senior project creates will remove much of the fiddling detail work of managing a class. Students will be taking care of much of their own learning, and will have the community of their peers for some of the evaluation and criticism of student work. The instructor's role changes, therefore, into what many educators call a "facilitator," but is probably more accurately called a "guide." The instructor will be more focused on leading students toward higher-level learning. The instructor's

particular education and expertise will be more relevant and necessary for students to complete successfully the online senior project.

9- Summary

This paper describes a new method for online teaching of the senior projects. In this method, the entire class will participate in one project and interact through mock interview. In this model web conferencing has been employed to replace the physical interactions. The project has many sections, and if a student fails to finish his or her part, this failure will not affect the entire project. Students from different locations are able to participate in the design and mock interview. In this paper examples were given for students in the field of Electronics/Computer, Engineering and Literature.

With advanced online technology software for web conferencing similar to WebEX, Elluminate, or Adobe Connect, this new method is applicable across Engineering, Science, Social Science, and Humanities majors, and could be implemented for other disciplines.

Senior project is a capstone course that makes a student ready for a specific industry. In this online model the emphases are on design techniques, student communication skill, and documentation. These are three major skills that employers are looking for.

10-Bibliography

- 1- Coleman, Stephanie; Benefits of Online Learning. World Wide Learn, The World's Premier Online Directory of Education. 14 August 2005. World Wide Learn. 02 May 2008. "<http://www.worldwidelearn.com/education-articles/benefits-of-online-learning.htm>"
- 2- Lewis, Regina; Earning a Degree Online. (2003) Retrieved from "<http://www.cbsnews.com/stories/2003/08/26/earlyshow/contributors/reginalewis/main570268.shtml>" August 14, 2005.
- 3- Blomeyer, Robert; Professional Development for Effective Teaching and Online Learning. Virtual School Reports, Connections Academy 2006- "<http://www.connectionsacademy.com/pdfs/VirtualNewsSpring2006.pdf>"
- 4- Millheim, Karen L.; The Role of Adult Education Philosophy in Facilitating the Online Classroom. Adult Learning 22:2, Spring 2011, p. 24-31.
- 5- Tu, Chih-Hsiung; Online Collaborative Learning Communities: Twenty-one Designs to Building an Online Collaborative Learning Community. Westport: Libraries Unlimited, 2004.