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Enhancing Student Learning with Video Projects

Abstract

This paper will explore the use of digital video as a teaching tool in college courses. Two very different courses of potential interest to engineering educators are cited as examples. The first is a foreign language course offered at the University of Notre Dame which uses video technology to encourage students to write, produce, and star in original Spanish language "telenovelas" or day-time dramas. The second course is an introduction to computer networking course offered at Kansas State University at Salina which uses video technology to teach the fundamentals of computer networking. Both courses use digital storytelling to enhance student learning, and strengthen communication skills.

Some scholars argue that "the multimedia language of the screen has become the current vernacular" and it is time for video instruction to become foundational to undergraduate general education. Digital video is becoming increasingly affordable and accessible, providing an engaging method of instruction in a variety of subject areas.

Video provides an excellent and familiar medium for enhancing student learning in a variety of disciplines, including engineering. Video serves as a bridge between the humanities and engineering when it brings technology into the humanities classroom and when it brings the humanities into the technology classroom.

ABET accreditation requires that all engineering graduates have effective communication skills, have an ability to function on multi-disciplinary teams, and have an understanding of the world, the economy, the environment and society. It is a challenge to fit the broad education required for gaining this kind of understanding into an intensive engineering education. Digital video technology addresses this challenge.

Introduction

Video production has a long history in the humanities because it was developed for storytelling out of a theater tradition. While the emergence of digital video has made video production a relatively affordable, manageable, and accessible tool in secondary and post-secondary humanities classrooms in the last decade, its use in engineering and science courses has been quite limited to date.

Searches of engineering education related databases such as ASEE, IEEE and ACM Digital Libraries return hundreds of articles on digital signal processing of video as well as algorithms for storage and optimization of video, but very few (if any) articles have yet been published about courses requiring the creative use of video technology for communication of engineering and technology concepts in a student video project.

Presentation of video content as an instructional aid in the classroom is commonplace, but the production of student created video in engineering and engineering technology courses is apparently uncommon. With the ease and accessibility of modern digital video creation

technologies, this no longer needs to be the case. In fact, some educators consider the use of video and other digital media communications technologies to be 21st century literacy that is important to general education in all disciplines. As Elizabeth Daley, Dean of the USC Cinema and Television school points out, "the multimedia language of the screen has become the current vernacular."[1]

Consider this excerpt from Howard Rheingold's essay on participative pedagogy:

> "If print culture shaped the environment in which the Enlightenment blossomed and set the scene for the Industrial Revolution, participatory media might similarly shape the cognitive and social environments in which twenty first century life will take place (a shift in the way our culture operates). For this reason, participatory media literacy is not another subject to be shoehorned into the curriculum as job training for knowledge workers.
>
> "Participatory media include (but aren't limited to) blogs, wikis, RSS, tagging and social bookmarking, music-photo-video sharing, mashups, podcasts, digital storytelling, virtual communities, social network services, virtual environments, and videoblogs.[2]

If participatory media truly is the new vernacular, revolutionizing the way the world thinks and communicates, then is it not an idea worthy of exploring and incorporating into as many courses that we teach as possible?

Michael Wesch, anthropology professor at Kansas State University and author of the well known "*The Machine is Us/ing Us*" YouTube video [3] thinks so:

> "YouTube and other video sharing sites have sparked similar widespread participation in the production of video. Over 10,000 hours of video are uploaded to the web everyday. In the past six months more material has been uploaded to YouTube than all of the content ever aired on major network television. While such media beg for participation, our lecture halls are still sending the message, 'follow along.'
>
> "This new media environment demonstrates to us that the idea of learning as acquiring information is no longer a message we can afford to send to our students, and that we need to start redesigning our learning environments to address, leverage, and harness the new media environment now permeating our classrooms. [4]

Educators are beginning to understand how media technology is changing the world, but also how it is changing the way students learn. Some research suggests that in general, "Net Generation" students raised on digital technologies have developed some very distinctive styles of learning that work well in video projects. Two of these are *inductive discovery* and *visual literacy.* According to a report entitled "Educating the Net Generation" by Oblinger & Oblinger:

"The Net Gen is oriented toward inductive discovery or making observations, formulating hypotheses, and figuring out the rules. They crave interactivity. And the rapid pace with which they like to receive information means they often choose not to pay attention if a class is not interactive, unengaging, or simply too slow.

"The Net Gen is more visually literate than previous generations; many express themselves using images. They are able to weave together images, text, and sound in a natural way. [5]

Recent research at the Dana Consortium on Arts and Cognition seems to indicate that time spent studying drama and other art forms can actually enhance memory and student learning in other academic areas.

"What we have found for actors is not that their memory for verbal material is better; it is that they apply strategies for extracting semantic themes from verbal material, and these strategies result in better memory for the material in question.[6]

While we do not suggest that all engineering students need to study acting to be good engineers, we do suggest that incorporating elements of the dramatic arts such as those required in student video projects might be helpful in creating a brain-based "enriched learning environment"[7] that students will find interactive and engaging. In addition, such projects may help to address the need for a broader education within already full engineering curriculums.

ABET accreditation requires that all engineering graduates have effective communication skills, have an ability to function on multi-disciplinary teams, and have an understanding of the world, the economy, the environment and society.[8] It is a challenge to fit the broad education required for gaining this kind of understanding into an intensive engineering education. Digital video technology used in student video projects addresses this challenge.

Student created video projects can be extremely effective educational tools as they encourage students to make connections, reflect on and interpret what they are learning; build learning communities, collaborate and negotiate nuanced elements as they create the narrative; and refine their communication skills by learning through teaching. The student use of video is a powerfully interactive way to process, interpret and negotiate meaning within a group from the planning stage through production and post-production. The nature of video requires students to attain deep understanding in order to clearly articulate their ideas to others. Video requires students to function as team members who use artistic and technical tools of multimedia to create a successful project.

Perceived Benefits

The authors of this paper have used digital video production in their humanities and technology classrooms respectively. In sharing their experiences they discovered both commonalties and surprising benefits from the "cross-pollination" of the disciplines, creating opportunities to learn from one another to improve the teaching process, student learning and the final product.

Whether a literary work or technical specification, each has a story to tell. Defining and making connections between "characters" or key concepts, articulating a narrative and understanding the narrative in a larger context are necessary skills no matter the discipline. The use of digital video production as a teaching tool obliges students to process material differently from traditional methods. Taking notes; preparing for class discussions, tests and quizzes; and even applying acquired knowledge to new problems or situations – sometimes an exhaustive list of learning and assessment activities in the traditional classroom – are peripheral in terms of the preparation and processing required for producing a video narrative.

Creating video requires that students reflect on what they are learning and to consider their newly acquired knowledge and skills through the purpose of the video. The defined learning outcomes of the course dictate the guidelines for a video project. Are the students being asked to "teach" the material, demonstrate an integrated understanding of the concepts or steps in a process, or use the material to create a new "product", situation or perspective regarding what they have just learned? The focus is on the student and follows the reflective learning model described by Anne Brockbank:

> "The teacher becomes a facilitator of learning. The focus becomes the students' learning and how they may come to understand, appropriate, modify and transcend meanings with the material. The student learners become the center and focus of the dialogue. For the teacher, the focus moves away from the transmission of the material to how the students are working with the material in the here and now.[9]

The teacher's role is to give the students the tools and guidance they will need to process and create with the material. Throughout the video project, students are the agents of their own learning. Whatever the learning outcome, students are obliged to communicate concepts clearly to one another while working in groups and to the anticipated audience, as well as prioritize and negotiate key elements. They must create an introduction and conclusion for their project, contextualize the material, and explore ways of making the presentation engaging and/or entertaining. Finally, the students must create a narrative not only within the comfortable domain of words and images, but expand their perspective to consider lighting, camera shots, sound, and overall audio-visual composition. The result is that students not only explore different processes and perspectives, but engage multiple intelligences [10] including "verbal/linguistic", "visual/spatial" and "interpersonal" intelligences. It provides an opportunity for "learning celebrations", defined by Maggie Meyer and Jenna Glock as:

> "When it comes to assessment of that learning we use the same concept in designing authentic situations we have called learning celebrations. A paper and pencil test does not touch true understanding. Unfortunately, it has become the standard way for students to show their knowledge. To demonstrate understanding we feel learners need to have choices so they can show evidence of their learning through the intelligence of their choice. To be a useful assessment, that learning should be applied in a setting that demonstrates genuine understanding.

> "We have discovered that some of the most meaningful moments in teaching and learning have occurred during these celebrations. When students have multiple choices in ways to demonstrate their knowledge, the evidence of their learning is more accurate. We wanted the students to actually become the experts through the learning process. [11]

Indeed, we have found that the opportunity to create video projects, paired with the newly developed literacies required to create in this medium is an ideal platform for providing "learning celebrations", demonstrating genuine understanding of concepts and technical skills through specific guidelines but with adequate freedom to engage multiple intelligences. The exploration of how video projects were used in two very different disciplines, Engineering and Spanish allows us to find common ground and to learn from each other's strengths and as well as expose opportunities for enrichment. Both courses use digital video storytelling to enhance student learning, and strengthen communication skills.

Finally, and not a small benefit, student developed video projects can be an excellent tool for promoting the visibility of the department or program. Superior projects can be presented as a teaching tool, used in recruitment "fairs" to attract potential students, or even used to educate the general public. They can be uploaded to web pages and used in portfolios as students venture out into the workforce or graduate schools. Showing an ability to collaborate, meet deadlines, communicate with digital media technology, as well as planning and executing a multifaceted project are valuable qualities that make a qualified candidate even more desirable.

Wakonse Conference on College Teaching

It may seem to be an odd juxtaposition; a paper describing video projects in Engineering Technology and Spanish courses. Indeed, it is an unlikely pairing except for the hidden connection that bears mentioning here. The instructors of these two courses would have had little chance for interacting and learning from each other without the Wakonse Conference on College Teaching (http://www.wakonse.org).

Actually an "unconference," Wakonse is a week long interdisciplinary meeting of higher education professionals at the rustic American Youth Foundation "Camp Miniwanca" located in Shelby, Michigan. Wakonse is operated by and for college teachers with no paid professional speakers typical of so many conferences today; but instead the agenda is set and the sessions and presentations are offered by the college teachers themselves.

Wakonse is attended by college educators from all across the United States representing all disciplinary areas with the common purpose of improving college teaching. The authors of this paper both attended the Wakonse 2008 conference and through a chance meeting discovered that they both include digital video as a teaching tool in their respective classes.

Through discussions at Wakonse and the subsequent collaboration of writing this paper, both authors learned a great deal from each other that can be applied to future versions of their class video projects.

Spanish Telenovelas

The stated goals of the Spanish language telenovela course taught at the University of Notre Dame are to provide students with an integrated multidisciplinary learning experience in which they study the telenovela; learn about its formulas, archetypical characters, historical development and cultural impact, while they also learn linguistic and technical aspects of screenwriting, production, filming, acting and editing in the creation of their own telenovela. But the stated goals really served solely to shape the structure of the course. The project itself, once students have the tools, skills, concepts and vocabulary needed to work together, is wholly student-driven and produced.

The course calendar is divided into two parts. The beginning of the semester is spent watching abbreviated versions of two well-known and representative telenovelas, *La Ursurpadora* (set in modern times, using a classic device of twins and mistaken identities) and *Amor Real* an elaborate, big-budget, period piece (set in 19th century Mexico, with common problems of legitimacy, family lineage and star-crossed lovers). At the same time our students explore various cultural readings as well as a text from Peru written for would-be script writers of telenovelas, defining the genre of the telenovelas and outlining the archetypes, narrative techniques and formulas that are part of the genre. They also read from technical manuals for film introducing them to the vocabulary and concepts of video production including types of shots, transitions and other technical considerations in the production process. All of these texts are in Spanish, giving students the technical vocabulary they'll need to negotiate and create their project in the target language.

Before the students begin work on their telenovela, we introduce them to the creative and production process by asking them to create commercials (which are then used to separate the episodes of the telenovela in the final project). Like those seen on television, the commercials are limited to 45-90 seconds, but it is an eye-opener for the students to see the amount of preparation, planning and quantity of footage needed to make the commercials a success. It provides them a wonderful opportunity for a learning curve (not to mention bloopers) as they make and learn from their mistakes in preparation for the production of the telenovela.

The students work in small groups to create their commercials, but have an opportunity, indeed the responsibility, for peer review and feedback during each step of the process (defining the concept/product, creating the script, reviewing rough footage, reviewing edited footage, evaluating sound and sound effects, etc.) When they have a commercial with which they are satisfied we begin the creation of the telenovela. The groups brainstorm ideas for the plots and characters and as a whole the class selects or integrates those that they find most appealing. In the past we have experimented having 2-3 writers write the script from beginning to end as well as having various small groups write a single chapter or episode. The latter may be a better model for the engineering classroom to allow all students an opportunity to be part of the writing process.

From this point forward the role of the instructors has been as resource, guide, facilitator of discussions, deadline reminder and reality check for some of the more ambitious projects.

Otherwise, the students are entirely responsible for incorporating and demonstrating what they learned from the readings and class discussion.

An added benefit in the foreign language classroom, but applicable whenever multiple levels of proficiency or understanding are involved, is that the students learn from each other. They quickly learn to recognize and capitalize on each other's strengths so that the end result tends to be the best of what the group has to offer. Examples of the student created telenovelas can be viewed at http://www.nd.edu/~kbarry2/tn/. [12]

Student Created Video in Engineering: Network Simulation

Maintaining a broad based education, while meeting the ever-increasing curriculum requirements is an ongoing challenge in undergraduate engineering education. Incorporating some interdisciplinary elements of the humanities into existing technology and engineering courses could be one way of effectively addressing the need for a broad education.

One approach used in the Networking course at Kansas State University at Salina asks students to complete a digital storytelling with video project. In the spring semester of 2008 using digital video, networking students were invited to tell the story of how a file is requested from an Internet server and downloaded using computer network technology. Strengthening student understanding of computer networking protocols and also practicing 21st century communications skills were the goals of the project.

After a class lecture on the same topic, students performed a network simulation explaining the process of encapsulation of data with the various networking OSI model layers using paper messages and envelopes provided by the instructor. Different paper colors represented different types of messages such as a web request, an e-mail message, or a print request. Different sizes of envelopes represented different encapsulation layers, with smaller envelopes used for upper OSI model layers and larger envelopes used for the lower layers. Students role-played the various networking devices such as switches, routers, computers and so forth. As the data was encapsulated, the smaller envelopes were placed inside of larger envelopes, and each envelope was given an appropriate source and destination address. Students completed the simulation several times in class before performing a simulation for the video camera.

As each person plays a role in the network, they must demonstrate knowledge of the networking being simulated. Students must fully understand how the network is supposed to work in order to contribute, and those students whose understanding is weak are unable to successfully contribute to the simulation without coaching. Extra encouragement and assistance can be offered when these deficiencies are discovered.

Once the footage explaining the simulation is recorded, it is edited into a short video segment that summarizes the process. For the first attempt at this kind of project, the instructor assumed the editing duties simply because of the limited availability of equipment. In the future, students will be called upon for the final editing and crafting of the story line. The finished video from Spring 2008 was uploaded to YouTube and as of this writing has received over 2,500 views. [13]

It should be noted that the class size for this project was relatively small, with fewer than 15 students involved. For larger classes, a different approach using multiple concurrent simulations and multiple video projects would likely be more effective. It is interesting to note that the Fall 2008 semester Networking 1 class did not choose to complete a video project due to a completely different classroom dynamic and lack of student interest. Michael Wesch notes:

> "Students would prefer less technology in the classroom (especially
> *participatory* technologies that force them to do something other than sit back
> and memorize material for a regurgitation exercise) [14]

Looking back, the Networking 1 teacher wonders if he should have pressed the issue harder given that the project deals with participatory 21st century literacy and communication skills.

While some students may be reluctant to take an active role in their learning, others may simply be camera-shy. In the spring 2009 semester, networking students have already been taking a much greater role in developing the "script" for the network packet simulation than in previous semesters.

The instructor provided some background information in the form of labs, lectures and a brief hands-on demonstration of layer 2 switch operation. Students were then provided with the same colored paper and envelopes used in the previous year's video, but then challenged to create their own internetworking simulation with two or more layer 3 routers that would include each student in the class role-playing the part of router, switch or network host such as a computer, printer, server, and so forth. Instead of being given step by step directions on how to work through the simulation, students used a constructivist approach drawing from what they had learned through the previous class lectures and lab activities with actual TCP/IP networks. The instructor was available to provide hints and to answer questions, but the real work of designing the simulation and working through the details of what is required to have network communications through all of the networking layers was left to the students to ponder and work through.

The result of this approach was a much more engaged class with students taking turns at the board drawing out diagrams, labeling network components, correcting each other's mistakes and asking much more thoughtful questions about networking protocols than students of previous semesters. As of this writing, a final video has not been edited and released, but much of the groundwork has already been completed for making one using the student developed "script" for network communications.

Potential Challenges of Implementing Video Projects

One possible challenge in incorporating digital video projects is that becoming familiar with the technical aspects of video production takes time away from the course material both for the instructor and for the students. Through the use of a guide or rubric instructors can communicate that while final project quality is important, the expectation is not that of a professional. Furthermore, the technical knowledge of creating video is valuable in and of itself. As more educators adopt a point of view of media as literacy and more courses use digital video projects, it will become further integrated into the curriculum where media literacy is required and the

students' experience in media skills will flourish overall. In the meantime, small projects can be incorporated slowly, introducing and emphasizing key steps in the production process.

Another challenge may be that although the students will likely quickly become comfortable with the methods and technology with some direction, the instructor may have more of a learning curve. Online resources and brief, manageable texts such as *Grammar of Shot* [15] and *Grammar of the Edit* [16] by Roy Thompson and *The Little Digital Video Book* [17] by Michael Rubin are very helpful. Another option could include obtaining the assistance of an expert in video from a teaching and learning center, film department or audio-video services until the instructor is comfortable with the technology.

A final consideration is evaluation. In our experience the students tend to perform better in the with both a guide and grading rubric, especially considering the brief time they have to get up to speed with the project. It is important that the rubric assess content, technical and aesthetic elements of the project.

Lessons Learned

Engineering educators should be encouraged by this example to seek collaborations in unusual and unexpected ways, because the process of interdisciplinary thinking is enriching to everyone involved. Elizabeth Daley describes it well:

> "Faculty in the humanities and in the arts and sciences – from disciplines as diverse as quantum physics, art history, and philosophy – have found common ground, insights and points of access into the pedagogical and research issues in one another's disciplines… Multimedia may well have the potential to provide a much-needed new space in which cross-disciplinary conversation can occur between the humanities and the sciences.[1]

In the future, video projects in the Kansas State University Networking 1 class will more closely follow the example of the Notre Dame Spanish class by asking the students to be more actively involved in script writing and creating the digital storytelling narrative that will be recorded. Having the students develop the content of the videos will require a much deeper level of understanding than simply acting out the parts that have been designated to them by their instructor.

One method of dealing with networking class student shyness in future video projects might be to have students experiment with computer graphics or other non-human actors in creating these videos. Examples such as the simple videos in "Plain English" from the Common Craft Show come to mind. [18]

Similarly, the Spanish classroom can benefit from the engineering model. The networking activity is a useful template that may be used to illustrate technical aspects of language. The connections between verb forms, modeling the relationships between tenses such as the perfect tenses and the usage of prepositions can all be enhanced through the kind of activities employed in the engineering networking class. It has encouraged the author to look at the *structure* of

language differently. This new perspective will be included in future language lessons and possibly for a digital video project in Spanish language courses.

Conclusion

The student use of video is a powerfully interactive way to process, interpret and negotiate meaning within a group from the planning stage through production and post-production. The nature of video requires students to attain deep understanding in order to clearly articulate their ideas to others. Video requires students to function as team members who use artistic and technical tools of multimedia to create a successful project.

Students using YouTube, social networking sites and other high-tech media in their day-to-day communication already have ample exposure to digital media. In the same way that its usage has changed the way our students communicate with each other, digital video projects change the way the students learn and demonstrate what they have learned. Digital video projects as part of a curriculum continues to grow and multimedia literacy and skill development in education is becoming more important. Engineering educators should be encouraged to explore the possibilities with digital video projects in their courses, remembering Daley's observation that "… those who are truly literate in the 21st century will be those who learn to both read and write the multimedia language of the screen." [1]

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