Experiences from Teaching an Interdisciplinary Multimedia Course

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Abstract

At Wellesley College very rarely do the Fine Art and Computer Science faculty cross paths. That was the case until two years ago when we taught an experimental course that brought together work the authors were doing in their respective fields. In this course, art and computer science students worked in assigned pairs to produce an interactive multimedia project on a topic of their choice. The project had to be taken from conception to publication on CD ROM. Theoretical material from both disciplines was presented in addition to the hands-on production skills. The projects covered a diverse range of topics, including: an interactive museum, a children's game, the nature of fractals, a jazz tutorial. The results far exceeded the instructors' expectations for the excellence of the projects. In the process, the students learned a great deal about multimedia and an important lesson about the nature of collaboration. The course has become since a showcase of the school's interdisciplinary offerings and has created an increasing stream of "Media Arts and Sciences" majors.

1. An interdisciplinary course

With the growth of multimedia, the boundaries between traditionally unrelated disciplines have blurred, requiring the collaboration of computer professionals, artists, engineers and scholars from all fields. Likewise in teaching a multimedia course, we believe that collaboration is an optimal format to thoroughly cover the diverse components of multimedia, and to create an effective climate in the classroom for students and faculty to pool their skills and experience. With that in mind, we selected a diverse group of students, primarily from Art and Computer Science majors, but also from other majors that had some experience in CS or Art. Students worked on a semester-long project in pairs to produce an interactive multimedia project on a topic of their choice. They were grouped according to their skills, so that ideally each team would have a complementary set of skills (i.e. both art and programming).

The project had to be taken from conception to publication on CD ROM, including research, storyboarding, addressing issues of navigation, interactivity, user interface design, screen design, typography, illustration, the effective visual presentation of information, mixing of media (sound, animation, stills, video), user testing and debugging. The projects were published on CD-ROM at the end of the semester.

The collaborative nature of this project accomplished several objectives:

- The collaborative arrangement fostered an atmosphere of cooperation and communication, teaching students to work together effectively. These important skills often get overlooked in a competitive (but also in an Academic) environment.
- Collaboration mirrors the process of multimedia production in the "real world". On a practical level, this meant that students were able to fully realize a significant project within a limited amount of time.
- Finally, it set up a structure for peer learning; students helped their partners to learn the concepts that were new to them. There was a healthy give-and-take.

2. Collaboration issues and working models

The teams took several approaches to the division of labor. One team opted for maximum efficiency towards the goal of producing a very ambitious, complete product. These students split the work evenly between programming and design, according to the skills of the two students involved. Their project was indeed very successful, but both students admitted that they would have learned more if they had each done some of the programming and some of the art.

Another team chose the opposite approach: they split up the sections so that each student was responsible for both the programming and the art for her sections of the project. Good communication was necessary to keep the

project consistent, but much of the work was done independently. The resulting project was excellent, but in this case, the benefits of the collaboration experience were concentrated in the design period. Nonetheless, this could be the method of choice for a team that does not really see eye to eye.

A third working model was best represented by the team whose credits listed one partner as the Senior Designer and Junior Programmer, and the other partner as the Senior Programmer and Junior Designer . Most of the teams took this approach which we believe produced a greater educational benefit than the previous two. Clearly, this model is the one the instructors prefer and encourage.

The first time we taught the course, we had left it up to the students to determine their own strategy. With hindsight the second time around, we focused more attention on the collaboration process. We strongly believe that the latter is an important educational aspect that should be stressed. In collaborative projects, the one issue that tends to arise is the equality of effort invested by the partners. We have recommended that students create a contract which can be reassessed at any time throughout the semester so that no one student feels like she is doing “all the work”. At the first sign of communication problems in a partnership, we suggest a meeting of the team with an instructor to mediate so as to nip a potential problem in the bud. This approach seems to work well.

Another issue that needs to be addressed in student collaboration projects is whether or not to permit students to choose their project partners. We had permitted such partnerships in the past in other computer science courses that were not as work intensive as this one. The first time we taught this course, two of the teams were self-selected pairs of good friends. Although they did have complementary skills, we found that it did not seem to be an advantage to have friends working together in a demanding project. In fact, these two teams produced projects that were below their perceived abilities, and not as successful as the others. Our theory is that when the project needs to "go into overdrive", friends will not push friends until it is too late. The second time around the instructors formed the teams according to their perceived abilities and did not allow the students to switch partners once made the assignments were made. Interestingly, students are willing to try it without complaining, when they see it as a course policy.

In an effort to facilitate peer learning and interaction early on, we structured several short assignments that required work in small groups at the beginning of the semester. At the first class session, the students were divided into groups of four, and given a selection of professional-level multimedia applications to assess. They had to interact among themselves before presenting their analysis to the whole class. Exercises of this nature help to facilitate the group process for students who have been well trained for [are more attuned to] independent work in a classroom environment in which they are in direct competition with their classmates.

Throughout the semester, work-in-progress critiques are scheduled, which function according to the model of studio art critiques. It is stressed that their participation in the role of feedback provider is just as critical as their participation in the role of presenter. The critique encourages further interaction amongst the students, involving them in the progress of the other projects. While the art students are well accustomed to this format, the computer science students need some adjustment to this process. This is probably due to the fact that, despite Knuth's teachings, CS students often think in terms of a correct or incorrect program, and rarely in terms of programming elegance.

The critique sessions also proved to be a good time to incorporate discussion about methods of user testing in real world multimedia production. This was especially useful last year since we did not have sufficient time at the end of the semester to adequately address user testing. This was not a problem the second year, as we increased the length of the class sessions to twice its regular length. The idea is that half the time is spent on lecturing, and the other half is devoted to tutorials, workshops and outside visitors.

3. Course contents

It should be stressed that the course was not solely focused on production. Although the students necessarily needed substantial instruction in techniques and skills, there was a major focus on the theory behind the design and the programming. This theory was presented, of course, from two very different (sometimes conflicting) viewpoints, reflecting the instructors' experience and background. Interestingly, the students viewed this as one of the more notable positive characteristics of the course.

We have divided the course into five major components, which are presented in an interleaved fashion.

- The first component provides an overview of Multimedia through case studies and introduces programming methodologies for Lingo, Macromedia Director's programming language, used throughout the course.
- The second component presents the theory behind the development of Hypermedia including principles of user interfaces and visualizations of quantitative

information, navigation techniques, story development and storyboarding. We also address the appropriateness of multimedia applications for the intended purpose: for instance, when should a book be a book?

• Design issues comprise the focus of the third component of the course, addressing issues of typography, design fundamentals, and color theory.

• The fourth component is concerned with media technology, and offers the hands-on skills and background material for working with images, sound, video and animation.

• The fifth and final component of the course considers a philosophical perspective on multimedia, touching upon the impact of technology on publishing, art, education, communication, copyright issues, ethics and society in general. If there is time and student interest, the course discusses the World Wide Web and related issues.

Taking advantage of the growing activity in multimedia in the Boston area, the classwork and presentations were supplemented by field trips to multimedia research labs and local companies. Students met with multimedia professionals (digital artists, computer animators, copyright lawyers, multimedia developers) and saw the development process in action.

We mention here some of the changes in the structure of the course the second time we taught it. We doubled the contact hours of the course and organized it in a laboratory/studio format. The first 70 minutes of a two-and-a-half hour period is designated for lecture, while the remaining time is dedicated to hands-on tutorials, workshops interaction and visiting speakers. We use a high-tech room containing a machine connected to a Barco projecting system and 16 top-of-the-line Macintosh computers, one per student in the course (the first year, students shared computers). We also make use of other computing facilities on campus. As we are about to embark on a third time offering the course, we intend to allow more flexibility in the 'workshop' nature of the various skills, in order to accommodate varying degrees of prior experience amongst the students of such varied backgrounds.

4. The projects

The topics chosen by the class were very varied in subject and in audience. We mention here just a few selected projects implemented the first two times we offered the course. A complete set, along with a substantial body of online material developed and used in the course, can be found in the course's web page:

http://www.wellesley.edu/CS/courses/CS215/

4.1. "Language Diversity at Wellesley"

The student population at Wellesley College comes from many countries around the world. This team interviewed students whose native language was other than English, videotaped them saying the phrase "I Love You" in their native language, and provided a means for the user to learn to say the phrase.

Fig. 1. Sample screen shot from "Language Diversity at Wellesley" by Katy Ong and Janet Lee.

The user could record his/her own voice and play it back for comparison with the native speaker. The students also presented writing samples in each of the languages, using a pen-pal metaphor. World maps indicated where the language is spoken, and seamless montages of background images provided a flavor for the various cultures represented. This was a beautifully designed interface with engaging original artwork. (See Fig. 1.)

4.2. "The fractal factory"

This project presents the novice with an introduction to fractals. The interface uses the metaphor of a factory. The user signs in on a time card and then has the option of proceeding to the archives (where fractals are explained, accompanied by animated examples of fractals), the Observation Deck (where one can observe fractals as seen in nature), or to the fractal machine. It is the latter feature that flaunts the programming talents of these students. The user enters values for the various parameters requested, and then watches as the Fractal Machine creates the "custom made" fractal on the screen in real time. While every project required problem solving skills in order to break down the problem into manageable, communicating pieces, and implement them

in independent modules, this project required more serious programming in order to calculate and display the custom fractals on demand. (See Fig. 2.)

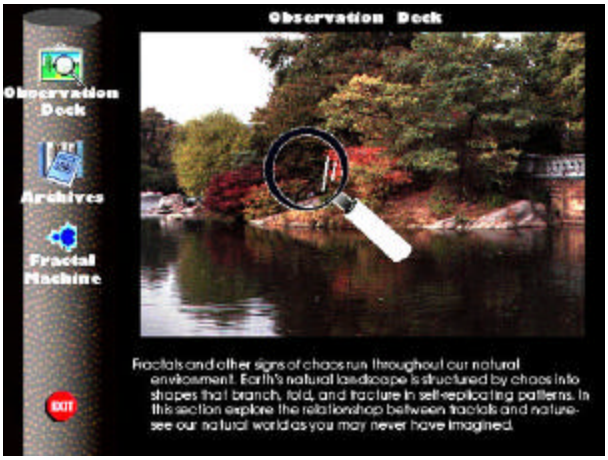

Fig. 2. Sample screen shot from "The Fractal Factory" by Alta Lee and Lila Kanner.

4.3. "Brainstorm"

This project is an interactive thought journal. It was designed to encourage college students to develop their writing skills through a series of interactive experiences that would pose thought provoking questions. The Journal can be accessed at any time, and edited. (Fig. 3.)

Fig. 3. Sample screen shot from "Brainstorm" by Achieng' Reggy and Catherine Wu.

4.4. "Into the woods"

"Into the Woods" is a game that is loosely based on the musical of the same name. The player interacts with fairy tale characters in their trip through the woods on a quest to collect items to bring to a wicked witch. Both students contributed to the art and the programming, producing a project that is aesthetic, humorous and enjoyable to use, and a programming accomplishment. (See Fig. 4.)

Fig. 4. Sample screen shot from "Into the Woods" by Caroline Tsai and Kristine Olson.

4.5. "Not quite everything you wanted to know about Jazz"

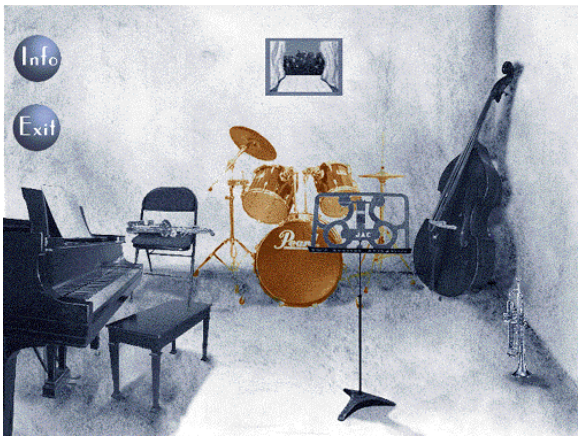

Fig. 5. Sample screen shot from "Not wuite everything you wanted to know about Jazz" by Tracie Lee and Yelena Nakhimovsky.

This was amongst the more substantial projects. Both instructors learned a great deal about jazz by the time the project was completed. The navigation was carefully and aesthetically designed. Voiceovers help to personalize the experience. The graphics create an atmosphere

consistent with their metaphor of a jazz club and rehearsal room. The climax is the opportunity for the user to be “on stage” and “improvise” with the band. (See Fig. 5.)

Overall, the students initially aimed very high in their project proposals, and had to scale back in order to realistically accommodate the time constraints of the semester. Nonetheless their excitement and motivation to realize their ideas was very high. Some groups set out to prove that they could indeed accomplish their original proposal in spite of our warnings, and in fact, they did.

The first year we taught the course, students worked in a small lab that was housed in the Art department. While it was not the ideal setting, it was, however, a place in which they were the primary, nearly exclusive users. Working in close proximity, the students were witness to the development of their classmates' projects, and often directly involved in the other projects during the brainstorming, troubleshooting, and critiquing sessions that happened spontaneously at all hours of the night. Excitement about the projects escalated as the deadline for completion neared. By the end of the semester, the collaborative effort had extended beyond the individual teams. Thus, the CD burning party was a celebration of a collective accomplishment. Before burning the CD-ROM, the projects were linked through a single interface giving them a unifying theme.

The second time we taught the course, we could negotiate a room that was more fit for lecturing. It was, however, shared with other classes and so it was not serving us well as a lab and development area. Next time we will try to get the best of both worlds. The success and visibility of this course will probably help us in this.

5. Course development

The idea for an interdepartmental multimedia course was conceived at a reception for faculty publications, when the instructors discovered, not quite by accident, that their teaching interests, projects in multimedia, and in fact, list of students, significantly overlapped. Both of us were faculty advisors for an increasing number of students proposing independent majors in “Media Arts and Sciences” or “Multimedia Studies”. These students were enrolling in relevant courses from the Art, Computer Science, Sociology, Music and Philosophy departments or taking courses at MIT’s Media Lab (Wellesley College has an exchange program with MIT), to piece together an independent program of study. Others were double majoring in Art and Computer Science, fulfilling the hefty requirements of both departments. Both of us had come to recognize that there was a great gap in the curriculum.

The Art Department had only one related course: a relatively new offering in Electronic Imaging, in which the computer is used as a fine art tool. Some sections of 2-dimensional design and photography classes used the computer for portions of the coursework. Students from these courses, excited by the technology, wanted more. Several students did animation projects as an extension of their work in Electronic Imaging, but teaching animation was beyond the scope of that course. The only options for further study of digital media within the Art Department were independent study projects or thesis projects. Furthermore, it was clear that these students would benefit from input from the computer science department.

Meanwhile, the Computer Science was offering two courses aimed at different groups of students: An introductory (“CS0”) computer science course culminating in HyperCard projects (this course has now switched to JavaScript) while focusing on human-computer interaction, interactivity and functionality; and a traditional Computer Graphics course with a significant 3-D design component. The CS instructor felt that students could very much benefit from some guidance in the design of their projects, but it was beyond the scope of his course and the ability of the instructor.

We agreed that students in both departments needed a course in multimedia as a logical next step in their studies. We recognized that a multimedia course offered by the Computer Science department would be very different from a course of the same name offered by the Art Department. While there are merits to teaching within a single discipline, we were interested in exploring the possibilities of teaching with a multidisciplinary approach, aiming for a richer classroom experience for the students. Thus we joined forces and applied to Wellesley College's Educational Research and Development funding committee for support of an experimental multi-disciplinary course in multimedia.

Ideally, our course would be but one of a cluster of related courses. The students who would take the multimedia course would already have taken courses in electronic imaging and programming. There would also be courses in animation and desktop video. Unfortunately, adding courses in a tight curriculum is an interdependent process, particularly complicated when departments are required, as in our case, to keep their number of course units constant. Despite these difficulties, with the help of many excited students and with the support of the administration and the two

departments involved, we managed to introduce the new course into our curriculum.

The interest among the student body is overwhelming. The number of students applying for this course grew from 60 applicants the first year to 100 the following year, from which we could accept only 16. This, of course, created scores of disappointed students that felt that their right to take the course of their choice was limited. We have since instituted more rigorous prerequisite courses from both disciplines. We expected the number of applications to drop, and indeed it did, but we were still swamped by three times more applications than we could accept. There is a need to offer a version of the course that will be better suited for an auditorium and will mainly focus on theory, separating it from a project-focused follow-up. However, this is a difficult course-logistical decision.

The students who have taken the course these last two years have continued to pursue their interest in multimedia both on and off campus. Most of the graduating seniors refocused their plans, and now pursue jobs and internships in multimedia while others are doing theses and independent study projects related to multimedia. Others are working on projects helping faculty to develop educational applications for their classes. Finally, we already have a few alumnae who pursue graduate studies, mainly in Human-Computer Interaction.

10. Conclusions

Liberal arts colleges are faced with the problem of balancing an increasing demand for new courses in rapidly evolving fields, such as multimedia, with limited resources with which to develop a new program of study. By joining forces we were able to bring a multimedia course into existence via an experimental route. But the interdisciplinary approach of ARTS215/CS215 provides more than a quick fix to a logistical problem. The unique climate of an interdisciplinary course fosters the cross fertilization of ideas, appropriate at liberal arts colleges with and without full-fledged multimedia programs. The success of this course has generated much discussion (and the creation of sub-committees) addressing the prospect of an official Media Arts and Sciences major. We are currently at the design stage of such a major. We expect, that by the time of this Conference, is this paper gets accepted for presentation, we will have details to report.

The results of our experimental course far exceeded our expectations for the excellence of the projects, the motivation of the students, and the impact on the students in their subsequent studies and career paths. In the process, the students learned a great deal not only about multimedia, art and computer science, but also an important lesson about the nature and benefits of collaboration, a subject often overlooked in today's increasingly competitive society.

The collaboration of faculty proved to be a beneficial learning experience in and of itself. It is clear that artists and programmers have very different methodologies. We have both learned a great deal from working together . A welcome by-product of the endeavor was the exchange of art and computer science ideas, which has subsequently inspired our collaboration on other multimedia projects unrelated to the course. Finally, the administration has reward our efforts with an award for teaching innovation that both instructors received.