

Abstract

At Wellesley College, very rarely do the Fine Art and Computer Science faculty cross paths. At least that was the case until last year when we taught an experimental course that brought together the work we were doing in our respective corners of multimedia into one class. The course was taught for a second time in the spring of 1998 semester and has been incorporated into the curriculum. This paper describes our experience organizing and teaching such a course.

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 students from other majors who had some experience in Computer Science or Art. Students worked in pairs on a semester-long project 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.

The project was taken from conception to publication on CD-ROM, including research, storyboarding, navigation, interactivity, user interface design, screen design, typography, illustration, 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, important skills that often get overlooked in a competitive 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.

Working Models

The teams took several approaches to the division of labor. One team opted for maximum efficiency toward 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 other 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 are focusing more attention on the collaboration process. The one issue that tends to arise is the equality of effort invested by the partners. We have recommended that students create a contract that 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 with the instructors to mediate.

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 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

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around, the instructors formed the teams according to their perceived abilities and did not allow the students to switch partners once we made the assignments.

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 students' participation in the role of feedback provider is just as critical as their participation in the role of presenter. The critique encourages further interaction among 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, Computer Science 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 of 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

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semester to adequately address user testing. This should not be a problem this year, as we have increased the length of the class sessions.

Course Contents

It should be stressed that the course was not solely focused on production. Although the students necessarily required 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 final component of the course considers a philosophical perspective on multimedia, touching upon the impact of technology on publishing, art, education, communication, 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, multimedia developers) and saw the development process in action.

We have made a few changes in the structure of the course this semester as we teach it for the second time. We have 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, and interaction. We now utilize a high-tech room containing 16 top-of-the-line Macs, one per student in the course (last year, students shared computers). We also make use of other computing facilities on campus.

The Art and Science of Multimedia: An Interdisciplinary Approach to Teaching Multimedia at a Liberal Arts College

The Projects

The topics chosen by the class were very diverse in subject and in audience. We mention here selected projects implemented the first time we offered the course. A complete set can be found in the course's Web site:

www.wellesley.edu/CS/courses/CS215/frame.html

- **"Language Diversity at Wellesley College"**

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 languages, and provided a means for the user to learn to say the phrase. Users could record their own voices and play them back for comparison with the native speakers. The students also presented writing samples in each of the languages, using a penpal metaphor. World maps indicated where the language is spoken, and seamless montages of background images provided a flavor of the various cultures represented. This was a beautifully designed interface with engaging original artwork. (See Figures 1-4)

- **"Souls' Midnight"**

In this children's adventure game, the premise is that twin sisters enter a haunted house. One disappears; the other (the game player) must explore the house looking for clues to help save the sister from the evil that befell her. This is another project in which the original digital paintings of each room in the house are striking. These students composed original music for their project. (See Figures 5-6)

- **"Deluxe Hotel"**

This project is about cocktail-lounge music and culture. The interface is a hotel elevator from which the user can visit four lounges. In each lounge, music of the 40s is performed, accompanied by an animation sequence. Every time the user returns to the elevator, a random selection of [elevator] music of the period is played. Graphics are beautifully done. Recipes for popular cocktails are provided, as well as information about the music.

- **"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 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 Figure 7-8)

- **"Tunnel Vision"**

A nightmarish experience in which the user explores the underground tunnel system below the college campus. Interactive animation sequences and effective use of sound effects await tunnelers as they try to find a way out. It is rigged so that no one can find a way out!

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 students worked in a small lab in the Art Department. While it was not the ideal setting, it was, 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 became 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. (see Figure 9)

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 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 course in Electronic Imaging, in which the computer is used as a fine art tool. Some sections of two-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, Computer Science was offering two courses aimed at different groups of students: an introductory computer science course culminating in Hypercard projects while focusing on human-computer interaction, interactivity, and functionality, and a traditional Computer Graphics course with a significant 3D design component. The Computer Science 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 multi-disciplinary 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 last year to 100 this year, from which we could accept only 16. Moreover, the students who took the course last year 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. Those who are seniors this year are doing theses and independent study projects related to multimedia. Others are working on projects helping faculty to develop educational applications for their classes.

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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 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.

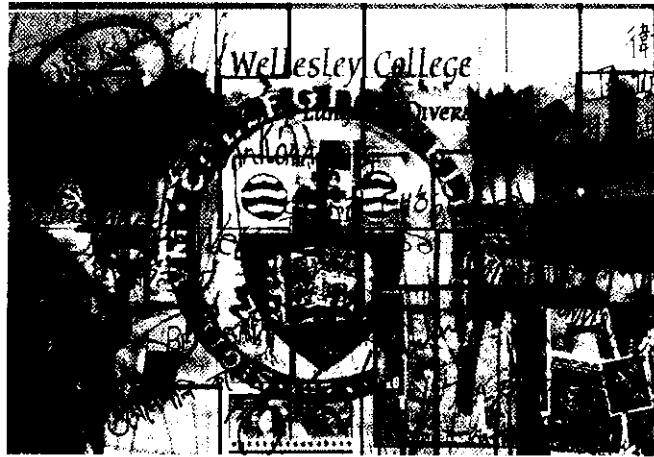


Figure 1 "Language Diversity at Wellesley College," opening screen



Figure 2 "Language Diversity at Wellesley College," index of languages. For each of these languages, a writing sample is provided, as well as a world map indicating where the language is spoken.

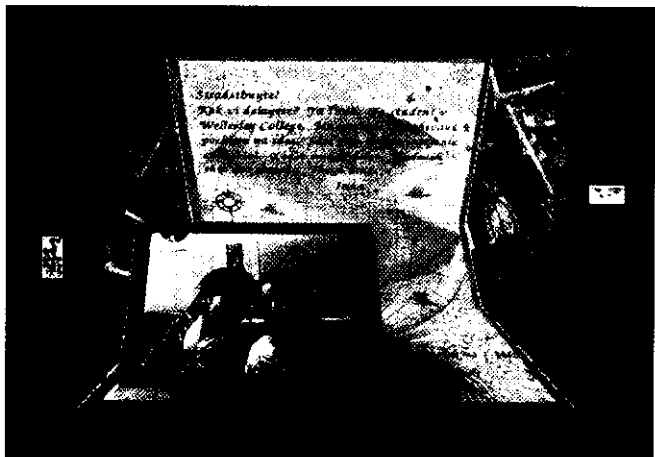


Figure 3 "Language Diversity at Wellesley College," a transiterated Russian letter.

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"Souls' Midnight"

Lila Kanner and Alta Lee

"The Fractal Factory"

Olivia Cortina and Susan Wasseluk

"Tunnel Vision"

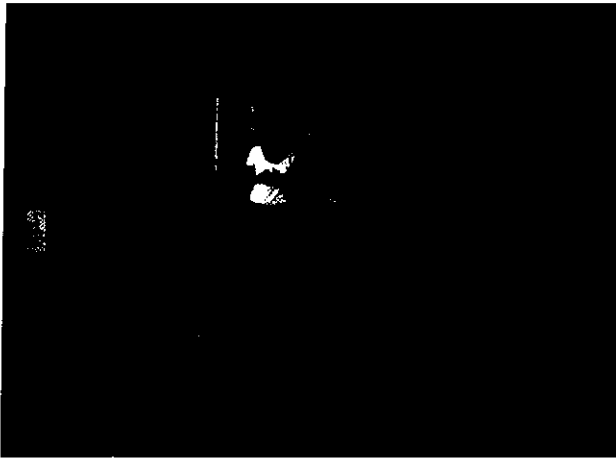


Figure 4 "Language Diversity at Wellesley College," with the metaphor of a theater, the user is taught to say "I love you" in Yoruba, with assistance from a native speaker.



Figure 5 "Souls' Midnight," entrance hall of the haunted house, with ghosts.

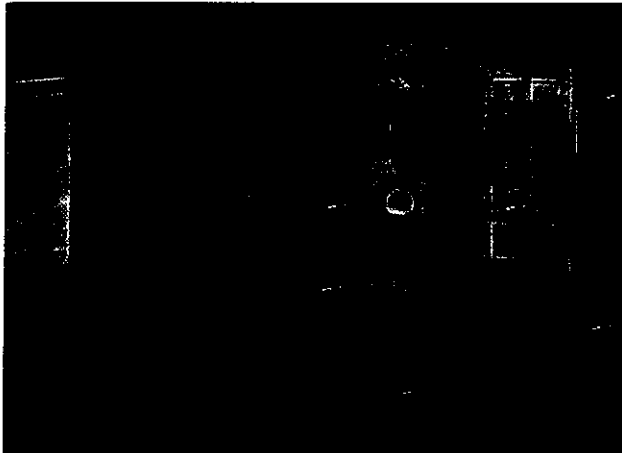


Figure 6 "Souls' Midnight," the Library. The brick is a movable sprite that was found in the haunted house. The mystery is solved when it is restored to its place in the library.



Figure 7 "The Fractal Factory," The Fractal Machine shown here is creating a custom-made fractal.



Figure 8 "The Fractal Factory," the completed fractal.



Figure 9 "The Art and Science of Multimedia," the interface of the CD-ROM from which all the projects can be accessed.