

## University of Massachusetts - Enhancing Learning Through the Use of Technology

### **Project title: Art and Engineering Synergy in Computer Game Development**

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**Project Abstract:** This work will focus on bridging the visual arts curriculum with computer science for purposes of game development teaching. Our goal is to develop a pilot course across the two disciplines, research and establish suitable pedagogical tools through use of necessary technology and along with the publishing of the results, initiate and establish a sound and successful multidisciplinary minor on Game Development bridging College of Visual and Performing Arts and College of Engineering at UMD.

**Goals:** The goal of this project is to develop a pilot multidisciplinary course on game development for students with arts and computer science backgrounds. After the pilot course, it is our intention to continue to offer the course and use it as a base for multidisciplinary minor on Game Development. The goal is, with every offering of the course, to produce games geared towards specific needs, e.g. educational, activity-stimulating games for the elderly, rehabilitation games, etc.

### **Summary of accomplished goals:**

1. Pilot hybrid class on Game Design offered in Spring 2009 semester with 15 engineering students and 8 digital media students. 8 games were developed and demonstrated as part of the class requirements and Final exam.
2. Students worked well together although from different majors and colleges and devoted significant time, effort, interest to the class. The results were excellent, especially given the time crunch, learning curves, and amount of work required to produce the final games.
3. Materials (lectures, assignments, tests) are developed and software is tested. Library of game elements is developed and ready to be used in future classes.
4. Hardware is configured and tested.
5. Minor is in process of development to be submitted in Fall 2009 semester for approval.

### **Changes based on prior game design course offering:**

1. Software used for the design and development of games - the Spring 2009 course utilized Torque X 2D and Maya.
2. Number of games designed and developed as assignments in the course.
3. Number of other assignments - homework or tests - requiring writing of reports, design documents or opinions and critiques of existing games.
4. Nature of lecture and tutorial material - focus on fundamentals, game design concepts, how-to tutorials and practical sessions.
5. Guest lectures schedule and speakers recruitment.

**What worked:**

The pilot class offered in Spring 2009 ran with 23 students, of which 15 were either Computer Science or Computer Engineering majors (College of Engineering - COE) and 8 students majoring in Digital Media Design (College of Visual and Performing Arts - CVPA). The students were asked to form 4 teams with 3 or 4 programmers (COE) and 2 designers (CVPA). The idea was to have each team operate as mini gaming company. The teams worked very well - students were communicating, working on their respective assignments, which the “company” distributed, and pitched their products on several different occasions. Two of the teams even opted for a game trailer as part of their product advertising strategy.

The teams were asked to develop a simple 2-dimensional arcade game mainly to become familiar with the software to be used throughout the class. The games were then presented in front of the class and, later, critiqued as part of the midterm exam.

The big undertaking - a 2.5- or 3-dimensional game - was assigned and consisted of several graded components and checkpoints. Based on the previous course (Spring 2008), it was evident that the approach to track the progress needs to be changed, we introduced the checkpoints and graded components, which reflected the milestones in the game design and development process. At this point, it should be stressed that both games the students were asked to develop, were NOT modifications on existing games, but rather new games with original stories, characters, and goals. This is very important in order for assessors to understand the effort, learning and sheer amount of work to be completed. The programmers, while using Torque’s functionalities (physics of collisions, embedding of models, etc.), had to code all aspects of the game. The designers, while using Maya, had to create and rig for animation all characters, objects and terrain for the games.

In addition to these two games, the students, individually, were asked to write two opinion pieces of required length, two critique pieces, and were also tested on their knowledge of game design fundamentals. This was accomplished via homework assignments and mid-term exam component.

Finally, the teams had to develop and present the final product of their small game, present a sale pitch for their game design concept of the big game and sell the finished product in a presentation with demonstration. These were required in the form of homework assignments.

The students were asked twice during the semester for their input on how the course is run. Both times, there were very helpful suggestions, which will be outlined in the next section of this report.

As part of the assessment process, the students were supervised and graded by two teaching assistants and the primary instructor (Dr. Valova). The presentations and demonstrations were also graded by the class using assessment instruments developed as part of the course preparation. As part of the instructor evaluation process at the end of the semester, the students were encouraged to write extensive comments in addition to the numerical scores related to the performance of the instructor. The comments reflected that the students have learned a lot, have gained experience working in teams and on strict schedule, have received quick and constructive feedback on their critique and opinion reports. The majority of the class agreed on what a positive learning experience the course has been in spite of the workload, long hours and steep learning curves.

**Suggestions and lessons learned:**

Majority of comments from students and feedback from the co-PI reflected the need for more laboratory or studio time. Essentially, the teams needed more dedicated time to work on specific tasks related to merging their work products and putting game elements together. This will be reflected in future offerings of the course, whether as part of a minor or major-specific elective senior class.

GarageGames product - Torque X - did not live up to its advertised specifications. As a result, this product will not be used as the engine of choice in future offerings of the course. There were multiple issues related to "updates". Some features that were available at the time of course preparation, were disabled at the time of actual student usage. This prevented the transition from 2- to 3-dimensional design and created issues with the Maya object embedding.

Number of required games - while the 2-dimensional arcade game served as a warm-up exercise, it took away from the second, large project in terms of time and lecture topic sequence. The general opinion seems to converge on having one game required, but insisting on the focus of genre and specific goal of the game, e.g. educational games, activity-stimulating games, etc. It will also allow for conversion of games to Xbox and their dissemination through on-line gaming communities.

**Future work:**

While this work will be completed by the Fall 2009 semester, it is still in the process of analysis and development. Although the class could be offered as a hybrid course for CVPA and COE majors with great benefits for students, the long-term goal of this grant was to develop an interdisciplinary minor in Game Development. After this pilot course, it is very clear what courses need to be required and recommended for the engineering and art students. As a longer term project, students majoring in English could become involved in the teams as part of the story developers in game companies. Nevertheless, offering a minor, especially interdisciplinary one, requires commitments from both colleges in terms of class frequency, instructor resources, lab time and teaching assistants. Although we do have a good idea, the completed proposal for the minor will be submitted in the Fall semester for processing and establishment.

Many lessons were learned from the first hybrid course, which will be reflected in the minor proposal. One major issue is having a theme, or focus of the produced games, which is something we did not accomplish in this course. The main reason - software discrepancies and limitations. However, having game theme will be reflected in the minor proposal and project rescheduling will accomplish this goal.

**Conclusion:**

The class was a success: the student teams clicked and worked together very well; 4 teams produced and demonstrated 8 games; students learned and experienced the fundamentals of game design process and production; students overcame many obstacles in their efforts to meet deadlines and present good products. Based on student feedback, while very challenging, the class gave them a glimpse of the real world of game development.