Zachary O. Dugas Toups - Teaching Statement

Through my experiences as a lecturer at Texas A&M University, I have fused my teaching with research. I have taken on increasingly advanced teaching roles, culminating in Senior Capstone Design (CSCE 482, Spring 2012), a course that I assisted in developing as a graduate student. When I taught Introduction to Program Design and Concepts (CSCE 121, Spring 2011), I incorporated game design as a final, team project, building on my experiences developing the Team Coordination Game, my dissertation research. Meanwhile, my prior and ongoing work with the Senior Capstone Design (Fall 2011, Spring 2012) course incorporates disaster-response projects with real-world constituencies drawn from the local emergency response community that incorporate cutting-edge technologies, such as augmented reality and trans-surface interaction. In my future roles as a faculty member and specifically with the Capstone class, I will engage students through game design in the classroom and team-oriented projects that align students with current research problems.

TEACHING PHILOSOPHY

Value of Game Design. I hypothesize that leveraging game design as a significant component of appropriate computer science classes will enhance retention and gender balance, which are ongoing problems in science, technology, engineering, and mathematics (STEM) fields (less than 45% completion rate among STEM aspirants in 2004 [2] and average 69% male [4][1]). Game mechanics, the moments in play where the player makes a decision and the system reacts through its designed rules [5], are the *lingua franca* of the new generation of students. The systematic and information-centric nature of games addresses computer science and engineering directly, while the narrative and social nature of games invokes the arts. Game design opens opportunities to address difficult science and engineering problems in the context of human-centered computing, social computing, narrative, and visual art and design. While games serve as valuable teaching tools themselves [3], game design is a difficult and rewarding educational enterprise. Success requires creativity, interface design, and complex system engineering. These qualities bridge STEM disciplines with fields that have traditionally attracted female students, such as language, communication, social studies, and art (average 60% female [4][2]); the fact that women represent a significant (greater than 42%) and growing part of the game-playing populous [1] supports my hypothesis.

Game mechanics are a medium through which players communicate with each other. Through game design and other long-term research projects, my students learn to construct and evaluate human-centered interfaces and develop complex systems. Such educational processes immerse students in real-world problem solving tasks that lack "correct" solutions. Further, as with all large projects, team skills are essential; I draw on my experiences in developing for team coordination [7, 8] to help students develop effective skills. Deliverables throughout the semester ensure students learn to communicate through written and spoken word, as well as multimedia: system demos and video. By performing original engineering and scientific work, strongly connected to the arts, students not only gain a range of valuable skills, but also craft a portfolio of work that will serve them as a foundation for academic or industry roles.

Team-Oriented Research Projects. Projects comprised of both group and individual components form an essential component of my classes. I take inspiration from successful professors at Texas A&M University, including Andruid Kerne, Frank A. Shipman III, Tracy Hammond, and Scott Schaefer. In my courses, students are expected to specify and execute a project with a team. Individuals develop their own ideas, prior to joining a group, so as to avoid fixation on other team members' ideas [6]. This enables each student the widest range of creativity, and empowers him/her to meaningfully contribute to the team. I have employed this design successfully in Introduction to Program Design and Concepts and am implementing it in Senior Capstone Design this semester (Spring 2012).

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[1] Derived from the categories of Biological and biomedical sciences; Communications technologies; Computer and information sciences; Engineering; Engineering technologies; Mathematics and statistics; and Physical sciences and science technologies.
[2] Derived from the categories of Communications, journalism, and related programs; English language and literature/letters; Foreign languages, literatures, and linguistics; Liberal arts and sciences, general studies, and humanities; Social sciences; History; Visual and performing arts.

The research process involves a number of stages that are applicable and valuable to all walks of life. During class projects, students examine prior work, identify gaps in knowledge, optimize resources, and develop new knowledge that they disseminate to others. Iterative cycles of building understanding, creating new systems and experiments, and evaluating progress are essential. This specification provides students with essential engineering skills while including research components in which they evaluate their work with users, resulting in human-centered designs. This is especially important in computer science, where many students who go on to become programmers will find themselves developing user interfaces, regardless of whether or not they are prepared to do so.

Depending on their level, students are given an appropriate level of independence. In low-level courses, students are assigned projects, at higher levels, they choose from a menu of options, in the highest-level courses, such as introductory graduate courses and beyond, the students will be expected to develop original work. This draws on the template from Kerne's Senior Capstone Design (CSCE 482, Spring / Fall 2010, Fall 2011), in which students bid on project categories through a proposal-writing component. For example, in my Introduction to Program Design and Concepts (CSCE 121, Spring 2011), students were assigned a tight project specification. When I was originally involved in Capstone, I specified a project in which students use a set of iPhones to produce a mobile game; multiple teams bid on the project, and the best proposal won.

Communication. In all areas of academic and professional life, communication is key. Students in my classes learn to communicate their ideas, designs, and results through multimedia. Students need to communicate effectively within their own teams; they need to manage one another's schedules and set up meeting times. Concepts from experience in educating teams, such as implicit coordination and careful use of communication channels, will prove valuable in this regard [7, 8]. Students will work with written word, developing project proposals that will be judged by their peers and instructors. They will write reports on their work, which may be submitted for publication. Course presentations will support students in developing public speaking and multimedia authoring skills. As projects are engineered, they will be demoed to classmates. Because video is now the best means to rapidly disseminate information to others, many classes will include a video-development component. In the fall 2011 semester, I developed a video component for Hammond's senior Computer-Human Interaction course (CSCE 436).

COURSES

I am well equipped to teach a number of existing courses, such as game design, human-computer interaction, computer supported cooperative work, and software development. I have had a great deal of involvement with course design. I am excited by the opportunity to develop my own, new courses, such as depth courses on user interfaces in games, interfaces for making sense of large collections of information, and mixed reality systems.

CONCLUSION

My teaching philosophy is informed by my experiences as a teacher, researcher, and learner. I hypothesize that game design in the classroom is an effective way to improve retention and gender balance in STEM disciplines, as it connects science and engineering with design, narrative, and art. I value connecting students to ongoing research problems, not just new technologies; my own dissertation research began as a project in one of Kerne's introductory classes. Through team-based projects that enable my students to take initiative, I immerse them in the research process and support them in developing novel systems. Students in my courses learn to communicate through a variety of media, making them individuals capable of sharing and promoting their work.

REFERENCES

1. ENTERTAINMENT SOFTWARE ASSOCIATION. Essential facts about the computer and video game industry. 2011.
2. HIGHER EDUCATION RESEARCH INSTITUTE AT UCLA. Degrees of success: Bachelor's degree completion rates among initial STEM majors. *HERI Research Brief*. Available online: http://www.heri.ucla.edu/nih/HERI_ResearchBrief_OL_2010_STEM.pdf. January 2010.
3. HONEY, M. A., HILTON, M. Eds. *Learning Science: Computer Games, Simulation, and Education*. National Academies Press, Washington, D.C., USA, 2010.
4. NATIONAL CENTER FOR EDUCATION STATISTICS. *Table 287: Bachelor's degrees conferred by degree-granting institutions, by sex, race/ethnicity, and field of study: 2007–08*. Available online: http://nces.ed.gov/programs/digest/d09/tables/dt09_286.asp. June 2009.
5. SALEN, K., AND ZIMMERMAN, E. *Rules of Play: Game Design Fundamentals*. MIT Press, Cambridge, MA, USA, 2004.
6. SMITH, S. M. Getting into and out of mental ruts: A theory of fixation, incubation, and insight. In *The Nature of Insight*, R. J. Sternberg and J. Davidson, Eds. MIT Press, Cambridge, MA, USA, 1994, 229–252.
7. TOUPS, Z. O. *Non-mimetic Simulation Games: Teaching Team Coordination from a Grounding in Practice*. PhD thesis, Texas A&M University, College Station, TX, USA, August 2010.
8. TOUPS, Z. O., KERNE, A., HAMILTON, W. A. The Team Coordination Game: A zero-fidelity simulation abstracted from fire emergency response practice. *ACM Transactions on Computer-Human Interaction 18*, 4, Article 23 (Dec. 2011). 23:1–23:37.