

# Collaborative Learning via 3-D Game Development educators\_0105

Chris Ault  
Interactive  
Multimedia  
ault@tcnj.edu

Teresa Marrin Nakra  
Music  
nakra@tcnj.edu

Kim Pearson  
Journalism,  
Interactive  
Multimedia  
pearson@tcnj.edu

Phillip Sanders  
Art,  
Interactive  
Multimedia  
sanders@tcnj.edu

Ursula Wolz  
Computer Science  
Interactive  
Multimedia  
wolz@tcnj.edu

Program in Interactive Multimedia  
The College of New Jersey  
Ewing, NJ 08628-0718  
609 771 2173

Primary contact: [wolz@tcnj.edu](mailto:wolz@tcnj.edu), 609 771 2766

## Abstract

The tremendous growth of the 3-D, first person video game genre provided a vehicle through which to create a one-year, upper level undergraduate experience in multidisciplinary, highly collaborative software design and implementation. We report on a team-taught course that encompassed concepts from the contributing disciplines of computer science, digital media, film, theater and music. The learning environment balanced individual experiential skills development with reflective analysis of media implementation as our students built a media-rich interactive game. This panel provides four perspectives on the design and execution of the course and resulting game from our contributing areas: computer science (Wolz), digital art (Sanders), music/sound technology (Nakra), and writing (Pearson). As moderator, Ault, whose own work is at the intersection of our fields, provides a unifying perspective.

## 1 Purpose and Premise

A problem in teaching game design and architecture at the undergraduate level is that to do it well requires cross-discipline expertise on the part of both the instructor and the student. Gaming is a strong motivator for students in a range of disciplines including computer science, digital art, communications and media studies, music and writing. But at a stage of their education focused on breadth rather than depth, it is virtually impossible to provide students with an experience in a single course that does justice to the complexity of game development. At The College of New Jersey, (TCNJ) programs from three schools (Art, Media and Music; Culture and Society; Science) in disciplines ranging from Communication Studies, Computer Science, Digital Art, Interactive Multimedia to Music include courses that touch upon video game development, but fall short of balancing art, computing, music and storytelling to develop cross-disciplinary appreciation for the collaborative effort.

From the computer science perspective, for example, students develop expertise in software engineering and artificial intelligence and can produce games with sophisticated underlying architecture. However the visual and auditory components, not to mention the story line, are often severely lacking in such projects. Complementary frustrations were heard from the faculty members collaborating on this project. Given the strong emphasis on broad liberal education at TCNJ, it is not realistic to expect students to develop advanced extra-disciplinary skills in all of the

contributing disciplines. Consequently, we created a learning environment in which cross-disciplinary students collaborated on developing a large artifact, namely a 3-D, virtual reality game. Through this process they learned to articulate the essential concepts outside their areas of expertise, developing an appreciation for the skill set required for those components of game development, while they themselves developed advanced skills within those same areas of expertise.

In this panel we will present four perspectives on this two-semester experience: 3-D animation, interactive storytelling, AI agent implementation, and sound and music composition. We will comment upon the tension that developed between the competing needs for good story, rich visuals, emotive sound, and sophisticated gaming, as we came to grips with the fact that we did not have the expertise, financial and human resources, or time to do it all. We will also report on how we created an environment in which all students participated in the decision-making required to implement a process management system with multiple asset development pipelines in order to produce our sample game.

Chris Ault will provide an overview of the process as a whole. Chris frequently raises the question of how to focus on the gaming and the interactivity. He continuously reminds us that it is the play that makes the game. Phil Sanders, who has as extensive experience with 3-D implementation has pushed the rest of us to consider the complexity of the 3-D pipeline and how little we really appreciate and understand it. The art is hard, not just technically, but esthetically. Ursula Wolz, the abstractionist in our group, takes the perspective that if it can be coded, we can figure out how to do it. She raises the question of how we can define processes that will help us automate the various production pipelines, either through computing systems, human protocol or cheap tricks so that the game logic as well as the visual rendering, and the incorporation of sound and music will be of the highest caliber possible. Teresa Nakra has brought the world of sound, spoken dialog and music to our production. The auditory component, which can often get short shrift in a game, will make or break the mood. It can carry and enhance the story line when limited resources prevent full implementation of our vision for AI logic or highly realistic visuals. Kim Pearson continues to maintain that the story is everything. Without a powerful story line and a clear understanding of the non-linearity of game story, the art, the music and the AI logic are merely pretty tricks. Where we all agree is that our biggest challenge is to literally render a good story as visual art, sound and music, and clean, consistent logic.

A key component of our success to date is that the faculty model the requisite respect and communication styles necessary for cross-discipline collaboration. Further, when opportunities arise, we articulate the cultural differences between disciplines, for example in what it means to give a short presentation (musicians clap at the end of a 'recital', computer scientists do not clap at the end of a 'demo'.) We emphasize a production environment that strongly supports communication across groups: individual techs working with visual artists and the composer on specific problems to develop the significant visual, logical and sound assets to bring to life to the story that was written collaboratively in the first semester.

Our pedagogy also supports disparate models of group collaboration and individual responsibility. For example we need a huge team of artists simply to render all the visuals, and so (as of this writing) we are recruiting from outside the course roster. Everyone in the course including the faculty will learn how to script game logic because we do not have enough programmers, nor do we have an outside pool of available expertise. Yet, we rely on a single music composer who works closely with a sound director and sound technician, each of whom in turn was a liaison to writers and game technicians. Our 'game shop' provides students from all contributing disciplines with the valuable experience of articulating their individual contribution to a large, complex, and very exciting whole. At SIGGRAPH, during this panel we hope to unveil a fully implemented two level 3-D game collaboratively designed and implemented through our course structure.

## 2 The Panelists

The panelists are all full time faculty at The College of New Jersey and currently teach in the Interactive Multimedia program. Individual summaries follow.

Chris Ault (Interactive Multimedia, School of Art, Media and Music) is an interactive media writer, composer and visual artist. He is a first year faculty at TCNJ contributing his complex skill set to the rapidly growing Interactive Multimedia program. His portfolio showcases work across the contributing disciplines including animation, writing, music composition and game design. He holds an Honors Major in Liberal Arts bachelor's degree from University of Texas, and a Master of Arts degree in Interactive Telecommunications from the Tisch School of the Arts, New York University.

Teresa Marrin Nakra (Music, School of Art, Media and Music) is a musician, inventor, conductor, and designer of new technologies for music performance. She is first year faculty of Music at TCNJ and the Artistic Director of Immersion Music. She holds both a Ph.D. and M.S. from the Massachusetts Institute of Technology's acclaimed Media Laboratory, where she worked with Tod Machover, Rosalind Picard, John Harbison, and Marvin Minsky. She also holds a bachelor's degree with high honors in Music from Harvard University. She has received numerous distinctions for her academic work, including Research Fellowships from IBM, Motorola, and Interval Research Corporation. She has written numerous scores for interactive environments and developed interactive music systems for museums, universities, and performing artists.

Kim Pearson (English, Journalism, School of Culture and Society; Interactive Multimedia School of Art Media and Music)

has had a distinguished career as a journalist, technical writer, essayist and poet. She is a founding member of the journalism program at TCNJ, initiated the professional writing minor, and is a co-founder of the program in Interactive Multimedia. She has more than 25 years' writing and editing experience for both consumer and controlled-circulation publications. Most recently, she edited *The Niagara Movement: Black Protest Reborn*, an interactive CD-ROM published by Association for the Study of African American Life and History (ASALH). She blogs about race, class gender, religion and sexuality at Professor Kim's Blog Spot) <http://professorkim.blogspot.com> Pearson holds an AB in Politics from Princeton University, and an MA in journalism from New York University, where she earned the Hillier Kriehbaum Science Writing Award.

Philip Sanders (Art and Interactive Multimedia, School of Art Media and Music) has an MFA from the NYU and a BFA from Guilford College. He is coordinator of the Media Program and Interactive Multimedia major, the president of the NJ AGUA (Alias Users Global Association) and the founder and first president of NY AGUA in 1992. Previously the technical director of NYU's Interactive Telecommunications Program, he has worked developing media projects with companies such as IBM's Multimedia Group, NYNEX Media Lab, the Duck Corporation, Apple, and Time Warner Cable, among others. His students at TCNJ developed the entire 3D graphics for an early online multi-player game Anarchy Entertainment. He has placed students in companies such as Sierra Online and Disney Interactive; as faculty at schools such as the School of Visual Arts and NYU; and in the entertainment industry, where one has won an Emmy for 3D graphics.

Ursula Wolz, (Computer Science, School of Science and Interactive Multimedia, School of Art, Media and Music) has an MS in computing in education and a PhD in computer science both from Columbia University. She has been teaching computing for 30 years, beginning as a Logo teacher in the MIT AI lab where she received a S.B. in Philosophy, Linguistics and Psychology. She twice chaired the computer science department at TCNJ. She has received funding from NSF, has published extensively on computer science education and was a member of the steering committee of the ACM/IEEE CC2001 Computing Curriculum effort. She is currently the "PI of Record" on the Microsoft Research funded project entitled "Advanced Interdisciplinary Game Design and Architecture Courses" that supports the curriculum work on the courses described here. She is also co-founder of the new program in Interactive Multimedia.

## ACKNOWLEDGEMENTS

The project described here was funded by a gift from Microsoft Research. Collaborating faculty at TCNJ include Anita Allyn, William Ball, Terry Byrne, Jikai Li, Miroslav Martinovic, and Robert McMahon. We also acknowledge the efforts, contributions and enthusiastic support of the students in both the Fall and Spring "Gaming" courses offered by the Interactive Multimedia program and the Department of Computer Science at TCNJ.