Using Computer Game Design to Boost Interest in High-Tech Careers

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It's Saturday morning, and some students in the Washington, D.C., area aren't sleeping in. Instead, this select group is at the city's McKinley Technology High School learning to create educational computer games.

Funded by the National Science Foundation, the Game Design through Mentoring and Collaboration (GDMC) program aims to increase student interest in science, technology, engineering, and mathematics (STEM) in traditionally underserved communities. GDMC provides an environment in which students learn the basics of professional-level 3-D modeling and animation software, as well as the logic of game design and programming.

Held on Saturday mornings throughout the school year at McKinley Tech, the sessions are offered on a drop-in basis. More than 200 middle and high school students from about 35 area schools have participated in the program since it started three years ago. Students who have been in the program a while have the opportunity to become paid mentors and work with the newer participants.

At the helm is Mason instructional technology professor Kevin Clark, who is the principal investigator on this project. He says mentoring is a large part of the program and helps students master the technology skills they've acquired.

"We spend a lot of time teaching the returning students how to be good mentors," says Clark, who also is director of the Center for Digital Media, Innovation, and Diversity. "We teach them strategies for troubleshooting if someone is having a problem or how to re-engage a student who doesn't seem to be working. Our big message is, 'Don't do it for them. Help them learn.'"

Engaging the students does not seem to be a problem for Clark and his team. "These students come in voluntarily to learn how to make video games. At the end of the day, some of them don't want to leave their computers," says Neda Khalili, a doctoral student in the College of Education and Human Development (CEHD) who has been with the program since 2007.

The student gamers range in age from 9 to 19. About 85 percent are African American, and the majority of them are male. These students and their design processes are the subject of Khalili's dissertation.

"I am specifically looking at students creating video games about science topics," she says. "How do students think and learn about science topics that are unfamiliar to them when the goal is to create a video game? What would this learning process look like?"

New game designers are first given a basketball game to work on that quickly shows them some of the things they need to consider when creating a game, such as angles and gravity. The introduction of science topics into the game design was added to the program last year. For the 2010 summer session, Clark and his coprincipal investigator Kim Sheridan, who holds a joint appointment in CEHD and the College of Visual and Performing Arts, were working with a specific group of kids for four weeks when they decided to take it up a notch.

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Mason doctoral student Neda Khalili takes field notes during one of the game design summer sessions.

MENTORING MAKES A DIFFERENCE

Mason doctoral student Neda Khalili has been working with students in the Game Design through Mentoring and Collaboration program since it began in 2007. The students and their learning processes are the basis of her dissertation research.

Through her observations, she has found that the introduction of the student mentor aspect to the program really made a difference in how the program and the learning evolved.

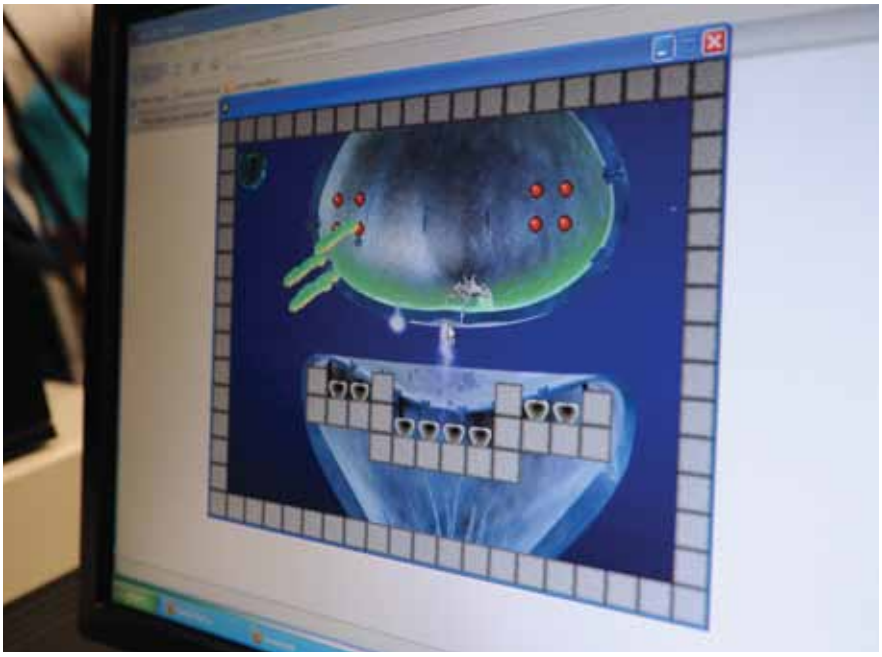
"[Using student mentors] really helped the instructor because students who were falling behind could get some one-on-one help without holding up the instructor's lessons," says Khalili. "Likewise, students who were more advanced could get specialized help to learn techniques that had not yet been taught.

"Often we would find students who were working at a higher level would continue their work at home and come in with their own questions to ask the mentors."

Students chosen to be mentors are those working at an advanced level who often have participated in the program for a number of years. Working with the group this summer were a few high school graduates who were already attending college or would begin college in the fall.

The game design program was also designed so students could continue working on their games at home. "We have tried to use software where you can download a learning edition at home for free," says Kim Sheridan, the coprincipal investigator on the project. When downloading isn't possible because of Internet connections or other technical issues, the participants can get the software on a CD or flash drive.

"With the mentors, we expect them to be working on a project of their own," Sheridan says. "They get bonuses if they upload their work."



A screen capture from one of the immunology games developed by GDMC participants.

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They brought in Melanie Stegman, a biologist from the Federation of American Scientists. The gamers broke into teams and were tasked with creating a playable computer game that demonstrated a scientific concept related to immunology. Stegman met with students to provide an overview of immunology and web-based resources. She also consulted with the teams on their specific projects. At the end of the camp, the teams presented their games and explained how they illustrated the scientific concept.

"It was wonderful to see how quickly students readily adapted their minds to focus on a science game," says Khalili. "They changed from picking 'good' guys and 'bad' guys to picking the right antibiotic to fight off the infection."

As the gamers discussed glial cells and neurotransmitters, red blood cells twirled across computer screens. The studio atmosphere of the work space is another component of the program and a part of what Sheridan brings to the project.

"A lot of my work on the project has been about transforming the classes from a traditional step-by-step technology class into one in which kids work on projects that are more open-ended," says Sheridan, who is also a visual artist.

The interdisciplinary nature of game design helps make this kind of collaboration happen. As an example, Sheridan recalls one Saturday when the designers were trying to model swords. "So they were talking about what their characters were like and what their stories were about," she says. The conversation soon moved to how pendulums work and how to make the swords swing in animation mode. "So we began talking about formulas and starting points, and how they have to program in the numbers. In order to make the game they want, they have to use math, science, and art—and put it all together."

In addition to the mentoring they receive while creating their games, the students are introduced to the professional aspects of the field through what Clark calls STEM summits. Over the years, the young gamers have met with professional game designers, entrepreneurs, and astronaut Bernard Harris to see how the skills they are acquiring can be applied in the workplace and to the college preparation they need to attain those careers.

"By integrating the STEM content, we are creating high-quality learning opportunities and demonstrating that what they learn now is relevant and applicable in their everyday lives," says Clark.

—Colleen Kearney Rich