# Books & Resources

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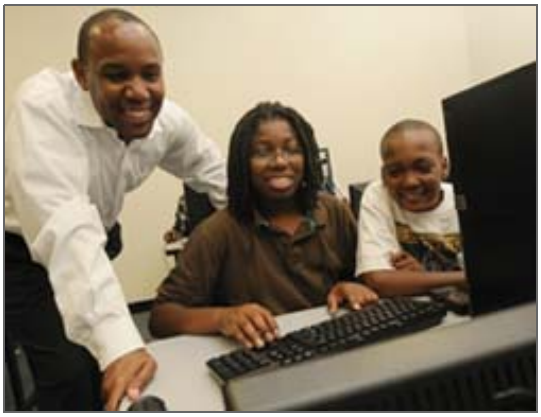
## Game Design as a Pathway to STEM Careers

**10/29/2010 - NSTA Reports—Debra Shapiro**

At first glance, you might think the students—most of whom come from underserved populations—spending Saturdays or summer days at McKinley Technology High School in Washington, D.C., are just playing video games on their computers. But actually they are acquiring ex-perience in game design, 3D modeling, and animation; some of the high school students stationed nearby are mentoring their peers and younger students. And everyone is gaining an understanding of science, technology, engineering, and math (STEM) concepts. A program called Game Design Through Mentoring and Collaboration, a partnership between McKinley Tech and George Mason University (GMU) in Fairfax, Virginia, is showing these students that STEM careers are not limited to white-coat-wearing lab scientists.



George Mason University's Kevin Clark (left), works with youths in the Game Design Through Mentoring and Collaboration program, which exposes students to STEM content as they design

A visit to McKinley Tech, which was already well equipped technologically through its Institute for Urban Game Design, inspired

video games. Photo by Evan Cantwell.

GMU's Kevin Clark, the program's principal investigator (PI), to partner with the school to obtain a National Science Foundation Innovative Technology Experiences for Students and Teachers (ITEST) grant, which funds the program. Clark, associate professor of instructional technology in GMU's College of Education and Human Development (CEHD) and director of the university's Center for Digital Media Innovation and Diver-sity, has a background in educational software design. Co-PI Kimberly Sheridan, an assistant professor in both the CEHD and the College of Visual and Performing Arts, brings her art education expertise to the project, providing students with "a studio environment for learning STEM," says Clark. This environment is characterized by group collaboration, multiple mentors, open-ended projects, and opportunities for students to critique others' work and receive feedback on their own.

## Beyond Play

While acknowledging the motivational value of gaming for students, Clark says, "We've been really deliberate about identifying STEM content and making it relevant" to students "so it doesn't just turn into 'let's build a game.' Students must learn the content to complete the task." For example, when a group of students want to design a basketball game with a 3D hoop and make a ball go through it, they must use the laws of physics to construct an appropriately sized "3D sphere and determine how it will go in the hoop and at what trajectory," he explains.

Instead of lecturing, student mentors and teachers facilitate by asking questions like "Which variables do you need to change?" In what Clark calls "the mentoring model," having experienced students serve as mentors makes the ITEST program sustainable because it eliminates the need for having more than one teacher in July and on Saturdays during the school year, when the ITEST program is offered. Mentors also en-able instructors to teach students of different abilities in one classroom, he notes.

The teachers ensure students understand what Clark calls "the pathways needed for participation in the STEM enterprise." Though students "may have been exposed to engineering or computer science as a discipline," they and their parents may be unaware of the courses and skills required for careers in those fields, he contends. "We work with parents and students to articulate that pathway. If students don't recognize the content is part of the requirement for the career, they may not value it."

To educate parents and students about the pathways, Clark and his colleagues hold STEM Summits. For the first summit, they brought 100 students and their parents to GMU to tour the campus; attend presentations made by faculty, staff, and admissions experts; and speak with current students. During the second summit, Bernard Harris, the first African American to walk in space, made a presentation to students. In addition, families can consult the program's website (http://itest.gmu.edu) for information on college preparation and scholarships.

The ITEST program's summer session gives students a chance to work with a biologist from the Federation of American Scientists to design a game based on a scientific concept related to immunology. At the end of the session, student teams present their games and their under-standing of the scientific concept to their parents. "We show them their children can make a living doing this," and advise them "when school starts, make sure your child is in AP Biology or high-level math," says Clark.

While most student participants typically attend McKinley Tech, Clark says word of the program's success has attracted students from other Washington, D.C., schools and from the suburbs. "People would come to McKinley and say, 'I want this in my school.' They want to replicate it in their community." He believes that the ITEST model could easily be adapted by STEM teachers elsewhere, and notes McKinley Tech is con-sidering "using the mentoring model in the course of the school day."