Innovations in Education

Institutions infuse computer graphics curriculums with novel programs, unique methods, and the latest technologies to enhance the classroom experience

By Courtney E. Howard

"I never teach my pupils. I only attempt to provide the conditions in which they can learn."

Those are the words of Albert Einstein, but many of today's top professors in the digital content creation field share the sentiment.

Now, and perhaps more than ever, instructors and pupils alike recognize that a great education extends beyond the lecture hall. Progressive educators are intent on delivering innovative programs to students, providing the opportunity to interact with the latest technologies, real-world production scenarios and workflows, and peers and experts with diverse backgrounds and skill sets.

Learn by Doing

A comprehensive and effective education, especially one in the field of computer graphics, encompasses far more than time spent reading textbooks and attending classroom lectures with myriad slides. Although both have their place, students increasingly are learning through practice.

Educational institutions offering courses and degree programs in computer graphics and animation increasingly are providing students a hands-on education with novel, advanced hardware and software systems.

"While strong keyframe animation skills are an essential part of our curriculum—and of primary importance to the education of animators—we offer the chance to work with motion capture using a PhaseSpace Impulse active marker system," explains Michael Scroggins, Computer Animation Labs director and Program in Experimental Animation faculty at the California Institute of the Arts' (CalArts') School of Film/Video. "The goal is not to supplant keyframe animation in any way, but to add to it. Students may experiment with this form of real-time performance animation to explore extending the possibilities of their art." PhaseSpace's Impulse motion-capture system combines hardware and software in a portable solution that delivers real-time tracking of 128 unique active markers, 3600x3600-pixel resolution, and a 60-degree field of view. Used for a wide range of applications—including those in the entertainment (television, video game, and music video), research and defense, and sports and medical markets—the mocap tool provides students with a working knowledge of another form of animation in addition to what's accomplished through typical 3D animation software programs, such as Autodesk's Maya, 3ds Max, and Softimage.

Chris Nabholz harnessed innovative tools and an education at Ringling College to create eye-catching imagery.

Multiple Uses of Mocap

One application of motion capture, Scroggins describes, is as a form of 3D rotoscoping. As with 2D rotoscoping, in the hands of a good artist, the technique can be very effective. He cites as an example Michael Patterson, who used the technique for his CalArts MFA thesis and Student Academy Award-winning film "Commuter," as well as subsequent professional work with the famous A-ha video "Take on Me."

Ringling's Computer Animation program celebrates student works, such as this piece from Evan Mayfield.

In yet another approach, one of CalArts' character animation students, Jaewan Park, has experimented with acting out his animation while clad in a mocap suit, and then using the results as a guide to his keyframe animation. Park previously would have recorded his performance with video and used that as an animation reference, Scroggins says. "The advantage of motion capture is that he can see his acting from any point of view using a virtual camera in Maya—not just as played to a single point of view, as is the case with a video-camera recording," he explains.

Alastair Macleod, head of animation at Vancouver Film School (VFS), takes another tack. He has elected not to bring motion capture into the program, despite many years of experience with the technology, including his work on *The Lord of the Rings* and *The Matrix* sequels.


Pratt Institute encourages student collaboration and use of the school's facilities.

"I have a collection of motion-capture data that's available to the students, and they can use [Autodesk's] MotionBuilder or my own proprietary tool for Maya to solve the data," Macleod says. "Giving students access to clean motion-capture data provides them with relevant experience. To put it another way: I would not say that motion capture is a learning tool, but a tool to learn, and is not something we are currently teaching in the Animation & Visual Effects department, although it is taught and used in the VFS Game Design program."

Virtually Real

Innovative instructors and students at educational institutions, such as CalArts' School of Film/Video, are taking motion capture even a step further, combining it with other novel technologies into a virtual reality system.

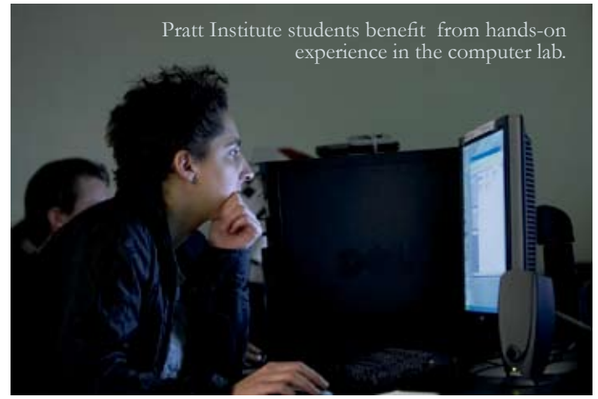
"We have recently acquired a Vizard VR system from WorldViz that, coupled with an eMagin Z800 HMD (head-mounted display), may be used with the real-time, motion-capture advantage of the PhaseSpace system to create work in fully immersive VR," Scroggins explains.

The Vizard Virtual Reality Toolkit from WorldViz encompasses high-end graphics utilities for building interactive 3D content and developing high-performance graphics applications, including virtual reality, scientific visualization, games, and flight simulation. The system supports a variety of display technologies, including the head-mounted eMagin Z800 3D Visor, reportedly the first personal display system to combine OLED display technology with head-tracking and stereo vision.

"The use of these tools for the performance of absolute (abstract) animation is one of the unique ways we are beginning to experiment with the potential of real-time gesture capture in immersive 3D CG space," Scroggins notes.

Grasping Input and Output

When it comes to learning 3D, the best place to start is in the real world. In many schools, students are encouraged, and even required, to study and replicate tangible 3D objects before embarking on an education and career in modeling or animation.


Pratt Institute students benefit from hands-on experience in the computer lab.

At Pratt Institute, for example, students gain the use of 3D scanning and printing devices to better understand all the nuances of the three-dimensional world. Pratt Institute offers degree concentrations in 3D Animation and Motion Arts, Emerging Arts, and Digital Imaging at both the graduate and undergraduate levels.

"Our 3D scanning and 3D printing technologies allow Emerging Arts students to fabricate enclosures for interactive devices, Animation students to develop tactile models, and our Imaging students to create objects ranging from plastic to bronze," explains Peter Patchen, chair of Pratt Institute's Department of Digital Arts.

Full Facility

In addition to 3D printing and scanning tools, Pratt Institute provides students access to greenscreen facilities, vinyl cutters, laser cutters, motion-capture collaboration with industry, and a scalable renderfarm. Similarly, the Savannah College of Art and Design (SCAD) is opening a new 65,000-square-foot Digital Media building in Atlanta to serve its roughly 2300 film, digital media, and performing arts students.

"We need facilities and specialized equipment to support them," says Peter Weishar, dean of Film, Digital Media and Performing Arts at SCAD. When the new facility opens in September, SCAD will have four greenscreen stages, two mocap studios, three sound stages, two small screening rooms (in addition to its three large screening venues with 650, 1250, and 1300 seats), two Foley stages, a recording studio, two renderfarms, 37 high-end Avid video editing systems, and two stop-motion stages.

"The variety of specialized equipment and facilities expose our students to the complex and sophisticated techniques used at the highest end of industry," Weishar explains. "Something like a motion-capture studio is not a substitute for the basics. Animation students must learn timing, drawing, storyboarding, and movement, and Visual Effects students must study light, texture, CG modeling, color, and film language."

Online Instruction

Educators are increasingly teaching the basics through non-traditional methods. "In the area of technical instruction, we are beginning to enhance the classroom experience with online video tutorials captured with Camtasia," says CalArts' Scroggins, referring to Camtasia Studio, a video-capture program for Microsoft Windows that is published by TechSmith.

"Students are able to review a lesson and take advantage of the ability to follow along with the active screen demonstration, scrubbing back and forth as may be desired when following a complex tutorial," Scroggins continues.

Cross-program Collaboration

Professors at Pratt Institute encourage collaboration among students enrolled in various, and even seemingly unrelated, programs. "Digital Arts students work with sculpture students to create investment castings of digitally created artwork," Patchen describes. "In addition to traditional professor-student instruction, this collaboration allows knowledge exchange to occur between students of different disciplines, thereby reinforcing their own learning."

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For the past three years, the staff at SCAD has been making a concerted effort to increase interdepartmental collaboration, through formal, curricular efforts as well as informal, peer-to-peer initiatives.

"We have been very successful coordinating our classes so that Performing Arts students are available to voice animations; Sound Design students can design sound for animated senior and thesis projects; and Visual Effects students can work with Film for things such as matchmove and practical effects," recognizes Weishar. "We are creating the same kind of collaborative environment most students will experience when they enter the industry. In addition, because we are a school, we push creative limits and work on digital installations, live performance, and physical computing projects that are not part of a commercial artist's daily life."

Simulated Studio

Most education facilities serving the digital content creation industry recognize the importance of a comprehensive, well-rounded education. Some, however, take it to a whole other level, providing an environment that closely resembles a production studio.

In Vancouver Film School's Animation & Visual Effects department, all programs are delivered within "immersive and intensive learning environments," says Macleod.

In the VFS 3D Animation & Visual Effects program, as an example, students learn a variety of subjects through traditional teaching techniques for the first six months. Once the fundamental principles have been introduced, Macleod explains, students select a stream, each of which has a Stream Mentor who teaches the stream topic (animation, modeling, or visual effects) at an advanced level, and a final project is completed using a simulated production environment.

"The benefit to this approach is that the student gets a combination of classroom and project-based learning in a simulated production environment, giving them a range of understanding and relevant experience," Macleod adds. "I think the main strengths of the programs at VFS are the components that simulate the production environment and form a large portion of the student experience."

Comprehensive Curriculum

Computer animation students at Ringling College of Art + Design gain a similar advantage: "[They] learn all phases of the production process because our goal is to teach them to become

CalArts' Advanced Modeling teacher Dan Platt demonstrates principles of proper edge loop flow when modeling for animation deformation.

complete filmmakers," says Jim McCampbell, department head of Computer Animation at Ringling. "However, because we deal with linear narrative stories for the senior-year capstone project, we focus heavily on character animation.

"Creating a believable performance is crucial to the success of the film as a whole," McCampbell continues. "An important aspect of the curriculum is to make sure that students see the connection between the animation and the other aspects of the film. For that reason, we don't compartmentalize our courses (a modeling course, an animation course, and so forth). Instead, we teach all aspects in all courses so that an understanding is gained of how each aspect is interrelated."

Doubtless, technology can significantly enhance an education, especially in the high-tech world of computer graphics. Experts agree that a comprehensive education is the sum of many parts, including, but not limited to: skilled and artful instruction, a foundation in the basics, collaboration, an understanding of the entire workflow, creativity, dedication, hard work, and knowledge of and experience with various novel systems and technologies.

"As we rely more and more on technology, it is vital that we do not lose touch with the core creative skills that require only the most basic tools," Macleod mentions. "Technology provides new mediums for expression, but also creates new limitations within those mediums. Removing those limitations provides a direct connection between the creative imagination and its expression in form."

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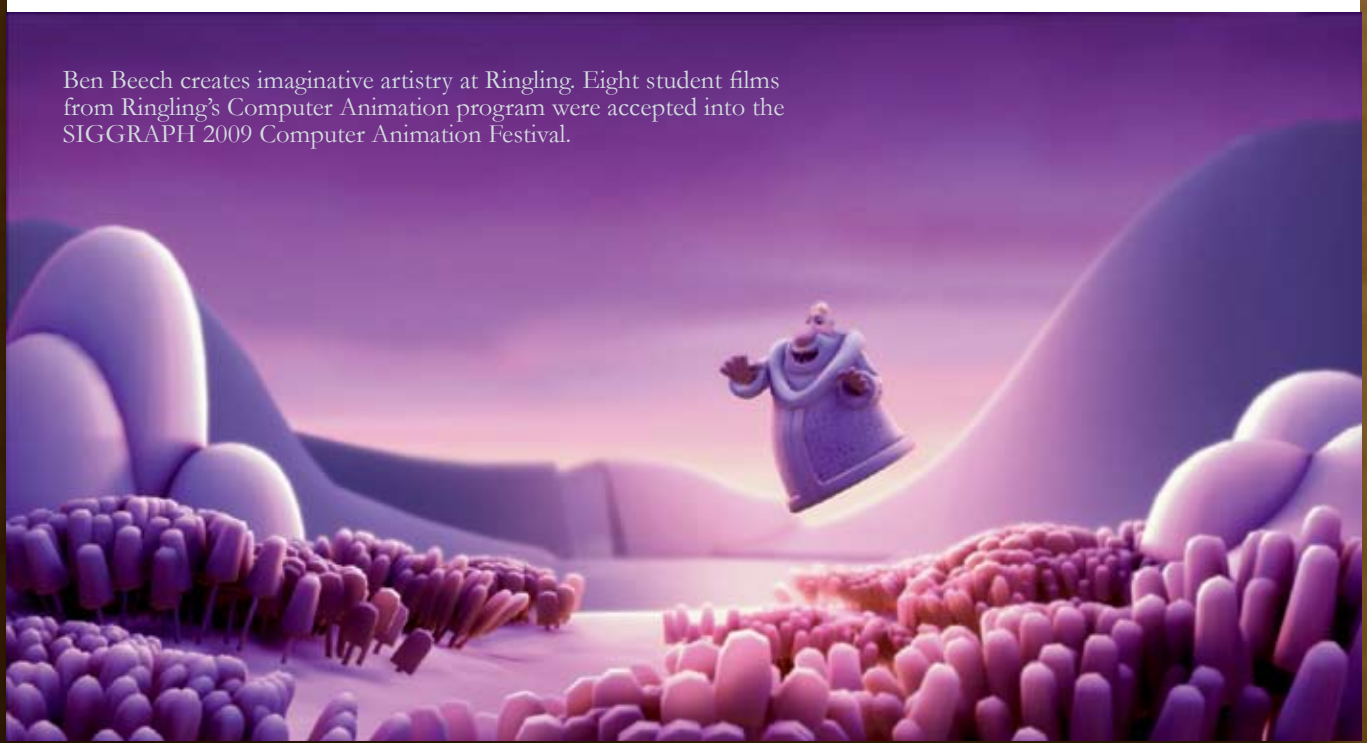

Ben Beech creates imaginative artistry at Ringling. Eight student films from Ringling's Computer Animation program were accepted into the SIGGRAPH 2009 Computer Animation Festival.