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College, 3D Lab Partner in Web-based Advanced Visualization Training

The nation's first curriculum-based program for volumetric imaging began as do many collaborations between local businesses and technical colleges: a local start-up in search of a steady stream of skilled employees approached a local technical college.


Robert Falk, MD

Robert Falk, MD, founding manager director and chief medical officer for 3DR Laboratories, Louisville, Ky, says, "When we formed the company, our business plan called for, 5 years out, between 150 and 170 skilled technologists." 3DR supplies 24/7 access to postprocessing and image reconstruction by trained technologists. "From a selfish standpoint, we needed a supply chain of technologists who were highly trained and highly skilled to help us out at 3DR," Falk adds.

What turned this local success story into a nationwide educational opportunity was the convergence of new technology in the form of thin-client postprocessing, a compelling need, and a unique collaboration between education and commerce that resulted in the launch of the online 3DR Academy this month.


Anthony Newberry, PhD

The Birth of a Program

When Falk and 3DR Laboratories cofounder Michael Lillig visited the president of Jefferson Community and Technical College (JCTC), Louisville, in 2005, with the proposal to add an advanced visualization certificate to the school's radiologic technologist program, he was intrigued. "Community/technical colleges have a mission to work with industry and companies, continually updating our curriculum and modifying existing programs to try to meet the needs of the emerging economy," Anthony Newberry, PhD, JCTC president and CEO, explains.

Initially, Newberry tapped newly hired associate professor Heather Brown, PhD, who was simultaneously developing a program for biomedical laboratory assistants, to head up the needs assessment for advanced visualization and develop the curriculum. Brown earned her undergraduate degree in mechanical engineering, but after becoming disenchanted with computer-aided design for the automotive industry, she studied neuroelectrophysiology of the visual system, earning a doctorate in biomedical engineering from Vanderbilt University.


Heather

Working with the instructors in the JCTC RT program as well as a statewide curriculum-review committee, Brown crafted a four-course, 16–college-credit program to be completed in two semesters.

- Cross-sectional anatomy: "The technologists have gotten basic anatomy and physiology in their associate's degree, and they should be familiar with x-ray

views," Brown says, "but they haven't necessarily learned cross-sectional anatomy, in which you look at different planes through the body and are able to identify the various anatomy. We do a full course in that from head to toe, with emphasis on the vasculature, because so much of postprocessing is done for CT angiography work."

Brown, PhD

- Volumetric medical imaging: The emphasis of the second class is the physics of processing principles that a technologist needs to understand to be accomplished at postprocessing, familiarizing students with the various software, available tools, pitfalls, and best practices. "I try to give them a deeper understanding of what they are doing, beyond the button pushing taught in many vendor applications classes," Brown says. "When they create a curved planar reformat, for instance, they have to make sure they are putting the points in the middle of the vessel or they can create a false appearance of a stenosis."

- Pathology: "The second half of the program is more of the practical aspects," Brown says. "You've learned all of the basics, the tools, and the anatomy, and now we are really going to use them and produce the images you will be completing for the physicians." The first course in the second semester delves deeply into the pathologies requiring postprocessing, such as atherosclerosis, diseases within the vessels, and other general disease processes likely to be encountered.

- Case studies: The second course in the second semester is entirely practical, based on case studies. Students are taught a protocol for a given study and then given five case studies to complete. Each week, students are taught a different case, beginning with the carotid arteries and all of the associated pathology and working through the peripheral circulation, the renal vessels, stroke work, the circle of Willis, abdominal aortic aneurysms, orthopedic studies, neurological studies, and kidney- and liver-donor cases.

Modular and Internet-ready

Brown graduated nine students from the first graduating class and, subsequently, five more. When 3DR Laboratories switched from the thick-client Vital Images workstations to the thin-client Visage software, however, Mercury Computers, Chelmsford, Mass; the college; and 3DR saw an opportunity to provide education to a much wider audience.

"The program we started at the community college is the only curriculum-based program available in the country," Brown, who also serves as director of clinical education for 3DR Laboratories, explains. "3DR has taken the program and is creating a completely online program" so that the curriculum can be offered via Internet.

Working with Falk, Brown dissected the course into stand-alone bite-sized modules so that, eventually, any users can sign onto the 3DR Academy education server and learn all of the anatomy, pathology, computer software, and skills associated with postprocessing at their own pace, and in the order they wish. The first module on Cardiac CTA is being offered for the first time this month. It will consist of three lectures covering cardiac anatomy, coronary artery disease, and the gated cardiac scan, a review of the postprocessing protocol, a Flash tutorial on how to use the software, and five case studies.

"A rad tech or student can be at home with a DSL line or a cable modem, take the curriculum, and get onto our server here in Louisville and process cases," Falk explains. "That opened up a whole new world for us. The community college offers a certificate

program in volumetric imaging, and it's the only rad tech school in the world, we think, that will certify techs as volumetric imagers in their curriculum. The curriculum can be taken at JCTC or online."

He continues, "We negotiated that 3DR Academy will create a modular version of the curriculum. It will be administered, from the educational and credentialing standpoints, by JCTC, for which we will pay them a portion of the revenue stream to cover their administrative costs. They will award fractional college credit each time a tech completes a module." Students, Falk adds, "can work through the curriculum one module at a time, and if they go through all of them, they will have their 16 college credits and their certificate, but they can literally do that at their own pace and chose the order in which they want to learn it."

The Janitor Can Postprocess

One of the reasons that there has not been a postprocessing curriculum is that there are no requirements for performing postprocessing. "Right now, the janitor of the hospital can do postprocessing," Falk says. "There are absolutely no requirements in the area of postprocessing: you don't have to be a rad tech; you don't have to be a medical person. It is a totally unregulated area of medicine right now. In most places, techs are doing it, but from the medical-society standpoint, there are no requirements."

Falk recognized early the need for technologists who were highly trained in postprocessing and a more efficient way of handling the work. "We actually adopted 3D and CT angiography early in my practice," Falk explains. "We were there at the time of the workstation model: you buy multislice CT, you buy a workstation, and if you need more workstations, you buy more and scatter them throughout the hospital."

Falk's practice covered three hospitals, all of which where interconnected, and all three hospitals bought 16-slice CT scanners and $300,000 workstations within 6 months. "We couldn't get our hospital to centralize the laboratory because the administration was so siloed, and nobody wanted to do the other guy's work because they didn't get any credit for it. We had tremendous duplication of hardware and software, but also duplication and dilution of technologist talent, because in the two smaller places, the workstations were being used an hour a week and that's it. You can't get good at it that way. It's like anything else; you have to do it, and do it a lot, to get good at it," Falk says.

Seeing the need to centralize postprocessing planted the seed for 3DR Laboratories, and training the technologists to do the postprocessing enabled Falk to understand just how challenging it was to bring a technologist up to speed. "I trained the techs in my hospital to do it, and I saw that it was really about a 6- to 9-month—almost a year-long—process," Falk says. "3D postprocessing is part science, but it is part art as well: to see what that important shot is and then produce it. As a physician, I didn't have time to sit at a workstation all day long. Out of 20 partners, I think two of us knew how to turn the workstation on. I knew this was going to be a technologist-driven device, over most of the industry."

Falk recognized that he needed technologists who not only knew what to do, but why they were doing it. "The what is an easy question, but the why is a little trickier, because now you have to start understanding disease processes and what the doctor looking at it needs to see," Falk explains. "You have multiple customers that you have to satisfy with postprocessing: you have to give something to the radiologists to do a complete formal dictation, and you've got to give something to the ordering physicians—usually surgeons, in image postprocessing, for guidance in presurgical planning. You have to give them the ah-ha

shot, what I call the money shot: what it is they need to see, in as few views as possible. Then, for the patients who are going to sit down with those doctors and look at these 3D images, you need to give something that they can conceptualize." He continues, "You've got to create images that will satisfy lots of different needs, and it gets to be complicated. The knowledge base that a technologist needs is tremendous."

Because the radiologist works primarily from periphery reformats, sliding maximum intensity projections (MIPs) of various thickness, and the axial data, the postprocessing curriculum has been designed to equip technologists with the skills to help speed radiologists' work flow.

"A tech can facilitate that if they are producing sets of sliding MIPs of the appropriate thickness and increments and then creating the curved reformats in advance, so the radiologist can quickly review and doesn't have to do that himself," Brown notes. "That is what we are training our techs to do: they are recognizing that the radiologists don't necessarily want to look at the 3D views, but the curved reformats, MIPs, and all of the other types of images you can create in postprocessing can facilitate their reading of that case. That is what we are trying to teach them to do."

Rigorous Assessment

While Newberry has tremendous confidence in Brown's credentials and pedagogic gifts, the college's needs-assessment process and quality-review protocols are rigorously applied to all programs.

"We consulted closely with the faculty; Don Pack, EdD, RT, who is the coordinator of the radiological technologist program; Dr Brown; and the faculty of the other rad tech programs around our state for the concept of this new program," Newberry explains. "Once a need is identified, and once we do our preliminary analysis, we enter a formal program-development process."

The process begins at the faculty level, where materials are developed for the program, including curriculum, faculty credentials, budget, and a characterization of the need for training in the community. Once the materials have been developed, the faculty program-development committee, the full faculty, and, ultimately, a committee representing the Kentucky Community and Technical College system review them.

All programs, including the new online program hammered out by JCTC and 3DR Academy, also undergo an annual review process, whereby each program is assessed based on seven criteria, including student outcomes.

"The college has its responsibility to its accrediting agencies and to the public to demonstrate that it has a quality program," Newberry states, "and 3DR has its responsibilities to its board of directors and others, so we have worked out a way to share our assets and collaborate on the development of the curriculum."

With the first module available online this month, Falk and Brown are optimistic about the future of the program. "We've had a fair amount of interest from some of the residencies around the country as a nice introduction to postprocessing for residents the first time they rotate through CT and body imaging," Falk remarks. "A resident coming through the body-imaging rotation doesn't know anything about a workstation, postprocessing, or any of the technology and language that are becoming such integral parts of radiology."

—C. Proval