Bridging the Classroom and the Clinic:
Specialized Facilities for Healthcare Provider Education
Wisdom tells us that we must learn to crawl before we can walk. We learn our ABCs before we tackle Shakespeare; we memorize our multiplication tables before we apply for work at NASA; we practice, practice, practice our way to Carnegie Hall. In many careers, our elementary steps are straightforward, our development is relatively independent, and making mistakes is an essential part of learning how to do things correctly.

In other careers, however, our learning is much more interpersonal, and our mistakes come with higher consequences. Take, for example, the field of healthcare. Students must master not only large amounts of academic knowledge, but also complex clinical skills involving real patients. These patients come with real health issues, and real emotions. The cost of errors is high. We all expect our healthcare providers to be professional, confident, and highly skilled. All of our healthcare professionals, however, must start out as students. How should we best prepare them?

A Changing Industry

We should answer this question sooner rather than later. Population is booming, particularly in the growing southeast region. With this growth comes demand for services of all types, including healthcare. Not only is the population growing, but it’s also growing older: the nation’s baby boomers, born between 1946 and 1964, are now in their fifties, sixties, and seventies, and this large-scale demographic shift is increasing the need for healthcare services. People are also living longer these days, and are accessing healthcare services across a longer period of time.

“Tell me and I forget; teach me and I may remember; involve me and I will learn.”

Benjamin Franklin
Other notable trends impacting the healthcare industry include a greater emphasis on preventative care, growing rates of chronic conditions such as diabetes, and larger numbers of people with health insurance due to the Affordable Care Act. The nursing workforce continues to evolve; experienced patient care providers, aging alongside the baby boomers, will leave significant vacancies as they retire.

For students, all of these trends add up to a huge professional opportunity. Muriel Horton, Retired Dean of Trident Technical College’s Division of Nursing, has seen this growth firsthand. “The Bureau of Labor Statistics expects employment of Registered Nurses to grow 19% between 2012 and 2022,” she tells us. “This is faster than average for all other occupations.” The healthcare industry as a whole is expected to drive 28% of all new US job growth, with the industry itself projected to grow by 33%. This translates to 5.7 million new jobs. This long-term pattern of increasing demand means that the need for leading-edge skills is real, and it’s here.

Classrooms for the Care Providers

The burgeoning need for highly skilled allied health professionals translates, of course, into a need for expanded allied health training programs, and expanded space to support them. The bulk of this expanded space is not the typical “sit and take notes” classroom environment of eras past. Traditional classroom space is still critical, of course, for lecture-based concepts and discussion. However, much of a student’s foundational learning now takes place in practicum spaces which more closely resemble a health care setting than a lecture hall. These hands-on lab spaces support real-
Featured Project: Health Sciences Building at Central Carolina Community College

World simulation. Designed to replicate a variety of clinical settings, mock clinical spaces allow students to gain comfort and develop skills with healthcare equipment, protocols, and work settings in a realistic environment. These leading-edge training spaces bring the clinic to the classroom.

Dr. Marilyn Brady, Dean of Trident Technical College’s Division of Nursing, knows that training in realistic health care settings builds confidence and saves valuable time acclimating students in the field. She describes this typical scenario: “For instance, the OB faculty might spend an entire day in a replicated clinical space prior to taking students to a clinical facility to orient them to what they’ll do in a newborn nursery, what they’ll do in labor and delivery, and what they’ll do in postpartum. When students go to those clinical settings for the first time, they can hit the floor running, and not need an onsite orientation. That’s been incredible.”

A standard training lab space might replicate a hospital room, featuring a functioning hospital patient bed setting complete with headwall, medical gases, call systems, patient monitors, curtains, and over-bed lighting. Support spaces include medical storage areas, hand-washing sinks, medication control stations, and even areas for laundry processing. Providing facilities with these clinical systems in a safe, controlled atmosphere allows students to build confidence in navigating a healthcare setting while they practice critical patient care skills. In some cases, the mock hospital rooms are modeled after those of local healthcare institutions, facilitating a smooth transition from academics to practice in the local community.

Labs replicating specialized clinical spaces provide targeted skills development for clinical settings such as intensive care units and labor and delivery suites. Mock operating rooms expose students to a highly specialized set of protocols and equipment, from scrub spaces to surgical storage to anesthesia equipment to instrumentation labs. Radiology rooms, often featuring X-ray equipment donated from local hospitals, require additional layers of infrastructure such as lead-lined walls and control space.

Other hands-on learning spaces replicate various professional healthcare settings. These include nursing home rooms, patient restrooms, massage therapy spaces, and physician’s offices. Mock office spaces often include check-in areas, triage, and exam rooms for training medical office assistants. Replicated physical therapy/rehab centers may offer large open gyms with exercise equipment, handrails, steps, ramps, exercise mats, and other equipment for physical therapy training programs. These labs allow
students to practice skills from medical records to occupational therapy. Dental programs take advantage of similar replicated clinical spaces, with fully functioning dental operatories, x-ray rooms, and sterilization areas in dental clinic settings.

Becky Smith, AIA, Healthcare Studio Leader for the architecture firm LS3P, has designed a number of allied health training spaces, and understands the challenges involved in replicating a healthcare environment within an academic setting. “Having team members with a deep understanding of the range of actual clinical settings is critical,” she tells us. “Creating these spaces for various Health Science programs and adapting them for educational use is key to the success of a Health Science project.” Due to the unique blend of skills required in designing both the educational and the healthcare aspects of these projects, Becky notes that being able to speak the same medical language as the healthcare professionals is vital. She also knows that the best designs grow out of listening. “Being a good listener is important, and the ability to draw critical information out of the program users will help the end product become a facility that the users helped create for themselves.”

**Education in a Digital Age: Bridging Theory and Practice**

Though all of the types of spaces listed above are extremely valuable in helping students to build applicable, transferrable skills, these facilities lack one critical ingredient in patient care training: a patient. Since using actual human patients for early-stage skills development is less than ideal for both student and patient, many programs are turning to high-tech solutions.
Enter High Fidelity Simulation (HFS). HFS programs use realistic patient simulation equipment, which can be programmed to mimic a wide variety of symptoms and events to allow students to respond, practice skills, and be tested in a safe, controlled environment as they learn. Types of equipment include adult male and female patient simulators, obstetrical patient and their infant simulators, and pediatric patient simulators which are programmed and maintained by on-staff simulation technology specialists. The technical staff support is important to allow the educators to focus their efforts on the students, rather than dreading the seemingly exhaustive details of setting up for various scenarios. HFS training for educators can also assist in enriching and expanding the curriculum to match the capabilities of the simulators.

HFS labs are typically located in a suite of mock patient procedure rooms with integrated technology for student/faculty communication and recording lab sessions for review and feedback. In a typical simulation, the life-like human patient simulator is arranged on a bed or stretcher, connected to active patient monitors for vital signs. Realistic medical equipment includes a headwall with power, data, and other communication systems; over bed lighting; and medical storage. Specialized wall coverings or cubicle curtains can add to the “clinical” setting. From an adjacent control room with closed-circuit television camera and a speaker system, the instructor and technology support staff can direct, record, and observe a student’s simulation session for later feedback and discussion.

Dr. John Schaefer serves as the Louis Blackmon Endowed Chair for Patient Simulation and Research and the SmartState BioMedical Cluster, and is highly experienced at using simulation in healthcare education. When asked about the benefits of simulation programs, Dr. Schaefer lists many, but says that patient safety is first and foremost. “It’s a chance for students to practice things before they go to patients,” he tells us. “Students can practice skills, practice judgment, and gain valuable experience before working with real patients.” Dr. Schaefer also points out the critical role of interdisciplinary collaboration skills, the ultimate goal of eliminating medical errors, and the use of evidence to improve clinical practice.

“We are just beginning to tap the potential of the simulation lab and what we can do to fully optimize the student learning experience,” Dr. Brady tells us. She notes that simulation spaces offer educators an alternative to onsite clinical training, in a more controlled setting which bridges classroom theory and clinical practice. In the simulation environment, educators can orchestrate common medical scenarios and ensure that students know how to respond, well before they experience a potentially dangerous situation in the field for the first time. “For example, if a patient is going into hypoglycemia, we don’t want students to wait until a patient’s blood sugar is dangerously low to respond. We want students to identify the symptoms and know how to intervene. The simulation allows us the opportunity to practice. We don’t have to wait for things to happen in clinical settings, and simulation allows us to offer all of our students the same experiences across the board.”

Simulation labs designed especially for collaborative learning are also proving to be a useful tool, both in maximizing the instructor’s time and in building the communication and teamwork skills which are vital in healthcare settings. In a collaborative simulation lab, a number of 2-student workstations are supervised by one instructor. Working in pairs, one student practices a procedure while a teammate documents and assesses the skill with the help of specialized software. Brian Getsinger, the Director of Technology of the Health Care Simulation Center of South Carolina, has observed numerous students gaining competence at procedures from IV placement to intubation in Trident Tech’s collaborative simulation space. “The space is unique,” he tells us. “You don’t see it in a lot of simulation labs, because it was developed here at Health Care Simulation South Carolina. It allows students to practice and test on procedures.
When they're competent at 100%, they go together as a group to a station up front where they are recorded and tested by a facilitator, and then they are graded.”

Dr. Brady has noticed that Trident Tech’s simulation capability is already being used in innovative new ways which engage students in learning. She describes a scenario in which a nursing student, alone in a simulation lab, interacted with a patient simulator monitored by an instructor in the control room. Her classmates, watching the procedure onscreen in another room, used an audience response system (similar to those used on popular game shows) to vote on possible treatment options. The student implements classroom feedback, the instructor adjusts the simulation accordingly, and every student is engaged in learning. Dr. Schaefer explains that, as student progress in both competence and confidence, simulation provides opportunities to practice clinical judgment, not just basic procedures.

Building Spaces for Leading-Edge Training

Allied health training programs have evolved to meet 21st century needs, and today’s buildings must follow suit. Specialized training facilities blend the best attributes of both higher education and healthcare designs, requiring specialized knowledge in both. In addition to simulation labs, typical program spaces may include traditional academic classrooms and lecture halls; amenities such as computer labs, medical libraries, student lounges, outdoor gathering areas, and study rooms; and faculty spaces, either interspersed among simulation labs or in a separate wing. Due to the unique nature of these programs, owners and designers must carefully consider a number of factors to maximize the potential of the facility.
Ample circulation  
In general, circulation needs for allied health training facilities are more aligned to those of healthcare than higher education, and these needs will impact building efficiencies accordingly. Programming calculations should include higher circulation ratios for areas where large equipment will be transported, if only on “move-in day.” Corridors and doors must be wide enough to accommodate hospital beds and equipment, typically 8’ wide for corridors and 4’ wide for doors. Movement of wheelchairs and gurneys may require door operators, and elevators must be sized to accommodate hospital beds, fume hoods, or other heavy medical equipment. Corner guards are required in all areas in which equipment will be transported.

Special spaces for simulation labs  
Labs for patient simulators provide a unique set of design challenges. Required lab/demonstration spaces for each program must include adequate square footage for all necessary equipment, students, and demonstrations; this space is often much larger than expected. Smith suggests allowing enough space for groups of 3-5 students in the patient area, with a large video screen at the footwall for immediate debriefing. “Adjacent work space for students not participating in the simulation will be helpful for demonstrations to groups,” she notes, “but these work spaces should be separated from the mock patient rooms with doors for acoustical privacy.”

Adjacent control rooms with one-way mirrors and integrated technology are critical for simulator control, instructor observation, and recording of lab sessions. Acoustical separation of the control room is helpful as the instructor-controlled “patient” interacts with the students, and vice versa. One control room per patient area is ideal, though a shared control room for 2 patient areas is workable. Dr. Brady believes that the separate control/observation room is important for student development. “It’s really, really nice that faculty don’t have to be right in the space with the students during simulations. Students always look at faculty for cues, and it’s really hard to keep a straight face when you’ve got a student asking ‘is that right?’”

In terms of sightlines and circulation, Smith has learned that the control room window should be at least 5 to 6 feet wide, and oriented near the foot of the bed to improve visibility. “If local codes will allow it,” Smith says, “providing the control counter heights up high and an adjustable task chair will also allow the instructor or technician to have a better vantage point.” Small conference spaces near the simulation lab allow immediate instructor feedback and a discussion of lessons learned following each session.

Labs for patient simulators also require generous workrooms for programming, maintenance, cleaning, and repair of patient models, including maneuvering space for heavy equipment and work-height counters wide enough to accommodate the life-sized models. The technician, who will train staff, schedule simulations, prepare simulators and computers for events, address technical and recording issues, and provide IT support for the highly specialized equipment, will also require a nearby office. Getsinger points out that these workrooms should ideally be adjacent to the simulation labs. “The work space next to the labs where the high-fidelity mannequins are programmed must be close by, because of the time it takes to set up a simulation. Also, within those work rooms, you’re going to want a sink for cleaning the simulators after procedures involving liquids.” Getsinger also advises owners to consider the amount of space required for storage and assembly of simulation equipment. “What we’ve learned is that if you think you need 100 square feet of space, multiply it times five. You’re going to need much, much more space than you think.”

All lab spaces will require careful attention to finishes, which must be safe, durable, easy to clean, and resistant to any chemicals used in a particular space. Ideally, lab finishes should replicate those found in corresponding healthcare environments to create as authentic
an atmosphere as possible for training. Where similar multiple rooms will be replicated, a full-sized mock-up during construction of a patient simulator and control room may provide useful insight into the construction and coordination of these spaces.

Close coordination
Having designed and coordinated many of these projects, Smith has learned the value of communication. “The ability to work closely with the engineers and the various vendors such as the AV/IT and medical equipment providers during design and construction is a critical aspect of the project process,” she tells us.

Due to the high volume of specialized medical equipment in lab spaces, the design team must coordinate with a diverse team of medical, dental, and lab equipment experts to select and install items such as ceiling-mounted surgical and exam lights, anesthesia columns, radiology equipment rails, wall-mounted surgical scrub sinks, patient monitoring systems, and x-ray equipment. Planning for minor differences among manufacturers while focusing on the essential functionality of the space is key to successful design and requires close coordination among architectural, structural, electrical, and plumbing consultants.

Simulation lab design also requires an extra layer of coordination with engineers and vendors to provide for adequate data and electrical needs. These requirements may include power and CAT-5 connections in the ceilings for cameras, various headwall connections, and integration with control room systems. Often, all electronics are tied to a remote server area, though some systems are localized within the patient simulation room.

Adaptability
In any educational facility, flexibility to meet future needs is a key consideration. In reflecting on the success of the Trident Tech facility, Horton tells us, “As we suspected, the flexibility has served us well. For example, in traditional classrooms, the number of seats dictates the number of students who can enroll in the class. In our building the number of students who need to enroll in a class dictates the size we make the classroom/lab. What this means for the community is that we are in a position to increase our enrollment to meet the demand of the market.” Because of this built-in flexibility, the facility is able not only to meet today’s needs, but also to adapt to future educational models and evolving technologies.

Openness
These complex facilities demand high performance spaces and the best design practices for both healthcare and education. It is fitting that they should also reflect the most critical functions of each: healing and inspiration. These spaces should be beautiful, human-scale, and light-filled, with views to nature and opportunities to engage with others.

Getsinger believes that Trident Tech’s facilities achieve these goals. “I think the openness is key for these facilities,” he explains. “When you open up the rooms, provide light, and make it look spacious, you see a lot of interactivity between students, the simulation technologies, and the facilitators. Being able to walk through the halls and see these activities taking place is exciting to the students, and also to people who are touring the facility.” This transparency creates an inviting space to support students and staff, encourage interest and enrollment for future students, engage the public, and educate others about the program.
Sound advice

Undertaking a Health Sciences project can be a daunting task at the beginning, particularly for educators who may have had little prior experience with facilities design and construction. “It’s a very, very complex system to get it right,” says Brady of the process. “You need a consultant to guide you through it. A variety of individuals could do that for you, but it should be someone who is very familiar with simulation from a nursing perspective, or someone who is more familiar with the physical space, infrastructure, and knowledge of how to make things work most effectively.”

Brady also recommends site visits to other facilities to see students in action, and to understand the organization and flow. Designers and owners both note that an easily overlooked consideration in the design of allied health training facilities is that of time. Both in design and in the field, these complex projects require ample time for coordination of details with end users, vendors, engineers, and contractors at all stages of the project.

The Future of Simulation Labs

With significant and measurable benefits to patient safety and student engagement, simulation labs have rapidly become an integral part of health sciences education, and the applications are virtually limitless. Dr. Schaefer already sees real value not only to allied health programs, but to the wider community. Beyond student use, he tells us, his center has is often used by practicing nurses, practicing physicians, and multi-disciplinary teams. “On the hospital side,” he explains, ”you might see co-teams practice. On the medical student and academic side, you might see nurses and medical students working as a team, learning how to work together in the simulation.” Schaefer sees multifaceted use of simulation spaces as a major industry trend. “When you’re thinking about commoditization, you’re enabling a lot of people to use the space at a lower cost at a good value. The biggest trend overall is making it easier for people to use simulation spaces, and that can be a function of design or arrangement.”

A Space Worth Creating

While the design of these spaces is complex, the results are rewarding. An allied health project requires specialized spaces, an experienced design team, close collaboration with team members, and time; however, careful consideration of key factors in the early stages of design can yield substantial dividends for educators and students. Though the benefits of these leading-edge facilities may be measurable, the value of state-of-the-art allied health training facilities extends far beyond metrics. There is no substitute for hands-on experience, and an investment in the education of our care providers strengthens the future of the industry and the health of our communities.

Students learn best by doing, and simulation lab spaces to support hands-on learning offer an ideal environment for student engagement and success.