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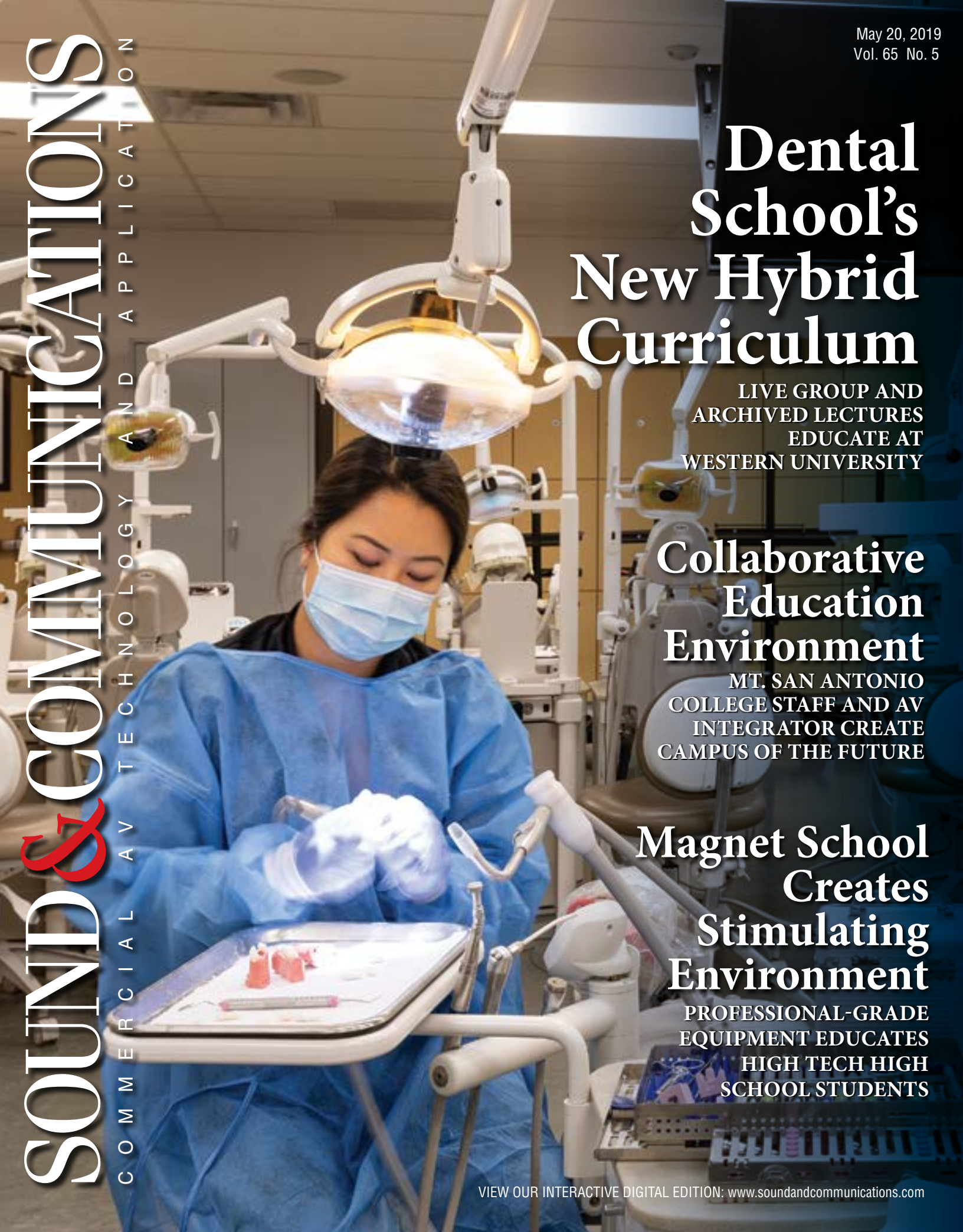

Dental School's New Hybrid Curriculum

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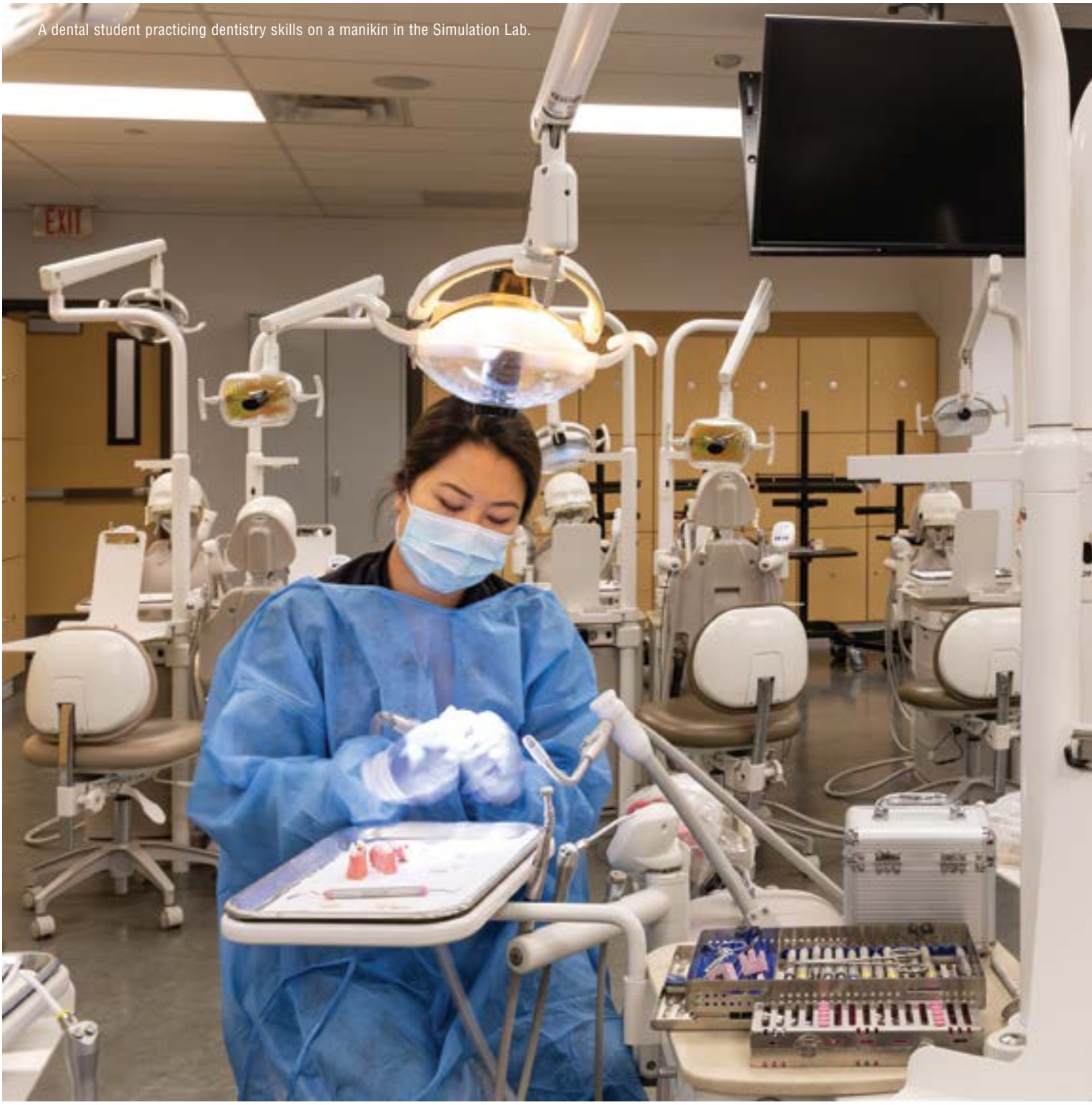
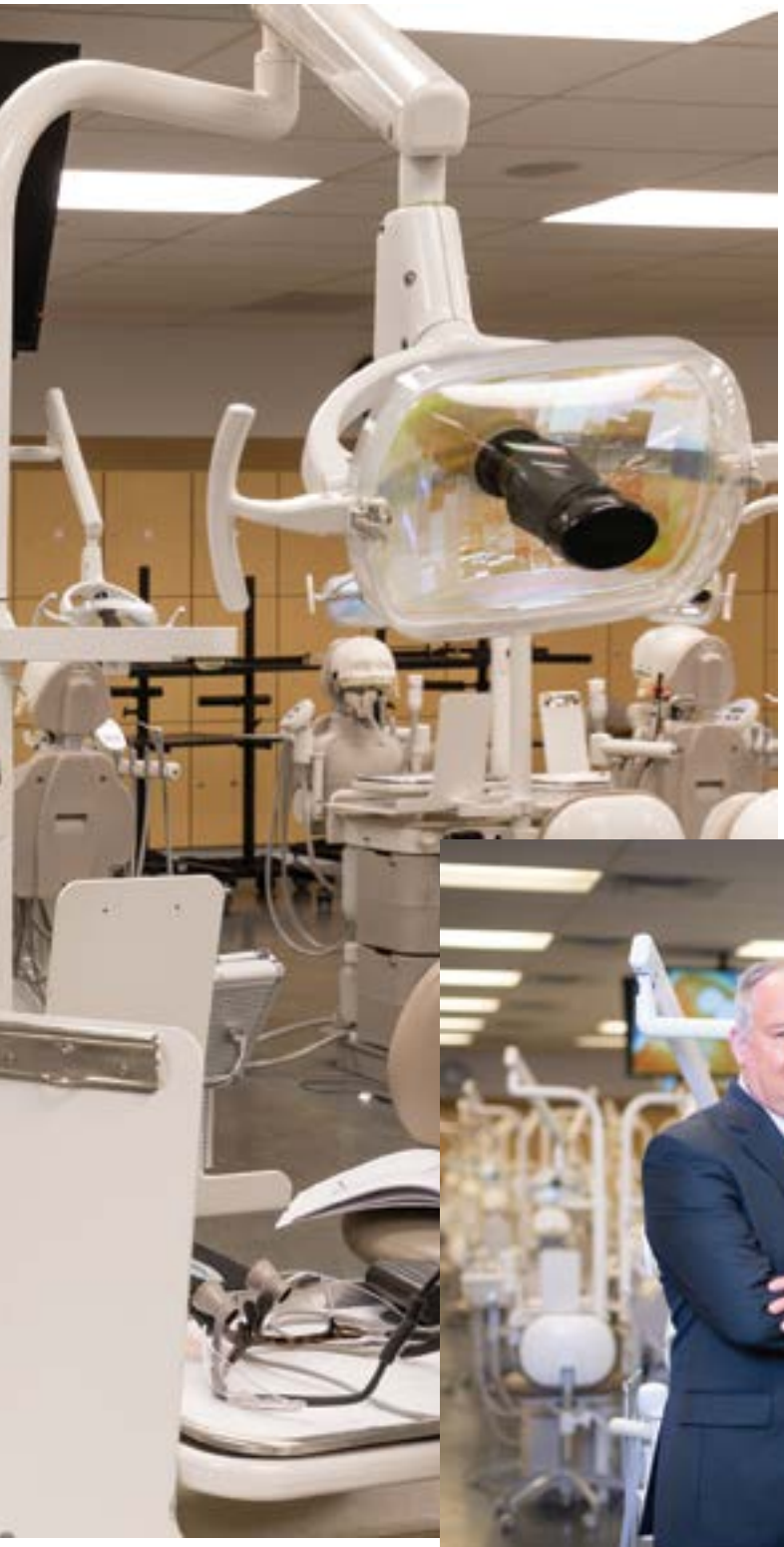


A dental student practicing dentistry skills on a manikin in the Simulation Lab.

Live group and archived lectures educate at Western University.

DENTAL SCHOOL'S NEW HYBRID

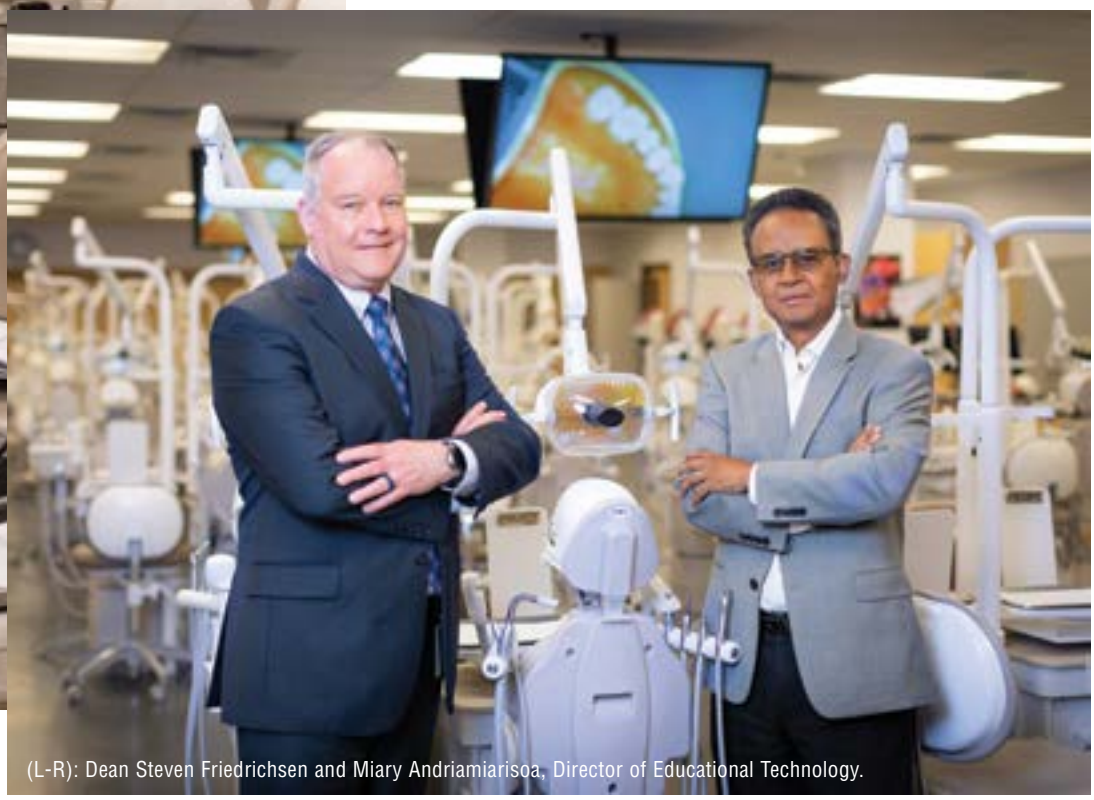


Dentistry is a highly skilled profession, and it requires years of education to master. Long before your trusted dentist asks you to open wide so he or she can examine your oral cavity, that dentist has undergone extensive education in health sciences. Prior to entering dental college, most students have at least a four-year college degree, and some have a master's degree, as well.

Accordingly, this article offers a detailed look inside a Dental Simulation Lab (Sim Lab) at Western University's (Western U) College of Dental Medicine (CDM) in Pomona CA. This Sim Lab provides training for aspiring dentists that is as close to reality as possible before they conduct actual procedures. AV is very much a part of instruction, along with small-group discussions and students practicing on manikins in dental chair stations within the lab.

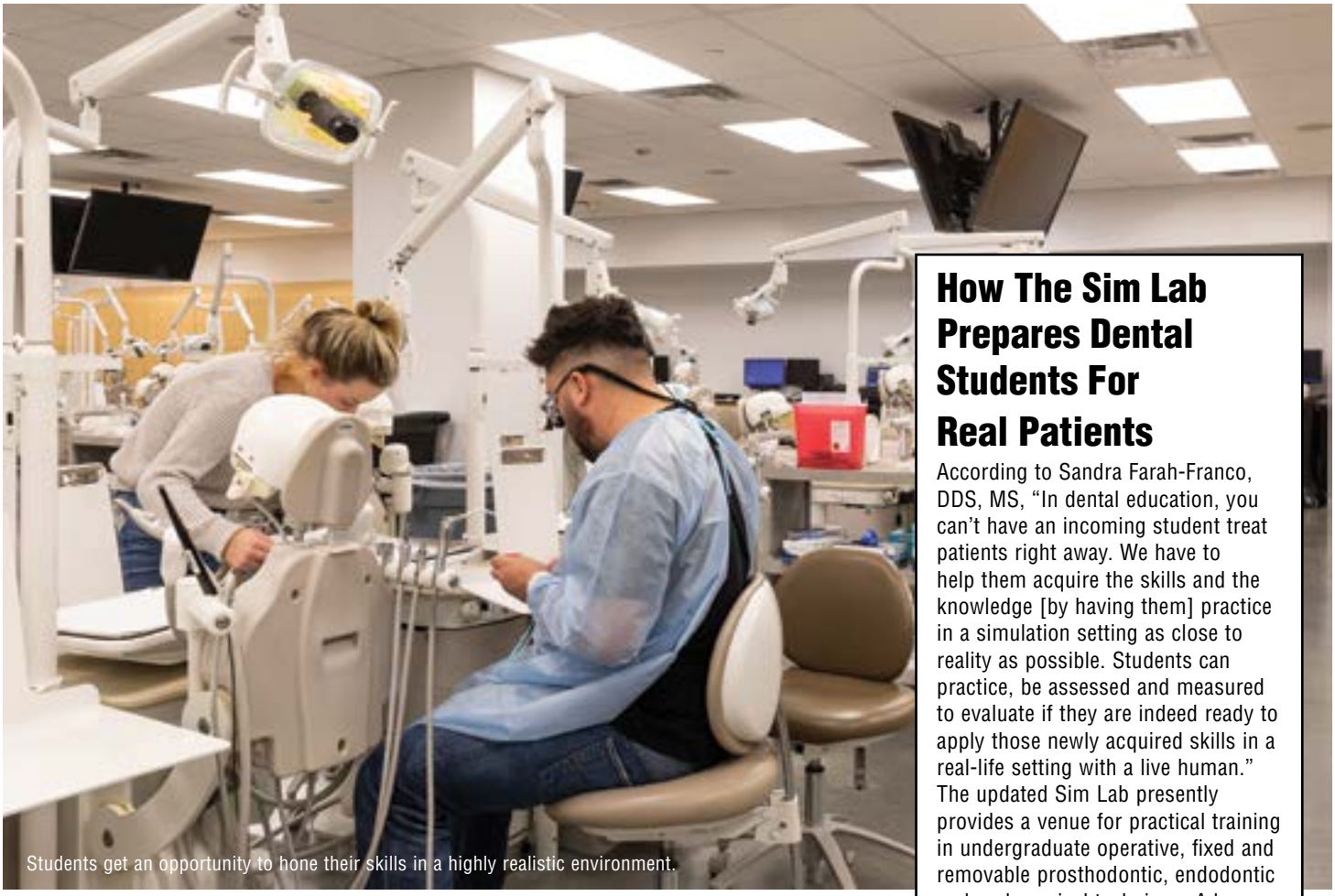
Flexibility for present use and future expansion characterizes the AV in Western U's Sim Lab. Thus, AV designer/integrator ClearTech (Altadena CA) had the goal of replacing components within the existing AV system in order to bring it up to today's technology standards and ensure the consistent, reliable performance required for the frequent usage of the Sim Lab. Among the new key components are a powerful dental microscope, 4K video sources, 4K networking, 55-inch LED-backlit displays for improved viewing at 20 dental stations within the main room, advanced DSP and a bevy of ceiling speakers.

Your author wishes to commend the invaluable assistance of



(L-R): Dean Steven Friedrichsen and Miary Andriamiarisoa, Director of Educational Technology.

CURRICULUM BY JIM STOKES



Students get an opportunity to hone their skills in a highly realistic environment.

How The Sim Lab Prepares Dental Students For Real Patients

According to Sandra Farah-Franco, DDS, MS, "In dental education, you can't have an incoming student treat patients right away. We have to help them acquire the skills and the knowledge [by having them] practice in a simulation setting as close to reality as possible. Students can practice, be assessed and measured to evaluate if they are indeed ready to apply those newly acquired skills in a real-life setting with a live human." The updated Sim Lab presently provides a venue for practical training in undergraduate operative, fixed and removable prosthodontic, endodontic and oral surgical technique. Additionally, the space is an invaluable part of Western University's continuing education programs, in that it provides an ideal environment to teach advanced endodontic, surgical and dental implant procedures. The Sim Lab enables the dental school to fulfill an important role as an education partner in the practical training component of the local community-college-based dental assisting and hygienic programs.

Sara Goldblatt, Business Operations Associate and Program Coordinator at Western U Health Sciences, as well as Executive Assistants Michelle Luna and Patricia Lozano in researching information for this article.

Hybrid Curriculum

Before we launch into our AV journey, here's some background on the dental school's new hybrid curriculum, as well as how it encompasses AV, as related by Sandra Farah-Franco, DDS, MS, Assistant Dean of Dental Sciences Education/Assistant Professor.

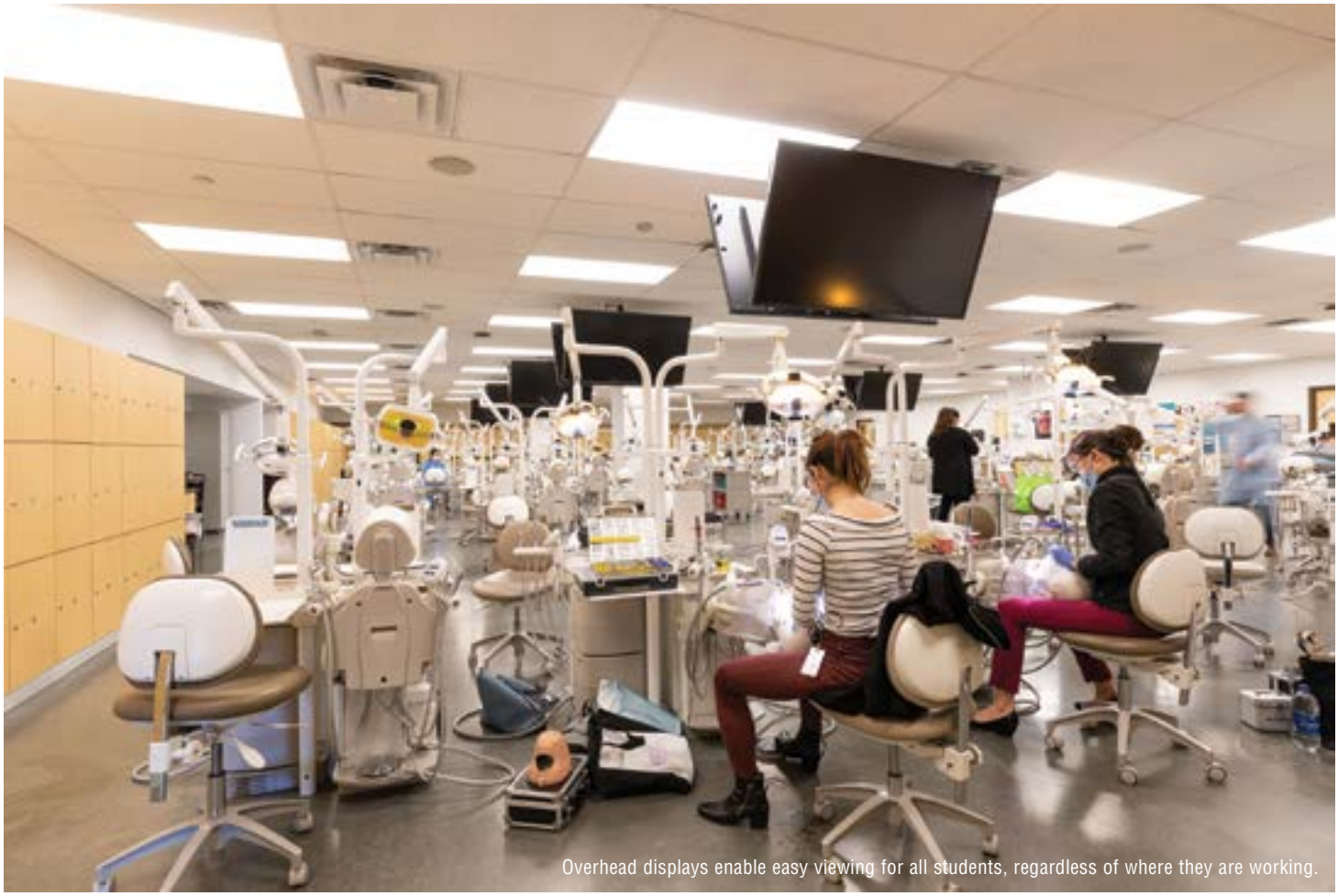
"Part of the innovation was to take the entire curriculum, which consisted of about two-and-a-half years of lectures and simulation sessions, and convert all lectures into an online format," she explained. "We deployed this new curriculum format and called it the 'hybrid curriculum' in the fall of 2017. However, we found that the technology in the lab was lacking and wasn't supportive of this new format."

Farah-Franco continued, "Sometimes, we show videos in the Sim Lab. Then, the students get together, usually in eight small groups with eight faculty, where they engage in discussions and knowledge gained on the platform. We have several faculty demonstrate the procedures that were described in the online platform. Then, right then and there, we're also recording the demonstration and feeding it right back for the student to access. So, there's a lot going on."

The Sim Lab offers as close to an actual scenario of a student working with a real patient as possible. "The hybrid curriculum allows us to develop a true competency-based curriculum," Farah-Franco emphasized. "As the student acquires knowledge and skills, they can go and apply it immediately in a real-world setting—meaning, treating patients right away. And therein lies the challenge, because students learn at various rates based on their ability."

According to Christina DeBono, President of ClearTech, the unique nature of the Sim Lab necessitated a close working relationship between integrator and client that included many different perspectives from the client side. "We were able to work with a group of end users in a very niche application, which is providing teaching technology at a dental school. What's also unique is that the end users—including the dentists, the dean and the associate dean of the college—worked with us directly on how our technology would apply specifically to their course curriculum," she recalled.

"It's a very unique situation, because you're teaching dental students how to do dentistry, then applying next-generation AV technology to that teaching process," DeBono continued. "And that's even down



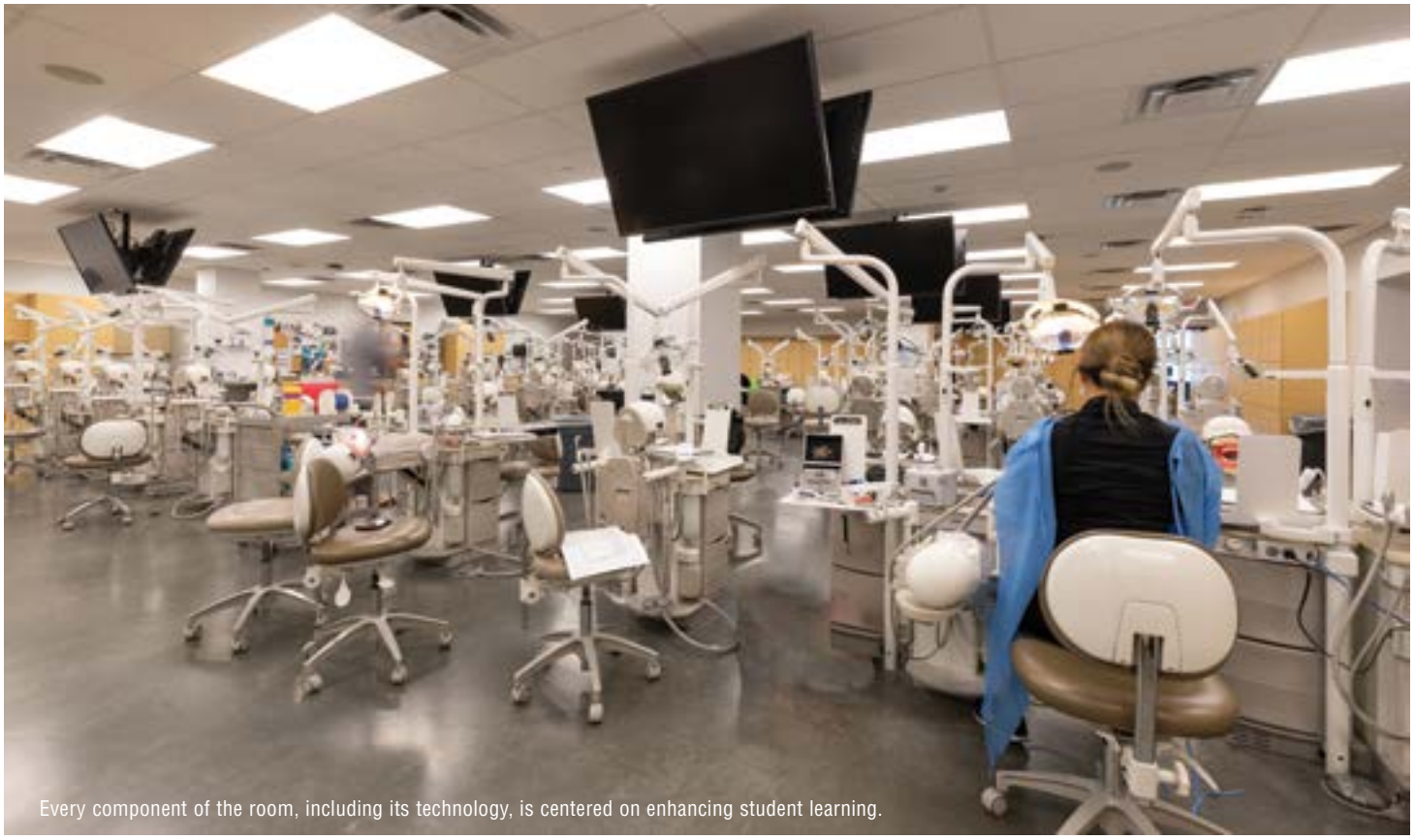
Overhead displays enable easy viewing for all students, regardless of where they are working.

to how we program the touchscreens that reflect the way they teach. We spent a lot of time interviewing the ECD Curriculum Manager and Assistant Professor, Brian Chui, who was in charge of that project. He's very up on technology. For example, the dental college needed a very special type of microscope and camera to show details of dental work to the students. We integrated the microscope and camera into the system and the touchscreens."

AV Integration

Within the Sim Lab, 20 NEC 55-inch flat-panel LED-backlit displays are arranged back to back in pairs. These displays are suspended from Chief ceiling mounts above the student stations. The ultra-HD displays are designed for 24/7 operation with reliable color reproduction of 10 bits or more.

"The NECs were selected for their reliability to reproduce colors more accurately than full-HD or other ultra-HD professional displays," Joe Perez, Chief Technology Officer at ClearTech, said. "They also provide great viewing angles for students, which really helped with the selected placement of the displays. The NECs offer full control of color, brightness and gamma, which was helpful, as well."



Every component of the room, including its technology, is centered on enhancing student learning.

The Sim Lab students are seated at individual student stations; there are approximately 80 of these stations. At each station, the students work on manikins seated in dentist chairs, as though they were actual patients. "Each student has their own manikin," Farah-Franco explained. "It's a model with plastic teeth made by a company called A-dec, [based in] Newberg OR. The student can practice all the procedures, including cleaning teeth and drilling, on a manikin with teeth."

The students can turn their attention from their manikins to the NEC displays mounted overhead when they need to.

Prior to this installation, each student station was equipped with a small computer monitor. Farah-Franco described how replacing those individual monitors with the NEC overhead displays has improved the learning experience. "Before this update, we only had 80 five-inch individual monitors for each student," she recalled. "When the Sim Lab was established in January 2010, we had AV, but we were only able to feed one zone at a time, and the signal was not 4K. It wasn't even high definition, which is cumbersome, because intra-orally in dentistry you have to have varying shades of white. So, the resolution and the ability to show the differences was not there."

"The new location of the large monitors really opens up the room visually," Steve Friedrichsen, DDS, Professor and Dean at Western U CDM, added. "The previous monitors were really like mini walls between the various units. I think it has improved the communication and socialization from that aspect, as well."

As noted, Brian Chui, DDS, Essentials of Clinical Dentistry (ECD) Curriculum Manager/Assistant Professor at Western U CDM, is credited with redesigning the Sim Lab's display system from the previous layout with individual monitors to the present layout featuring the 20 55-inch displays.

"We were able to work with Dr. Chui, who really came up with the graphical user interface that would make it easier to use and makes perfect sense from a user/instructor perspective," said Perez. "I worked on product selection, the number of sources and displays to fit the budget, as well as system schematics. [ClearTech Senior System Engineer] Ernie Luna did the commissioning and field engineering on this project and put our design into a functional system."

System Flexibility

Both ClearTech's Perez and Western U's Chui agreed that the updated system offered lots of flexibility. "The equipment was designed so that it would be future-proofed for the next five to 10 years," said Chui. "So, it's scalable." Affirming the flexibility of the updated AV, Chui noted, "If we wanted to, we could have 10 different sources running all at once in the room. So, there are multiple possibilities of teaching multiple topics all at once."

Regarding challenges, Chui said the position of the monitors was critical, because they needed to be visible to students who would be seated, for the most part. "Since we were limited to 20 monitors, we had to strategically place the monitors where students can view one or more displays," he explained.

"The project took about a month to install," Perez said. "The customer was very flexible with us doing the installation…. Some of the greater challenges were the amount of structural support necessary for the 55-inch monitors hanging over the student stations. The student stations are permanently affixed to the ground, so they can't be moved. Another challenge for us

was implementing the Crestron NVX system and having only been certified two days prior to the installation. But Crestron really helped us complete the project as intended."

The AV design for the Sim Lab prioritized flexibility and future expansion of the system, and, according to DeBono, Crestron NVX was an essential part of ensuring the viability of the system for years to come, although it presented a learning curve for ClearTech. "Using Creston's NVX was a way of futureproofing the system," she said. "With the number of sources and destinations, it ended up being a much more cost-effective solution for this particular client. Installing AV-over-IP was a change from our traditional AV systems."

The dental school also invested in a new Global A-Series dental microscope for training that provides a more than 100,000-lux output. "The intraoral dental microscope has been around for a while," Chui pointed out. "The new Global model is an upgrade that allows us to magnify the smallest details and get up to 20 times the normal size of a tooth. The microscope is mounted on a moveable arm, and the dentist positions the microscope to use for the procedure. Then, there's a high-definition camera that's attached to the microscope. So, whatever the dentist is doing is fed to the students for viewing."

"We had completed the install before the new scope showed up," said Perez. "So we provided HDMI for the scope and camera connections." The camera is a PTZOptics model with pan/tilt/zoom functions. ClearTech also provided two HDMI inputs for the client-furnished Dell 4K desktop PC and three HDMI inputs for laptop and auxiliary-type connectivity at the instructor's desk.

"The PTZ camera is used to record faculty as they're demonstrating the procedure, or for recording the actual procedure. So, the PTZ is a very fancy webcam," said Chui. "There's also an Elmo 4K document camera for the instructor to do more wide-scale, wide-view demonstrations, such as drawings." The existing Mediasite room recorder/streamer allows the students to review demonstrations later for clarification.

Sim Lab Audio

"The new audio system allows us to present four different zones in the area," said Chui. "Previously, we only had the ability to send audio to the Simulation Lab and the adjoining support lab. However, the current audio in the Sim Lab is broken up into three separate zones. So, if there's activity on the left side, we can send audio there without interfering with the other half of the class. The same goes for the right side." There's also a third setting that controls audio for the entire room.

The Sim Lab's adjoining support lab is the fourth audio zone. "The Sim Lab expands audio into this room so they can hear the lecture or anything that's going on in the main room," said Perez. "Both the Sim Lab and the support lab have their own wireless microphone for instructor presentations within each room."

There are 20 JBL 26C ceiling speakers in the Sim Lab and 10 in the adjoining support lab. "We knew that we wanted future flexibility, so we fed with Dante digital audio via Biamp DSP and a Yamaha digital amplifier," said Perez. "This combination has been great for us in the past and present. The school's internal AV team upgraded their wireless microphone system. ClearTech added a Shure antenna distribution

EQUIPMENT

Display System

10 Chief CMA115 ceiling plates
10 Chief LCB1U large flatpanel ceiling mounts
1 Dell custom high-end gaming PC dual 4K (2 HDMI sources)
1 Elmo MX-1+Connect Box 4K doc cam w/HDMI output expansion, 30fps, (1 HDMI source)
1 Global Surgical Equipment Global A-Series microscope
1 Mediasite RL220 room recorder/streamer
20 NEC X551UHD-AVT2 55" LED ultra-HD displays for 24/7 operation
3 PC laptops at instructor's desk (1 HDMI source)
1 PTZOptics HCM-1C-WH ceiling mount for HD Camera
1 PTZOptics PTI2X-NDI-WH PTZ HD camera w/NDI (1 HDMI source)

Audio System

1 Biamp TesiraFORTÉ DAN CI digital audio server w/12 analog inputs and 8 analog outputs
30 JBL Control 26C 6.5" ceiling speakers
3 RDL STD-10K passive audio dividers/combiners
2 Shure UA505 antenna brackets
2 Shure UA825 antenna cables for distribution
1 Shure UA844SWB antenna distribution system
2 Shure UA8-470-542 half-wave antennas
2 Shure ULXD4-G50 wireless mic receiver kits
4 Yamaha XMV4140-D multi-channel digital amps

Control/Switching System

1 Crestron CEN-SWPOE16 16-port PoE for touchpanels and device power
2 Crestron DMF-CI-8 DigitalMedia card chassis frames for DM-NVX encoders
20 Crestron DM-NVX-350 DigitalMedia 4K 4:4:4 HDR network AV encoders/decoders
11 Crestron DM-NVX-350C DigitalMedia 4K 4:4:4 HDR network AV encoder/decoder cards
1 Crestron DM-XIO-DIR-160 Digital Media Xi0 Director virtual switching appliance Crestron Fusion monitoring and scheduling software
1 Crestron Pro3 3 Series control system
1 Crestron TS-1542-TILT-B-S 15.6" HD touchscreen, tabletop w/tilt (black, smooth)
1 Crestron TSW-560-560-W-S 5" touchscreen, wall-mounted
1 Extreme Networks X440-G2-48P-10GE4 48-port network managed switch

Rack/Accessories

2 Furman PL-8C 9-outlet, 15 amp power conditioners w/pull-out lights
1 Middle Atlantic BGR-41SA-32 41RU equipment rack
1 Middle Atlantic BGR-552FT-FC rack-top fan exhaust kit
2 Middle Atlantic PDT-1620C-NS vertical power strips

List is published as supplied by ClearTech Media.

The dental simulation instructor media center.

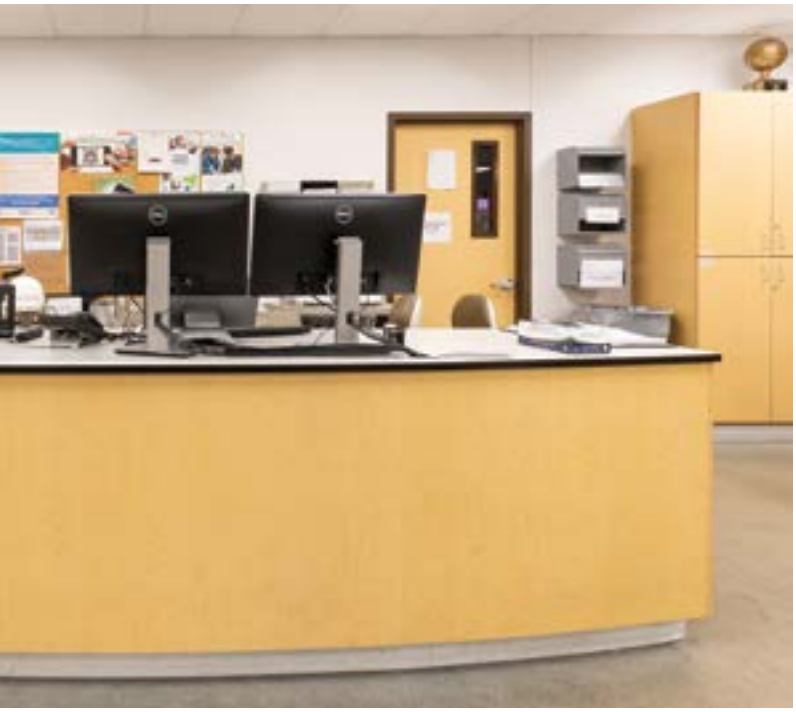
system to allow presenters to be anyplace within the two rooms and have the signal be reliable."

Regarding control and signal switching, "ClearTech installed AV-over-IP [infrastructure] in parallel to the client's network for the Crestron NVX and Dante systems only," said Perez. "In the future, the NVX can be added to the school's network. NVX enables any/all sources to be routed to any/all displays." Thus, Crestron's new NVX network AV solution provides greater flexibility and scalability for future expansion, as previously mentioned.

AV access is via a 15.6-inch HD tabletop touchscreen in the main room and a five-inch wall-mounted touchscreen in the support lab. ClearTech provided programming for the system, as well.

Digital Maturity

Miary Andriamiarisoa, Director of Educational Technology/Assistant Director for Innovation at Western U, gave his perspective on the new CDM AV update. He's involved with IT for the entire university. "My role is to ensure that we leverage technology in order to enhance teaching and learning," he shared. "I'm a promoter of technology. You know, we live in the 21st century, which is dominated by technology and also disrupted by technology. We have to make sure that we're using technology in a way that provides top-notch education for our students. That means ensuring that our classrooms and also our faculty members are well equipped from a technology standpoint."



He noted that translates into what's called "digital maturity," which relates to one's ability not only to understand technology, but also to solve practical problems at the organizational or institutional level. "That's all part of what I do here, so that our digital maturity level goes up every year," Andriamiarisoa said. "It's an exciting and challenging endeavor."

He explained that one of the technical challenges on this project was that the Sim Lab has a complex system where there is a large number of connected AV systems. Initially, every single student station in the Sim Lab had to be updated. Rather than have 80 displays for 80 student stations, the number of displays was pulled back to 20.

The upgrade in video resolution also added to the system's complexity. "There's the fact we went to 4K, where initially we were just using HD signals," Andriamiarisoa said. "So, moving from HD to 4K results in four times more traffic. We had to re-engineer the old system to a stage where it's a lot more manageable."

He highlighted two features that help the students reinforce their learning. One is the aforementioned Mediasite, which is a room recorder/streamer. "Students would like to review the lectures, so the whole lecture session conducted by a professor is recorded," Andriamiarisoa described. "We set up a [Mediasite] lecture-capture system in order to record the lectures and the sessions. Once the class is over, students can access the site. Students find this extremely helpful. On the spur of the moment, sitting in class, you don't have time to digest the material. But when you go back and review the whole session, the lecture-capture system allows you to get into deep learning as opposed to surface learning. You ingest a lot more of the learning component than otherwise."

The second learning-aid feature is Zoom videoconferencing. "Zoom is a streaming solution we've just incorporated within the dental lab," said Andriamiarisoa. "The idea is to allow external viewers to be participants. Zoom allows remote viewing and also offers recording. So, in addition to Mediasite, which records the local sessions, we have Zoom as a backup that can remotely record that session."

There's also Crestron Fusion software incorporated within the system that monitors all the AV equipment within the room. "Fusion allows you to know, for example, if a projector lamp is going to die within 25 hours," Andriamiarisoa said. "The Fusion monitoring system allows our tech-support team to operate the entire room remotely. Fusion plays a dual role. The first role is support that can be done via the web interface. The room can be controlled remotely. The second feature is that it gives you information about critical data on the use of AV components in the room, so you can be active rather than reactive when dealing with maintenance."

Patricia Lozano, Western U's Executive Assistant to the Chief of Staff and Executive Director, Public Affairs and Marketing, nicely summed up our article's informational goal. "I think how everything in the room and the equipment is set up helps the students enhance their learning," she said. "Times have changed. We don't use the same technology. Dentistry is done differently. The [Sim Lab] sets high expectations on how training is done."

We'll close with a simple dentistry lesson that anyone can learn, even without a high-end AV system: Be sure to brush and floss!