Defence Global

Rt Hon Ben Wallace
Secretary of State for Defence

UNIVERSITY OF NEBRASKA MEDICAL CENTER
iEXCEL℠

TTs
Providing Independent Testing, Evaluation and Research Services for the International Defence, Safety & Security Communities

BASE CAMP
CONNECT

UNMC | iEXCEL

Improving Human Performance & Effectiveness in Health Professions Education

Safety Focused, Outcomes Driven

Performance Enhancement

- Preparedness for disasters & pandemics
- Team training & hand-offs
- Safety focused – outcomes driven

Data Capture Model

- Technology enables data capture
- Measuring simulation adoption, facility & technology use
- Scheduling, inventory, invoicing, and competencies assessment

Return on Investment (ROI)

- Academic & business missions
- Relationships with industry & military
- Reputation enhancement
- Research & development collaboration

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Defence Global Contents

Covers:
University of Nebraska Medical Center, Base Camp Connect, Ordnance Test Solutions

Logo's Front Cover:
University of Nebraska Medical Center, Ordnance Test Solutions, Base Camp Connect

Credits: Images - Front Cover

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Other Images: Courtesy of Canadian Armed Forces, L3Harris, Royal Australian Navy

iEXCEL: Global Leadership in Improving Human Performance & Effectiveness in Health Professions Education

Bringing XReality to Healthcare Education & Training

Transforming the Healthcare Learning Environment:

iEXCEL is a visionary program at the University of Nebraska Medical Center (UNMC) designed to transform current healthcare professions education. This emerging interprofessional, experiential model is built upon a competency-based approach. Stepping boldly into the future involves accelerating the adoption of simulation to ensure preparedness and readiness as well as offer remote and distributed learning opportunities. In the Davis Global Center (iEXCEL headquarters), all healthcare disciplines, at all levels of training are engaging in interprofessional, experiential learning activities including the use of Virtual, Augmented and Holographic technologies (XReality).

To ensure mission success, iEXCEL requires a culture that is interdisciplinary with an emphasis on flexibility and open-mindedness to foster exploration and innovation. This hybrid training model facilitates learning through offering comprehensive simulation activities that blend XReality into the learning experience. The aim is to adopt XReality to motivate and accelerate learning and improve retention. This initiative requires the creation of medically accurate 3D (volumetric) images that help improve understanding of human anatomy and complex physiology. By taking advantage of total or partial immersion, learners become familiar with procedural skills, medical equipment and diverse environments. Learners can also engage as teams through these interactive 3D immersive experiences. This collaborative approach ensures that content designed for higher education blends with traditional "hands on" simulation throughout the building to provide a hybrid training model.

iEXCEL Visualization Studio:

Accelerated by the challenges presented by COVID-19 to provide immediate and accessible learning opportunities, virtual and augmented reality technologies are being rapidly incorporated to support both on-site and remote learning. After extensive reviews, iEXCEL came to the conclusion that highly accurate and full volumetric medical content was difficult to source. Therefore, a multidisciplinary content development team has been created. Based in a studio at iEXCEL, this team is already demonstrating extraordinary talent and medical content production capabilities by working closely with clinical subject matter experts at UNMC and Nebraska Medicine. The results are quite stunning, including interactive 3D medical models, holographic productions, and gamified educational materials. This iEXCEL content creation team combines digital twinning capabilities with accurate medical visual imagery to create learning experiences that are exciting, engaging and manipulable. These interactive volumetric assets can be viewed and interacted with in Head Mounted Displays (HMDs), on 3D CAD walls, in immersive environments (CAVEs), and accessed, viewed and maneuvered on mobile devices.

Infection & Replication of Lung Cell by COVID-19 Delta Variant

The iEXCEL studio is "housed" in the Davis Global Center. This space is occupied by a skilled and diverse team who create 3D imagery in this collaborative environment that is purposefully designed to balance the ability to focus and yet still engage as a team. The studio includes huddle spaces for team meetings, a writeable wall for storyboarding and design, and flexibility for design meetings. The studio was purposefully planned to welcome subject matter experts for advice and reviews, as well as provide their feedback as well as robust quality testing sessions. This partnership between clinicians and iEXCEL content creators is proving essential for success in the development of high quality and accurate medical imagery.

Applications for XReality in Training:

To ensure that future health care providers and practitioners are well-prepared for any medical scenario, including disasters and pandemics, iEXCEL has adopted a hybrid approach to training. This integrative method includes incorporation of immersive technologies and encourages awareness of the rapidly changing realities in the medical and public health fields. This model also provides insight into how trainees are responding to challenging scenarios medically, emotionally and physically. This intentional approach allows participants to see challenges as opportunities to overcome rather than immovable roadblocks. Instructors guide learners through a prebrief, then facilitate the pre-planned hands-on exercise, followed by a debrief (after action review). This method allows learners to make and face mistakes and communicate openly with peers. Immediate feedback with remediation plans is provided as necessary.
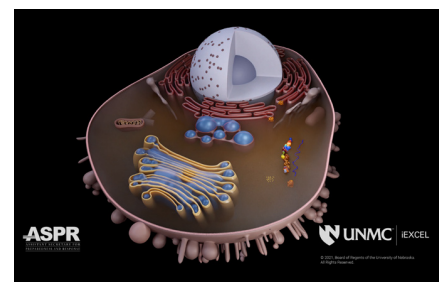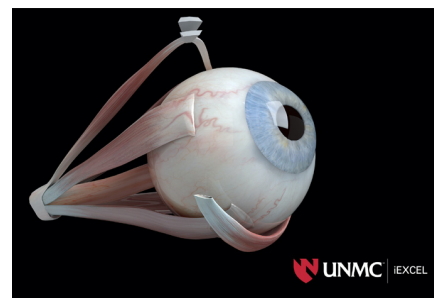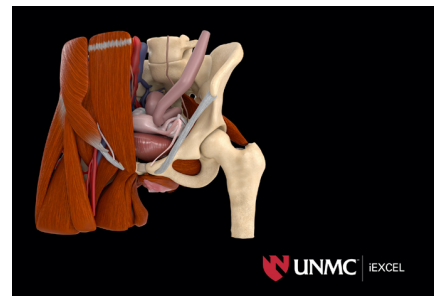
5-sided Laser CAVE: Digital Twinning of Medical Crash Cart

The iEXCEL studio has already created numerous assets and scenarios for disaster and bio preparedness, including donning and doffing, cleaning of infectious rooms, and transmission awareness. These modules augment hands - on simulation exercises that include transfer and transport from one level of care to the next. These assets introduce and reinforce scenarios in engaging and memorable ways. Other projects include a digitally twinned C-ARM for positioning without exposure to active radiation; pelvic anatomy that introduces vasculature and prolapse scenarios; and a coagulation cascade that demonstrates complex molecular interactions.
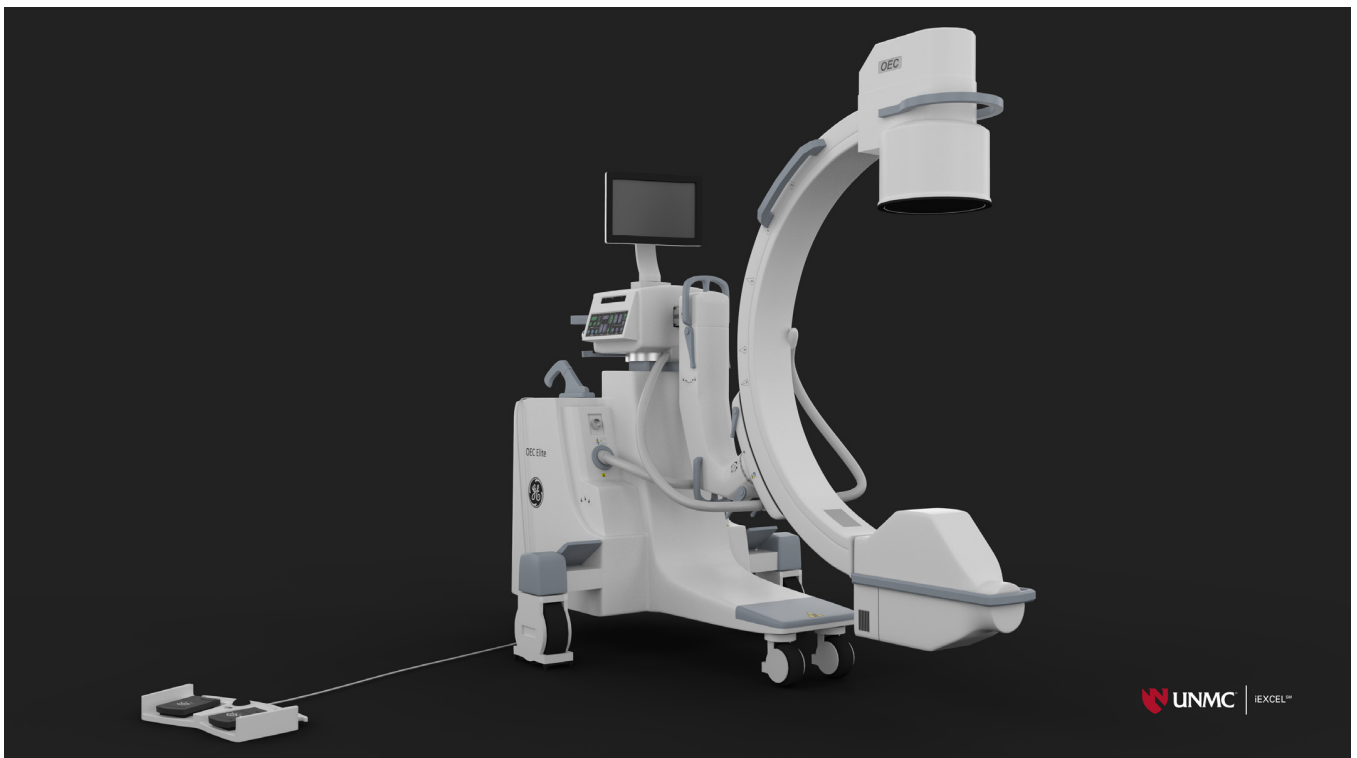
Platform agnostic 3D models of C-ARM

3D images of real patient data can also be used to create teaching modules – especially rarely seen pathologies. Incorporating patient data initially raised confidentiality concerns related to the US Health Insurance Portability Act (HIPPA). The iEXCEL content creation team works with clinicians to ensure that all patient data used for training imagery is anonymized prior to studio transfer for enhancement.

In addition to fulfilling the academic mission (curriculum and clinical practice), iEXCEL has attracted many business opportunities, including significant interest from industry partners to create medical content for the virtual worlds. Examples of industry projects to-date include: a multinational network specializing in non-clinical senior home care, an international pharmaceutical company, and a global facilities management corporation. Surgical companies are also seeing the potential for pre-surgical planning; using visualization to help enhance procedures; and research and development related to improving products and procedures. Projects are prioritized on a myriad of factors, including applicability to multiple disciplines, relevance and well-articulated and measurable objectives

Remote and Distributed Learning:
To ensure the 6 remote training sites in rural Nebraska are fully engaged in the same transformational learning experiences, interactive, digital walls have been installed at each site. These walls are connected in real time, so learners from multiple sites can simultaneously engage and communicate as teams. Therefore, with this collaborative software, and independent simulation labs at each site, learners in remote locations have access to the same standard of training. Visualization content created by iEXCEL is also shared across the State of Nebraska. This innovative approach ensures UNMC instructors in Omaha are available across the 500-mile wide UNMC campus. Unique cases, new standards of care, and interprofessional communication can be shared, allowing for preparedness exercises and, offering consistent education delivery regardless of location. XReality offers the opportunity for iEXCEL to foster innovation by deploying content that can be distributed across distance to remote training sites via augmented and virtual reality devices.

iEXCEL content creation studio

Summary:
Several key factors are proving essential to the success of the adoption of XReality in healthcare. One of the most critical is the ability to create high quality and accurate medical imagery. Assembling a highly skilled and interdisciplinary studio team is key to ensuring content meets the high standards necessary for training. In addition to offering special skills in medical illustration, animation, rendering, and computer programming, each member must be able to operate in a team environment. Whilst iEXCEL is still in the early stages of the integration of XReality into health professions education, instructors and learners are reporting they find this emerging field opens new and promising vistas. They confirm that 3D imagery, especially when combined with other simulation modalities, creates extraordinarily beneficial learning opportunities. One clear advantage is stimulation of the imagination related to how it can be applied to content delivery and performance improvement. XReality can certainly accelerate the understanding of complex medical processes, procedures, and concepts. There is also increasing recognition that XReality can be adopted to practice and guide patient care diagnostics and procedures using real patient data, such as CAT scans and MRIs. Due to the rapid adoption of visualization by our healthcare professionals and the promise of this method of content delivery, the visualization studio is currently responding to numerous and ever-increasing requests for virtual and distributable educational materials that "bring learning to life."

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