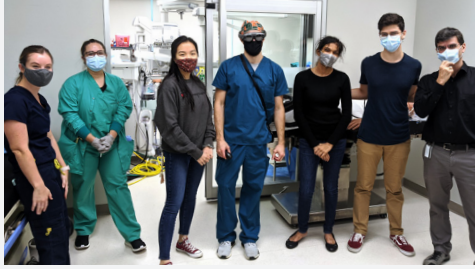




University of Miami students get in-demand job skills with Unity in the XR Garage

Unity helps students and faculty create innovative XR solutions and enhance learning campus-wide.





The challenge

To innovate and modernize curricula while imparting high-demand job skills

Unity solutions in use

XR Garage powered by Unity Pro, AR Foundation, ArtEngine, Asset Store, Pixyz, Reflect, XR Interaction Toolkit

Program size

15 students, 2 instructors

Location

Miami, U.S.

How does a school expand student capabilities and job skills while improving instructional effectiveness?

The University of Miami (UM) built their XR Garage program for students to learn how to create real-time 3D (RT3D) and virtual, augmented, and mixed reality (AR/VR/MR or XR) content while helping enhance curricula.

According to Burning Glass, industry demand for these skills has grown 601%¹ faster than the market overall and the skills are critically important components of the Industry 4.0 revolution. The student apps and solutions include medical visualizations used in surgeries, emergency training tools for nurses and first responders, as well as materials for physics classes and architectural walk-throughs.

A clear choice that checked all the boxes

To get their XR Garage program off the ground, UM turned to Unity. Max Cacchione, the IT department's director of innovation, had previously used Unity to develop AR solutions for autistic students. "It's imperative that any solution we use is easy to adopt, easy to scale, and can be rapidly deployed across a variety of departments and academic areas."

"We needed an XR development platform that had a low barrier to entry for both students and the faculty that would guide them."

– Max Cacchione, Director of Innovation, IT Department, University of Miami

The results

- 20+ completed projects for XR-enhanced learning materials used throughout UM schools
- 30 students trained in Unity, with two securing full-time positions as Unity developers
- Created an AR medical visualization application currently used by surgeons
- Built an immersive VR app to train staff for a new student services building while it was under construction
- Developed several health-focused XR projects including some staged for commercialization



UM answers the demand for XR developers

As one of America's top research universities, UM has always looked at the future of industry to best prepare its students. And with the rapid onset of XR technologies in the workplace, it was clear that UM needed to advance their interactive design and development programs to meet the skyrocketing demand for XR developers.

To this end, the UM IT department's Innovate group, which Cacchione heads, founded the XR Garage in May 2019. He says, "We needed an XR development platform that had a low barrier to entry for both students and the faculty that would guide them."

The importance of this was quickly apparent. Given the high demand for skilled Unity developers, finding qualified instructors for the new technology had been tough. Yet Unity's ease of use let students quickly jump in and start experimenting. UM also leveraged Unity's large, active community and a wealth of free educational content from [Unity Learn](#) to jumpstart the adoption process.

¹burning-glass.com/wp-content/uploads/Visualizing_future_3D_skills.pdf

This is where the magic happens

In the XR Garage, a team of 15 students and professional staff collaborate, completing courses and research in user experience, interaction design, human-computer interaction (HCI) technologies, machine-learning as well as Creative Coding, which teaches Unity as the primary platform. The IT department runs the program as a shared service that is offered to the entire UM academic community. Sponsors include Adobe, Florida Power & Light (FPL), and Magic Leap.

Typically, a professor comes to the XR Garage for help creating a more engaging and effective learning experience for their students. A project comes to life after considerable brainstorming and collaboration between students and staff, as Cacchione says, “That’s really where the magic happens – students know Unity, professors know the subject matter, and they work together as peers.” IT then provides the project management framework to see it through to delivery. This process includes:

- Conceptualizing XR apps and content
- Discovery and requirement definitions
- Storyboarding and wireframing
- Software development

Students get started with the XR Garage as “apprentices” in the IT department. Over three to six weeks, they’re introduced to the department’s agile/scrum methodologies and get familiar with the team and working environment. Tutorial training in Unity is a vital component, as Unity is the primary development tool used for all XR Garage projects.

The benefits are considerable: professors gain powerful XR instructional aids, their students learn more, and the XR Garage developers come away with vital career skills. The program also started contributing to the research impact of the university with a publication in *Informatics*, exploring the use of XR in operating rooms.



Working closely with the UM School of Medicine, XR Garage built the DICOM Visualizer for viewing patient images such as holograms during surgery.

“That’s really where the magic happens – students know Unity, professors know the subject matter, and they work together as peers.”

– Max Cacchione, Director of Innovation,
IT Department, University of Miami

“A key factor of our success is the student internship program, run by Max Cacchione. Max uses Agile to organize project activity and Unity as the underlying platform that powers our apps. These tools, along with practical experience, add richness and depth to our students’ educational experience and make them more marketable post-graduation.”

– Allan Gyorke, Chief Academic Technology Officer, University of Miami

Critical tools for surgeons, caregivers, educators, and adult learners

Using AR to visualize medical images from CT scans, MRIs, and ultrasounds is a breakthrough technique that the UM School of Medicine faculty sought to encourage. With their guidance, the XR Garage built the DICOM Visualizer application currently in use by several early adopters. According to the Innovate team's core programmer, Rachel DePaz, "Doctors can now view images such as holograms of a patient's spine during surgery – right in front of them. The app has the potential to really improve outcomes." Diagnosticians and clinicians also use it to study and collaborate on medical visualizations.

With XR training materials, nursing students and first responders can acclimate to real-world emergencies where experience is the reliable way to eliminate panic and solve problems quickly. One example is airway fire, where vapors from chemicals used in lung and trachea procedures actually ignite inside the patient's airway. By adding XR fire and smoke effects to a simulation sequence, trainees can get past the harrowing initial visual experience and learn how to respond calmly and effectively.

To cope with the pandemic, UM has been able to develop Unity-based applications for remote learning. Students and educators can share 3D models and interactive exercises from their own environments. These activities sometimes take place across the country, but also connect educator communities and students in real-time from Miami to Europe and throughout the Southern Hemisphere.

Rich Unity capabilities for diverse applications

UM leveraged a number of specialized Unity capabilities for creating more effective learning content. For example, the UM used [Pixyz](#) to prep, optimize, and import large CAD files, and created a point cloud of the entire UM campus that includes billions of data points.

For the UM School of Architecture, UM employed [Unity Reflect](#) to create 3D building walk-through experiences for both AR and VR headsets. They also used [Unity ArtEngine](#) to experiment with different architectural surfaces for reconstructing historical buildings. ArtEngine helps them automate and accelerate the photoconversion of physically based rendered (PBR) materials.

To speed content development for different headsets, XR Garage took advantage of both the [XR Interaction Toolkit](#) and [AR Foundation](#) packages. In particular, the toolkit's friendly and accessible UI empowered students who lacked coding experience, while AR Foundation helped make their content cross-platform compatible for different head-mounted displays and hand controllers. In addition, the [Unity Asset Store](#) provided a plethora of third-party resources such as avatars plus smoke, fire, and water effects.

"Working with Unity at UM opened doors to additional internship opportunities in the industry."

– Rachel DePaz, Core Programmer, Innovate Team, University of Miami

The report card looks good

Since the inception of the program, the XR Garage has developed 20-plus UM projects, obtained four grants, hired two student grant writers, and trained 30 students in Unity, with two springboarding to full-time jobs as Unity developers. The university is redesigning its Interactive Media program to be entirely Unity based, and according to DePaz, “Working with Unity at UM opened doors to additional internship opportunities in the industry.”

UM's Diana Arboleda, a structural engineering lecturer and Director of Robotics in Education, had a great experience working with XR Garage. “I met the UM Innovate team at a critical point when I was exploring mixed reality content for one of my classes. We started the work in the summer and by the beginning of the fall we had the first prototype for Vectors in Space that I delivered to my class. Thanks to that first experience, I was able to figure out the best way to integrate this type of technology into my courses.”





Other university leaders are also seeing the impact of the XR Garage projects and are increasingly willing to fund them as well as the XR Garage itself. When the provost and the UM health system (UHealth) launched an XR project RFP, they received three times more proposals than the number of awards offered and ended up funding 25 projects. Several projects were selected for Phase 2 funding for commercialization. DePaz says, “With this kind of financial support at early stages, UM has shown that it’s very serious about supporting XR.”

An advanced tool for the entire school

UM originally adopted Unity to help solve short-term needs with RT3D research and solutions. It’s beginner friendly for students, a powerful teaching tool for educators, and the ease of onboarding lets XR Garage deliver solutions for stakeholders across UM quickly. And it’s helping UM students develop the skills needed to meet an industry demand for RT3D and XR applications that will continue to grow.

Cacchione concludes, “This collaboration generates multiple opportunities. Instructors will get the support and training they need to enhance classroom education; students will acquire new, in-demand skills that mean greater employment opportunities; and, collaborating with Unity will advance our vision to be a leader in immersive media and technology.”

“It’s imperative that any solution we use is easy to adopt, easy to scale, and can be rapidly deployed across a variety of departments and academic areas.”

– Max Cacchione, Director of Innovation, IT Department, University of Miami



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