

Reimagining college chemistry

Virtual reality storytelling transforms science education at ASU

By Lauren Whitby, ASU News
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A molecule on a printed page is not a molecule at all.

That's how [Ian Gould](#) described a problem with traditional chemistry coursework. If students only see molecules on paper, critical misconceptions can develop about how chemical processes actually work.

That's because textbooks and handouts are often missing the context of how molecules function in their natural environment, not to mention how chemistry plays a role in addressing real-world challenges.

Gould, who is a President's Professor at Arizona State University's [School of Molecular Sciences](#) and associate dean of instructional innovation at [The College of Liberal Arts and Sciences](#), is part of a team at ASU hoping to change that.

Starting this fall, after a year of pilot courses, all students in CHM 113: General Chemistry I and CHM 114: General Chemistry for Engineers will participate in virtual reality [Dreamscape Learn](#) sessions that engage and immerse students in gripping narratives to make connections to the real-world applications of hands-on wet lab experiments.

VR in ASU biology

A [large-scale study](#) published earlier this year found that NeoBio, ASU's first VR curriculum developed in partnership with Dreamscape Learn, had a positive impact on student outcomes.

Regardless of demographic background, students performed well on lab assignments, with average grades of 90% or higher across all groups.

These courses, also known as NeoChem to describe this new way of teaching and learning, follow ASU's successful [NeoBio courses](#) and are the next installment of the university's work in expanding this approach to additional STEM courses and degrees.

Students were more likely to remain in School of Life Sciences majors.

Students achieved higher grades in subsequent 300-level genetics courses.

In the first Dreamscape Learn module, students pilot a craft to the edge of the Amazon rainforest to recover a cyber-weapon from the burned-out wreckage of a tech company. They uncover a mystery that they must solve by applying chemistry principles.

NeoBio, currently offered in BIO 100, BIO 181 and BIO 182, was honored at the [2025 Edison Awards](#) for innovation in education and learning.

"When you can see a real-life application, it makes you remember more about what you're learning," said Christian Bueno, an electrical engineering major from San Diego who took CHM 114 this summer. "For example, you use X-ray fluorescence, and that's using criminal investigations to check for certain types of elements that may occur in a crime scene."

Later, in Module 2, students visit a remote valley in the Himalayas and come face to face with a life-threatening crisis, where a chemical pollutant has permeated the region's water source and is rapidly spreading an illness among people and livestock.

"I like it because it gives us a chance to apply the kind of obscure-seeming chemistry skills we learn," said Gabriel Lariosa, a neuroscience and psychology double major from Plainfield, Illinois, who took CHM 113. "A lot of people think, 'When am I ever going to have to convert something into moles?' but the VR lab shows you a scenario where you might actually have to do something like that.

"I feel like I'm starting to grow attached to those little VR animals and stuff we're focusing on."

Students complete nine VR sessions and nine wet lab experiments throughout each course. Each session is connected to the next through the Dreamscape Learn narrative, which allows students to see how chemistry plays a role in human health, crime investigation, sustainability, space exploration and more.

"Dreamscape Learn helps us to teach chemistry in a way that it's pretty much impossible to do in a traditional lecture sense," said [Ara Austin](#), who is a clinical associate professor in the School of Molecular Sciences, assistant dean of instructional innovation at The College and member of the Dreamscape Learn team.

"There's nothing like taking a student and putting them in a world where they're like, 'Oh, I am the agent that's supposed to go and fix this problem.' You're not going to be able to convincingly sell that in the lecture to a student.

"For me, that's what Dreamscape Learn is. It's the bridge between taking technology and placing a person in a place that we are not going to, ever perhaps, be able to go to in our lifetime."

Through virtual reality, students engage with complex chemistry concepts, such as the three-dimensional properties of atoms and molecules, in ways that are impossible through a lecture or a textbook. They are immersed in molecular environments that show why chemical processes depend upon complex interactions and energy flow among trillions of molecules. They also learn how to virtually use state-of-the-art, and often expensive, high-tech instruments typically inaccessible in standard general chemistry courses.

The team behind the newly designed laboratory curriculum hopes to help more students feel capable of pursuing science fields, in addition to feeling more welcome in scientific discussion and communities.

(Video: {<https://youtu.be/cKgKjTyNgD8>})

When science curriculum was first developed in the 1950s and '60s, it was designed for small and elite groups of students. The traditional tactic of rote memorization does not work for many students, and many are often too intimidated to take STEM classes.

“Students don't need more chemistry; what they need more of are ways to see how chemistry works, to see the value of chemistry to society, and to see themselves as chemists,” Gould said.

“This is particularly important for those students who may not feel welcomed by the traditional academic science culture or who are minoritized in other ways. The Dreamscape environment is spectacularly successful in providing such experiences for students.”

Dreamscape Learn chemistry is founded on ASU's commitment to innovation as well as helping every student succeed. As more students feel empowered to study science, more leaders and problem solvers graduate inspired to solve the challenges they see in their local and global communities. Graduates who better grasp science can become the innovators who will benefit humankind.

“I believe that all people can do science, and I think that the traditional curriculum makes it harder for everyone to do science,” Austin said. “That is not on the student — that is on us to change and modernize and critically think about how we would like to evolve as an institution in higher ed. And I think Dreamscape Learn is doing exactly that.”

“Not only is it novel in the technology sense, but it helps us as educators to rethink about what we'd like to teach, what is essential in modern society and how can we get the students going, in order for them to be successful in the modern world.”

This story originally appeared on [ASU News](#).

Main image



Arizona State University's new Dreamscape Learn chemistry courses integrate virtual reality technology with hands-on wet labs, empowering students to better understand foundational chemistry principles as well as see their applications in the real world. Image by Meghan Finnerty and John Stobbe

Gallery



ASU student Gabriel Lariosa participates in a Dreamscape Learn session for his CHM 113 course.



Two ASU students perform an experiment in a chemistry lab as part of CHM 113.



A view of the periodic table from ASU's virtual reality Dreamscape Learn chemistry experience.



Nadia Kisela, a biological sciences major, participates in a Dreamscape Learn session for ASU's CHM 113 course.



Dominic Vargas, an aerospace engineering major, performs an experiment in ASU's CHM 114 course.



A virtual reality cockpit view from the ASU Dreamscape Learn chemistry experience.