

Interdisciplinary Curriculum

Newly established University of Minnesota Rochester has a radically different approach to higher education

Photos by Tom Roster, Black Star, for CrossTalk

By Kathy Witkowsky

ROCHESTER, MINNESOTA

IT'S NOT UNUSUAL to see student artwork displayed in the halls of universities. But student science projects? To highlight his institution's unusual interdisciplinary approach to health sciences, that's what Stephen Lehmkuhle, chancellor of the newly established University of Minnesota Rochester, chose to hang in the reception area next to his office. The informational posters explore specific health issues, their causes and their possible solutions. Designed last year by students enrolled in UMR's first-ever freshman class, the two framed examples—one on malaria, the other on melanoma—resulted from a joint assignment in biology, organic chemistry and writing, all required courses. As they often do at UMR, students worked on the project in small groups, which provides an interactive learning experience and teaches them how to function as part of a team. Then they had to present their findings to faculty—because public speaking is another key life skill.

"It really epitomizes what we're trying to do," said Lehmkuhle, who has set out to create what he calls "the university of the future": one that, as he puts it, "prepares students for jobs that don't yet exist, to solve problems that aren't yet known, using technologies that have not yet been invented." Indeed, he says, the world is changing so quickly that much of what freshmen learn will be outdated by the time they are juniors. So rather than

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stuffing students full of knowledge, universities should increase their capacity, as well as their desire, to learn.

That's not a new goal for educators. But because he was hired to start UMR from scratch, Lehmkuhle (pronounced "lem-cool") has been able to go about achieving it in a very intentional way. "What attracted me here was the opportunity to create the change rather than manage the change," said Lehmkuhle, who left the University of Missouri to take the job as UMR chancellor.

What Lehmkuhle and his vice chancellor, Claudia Neuhauser, have created is an undergraduate curriculum focused exclusively on the health sciences, with a strong

liberal arts component. More crucially, it is also based around, and tracks, a set of student learning outcomes and objectives, rather than faculty interests; it employs state-of-the-art technology and best-teaching practices to account for different learning styles; and it rewards tenure-track faculty for effective teaching as well as research—research in both their areas of expertise and on their students' learning.

With just one undergraduate program—a bachelor of science in health sciences (in the fall, it will add a second undergraduate degree, a bachelor of science in health professions)—UMR also turns the

traditional approach to higher education on its head by mandating a rigorous, tightly prescribed curriculum for its students' first two years, then allowing them to broaden into other areas as juniors and seniors, rather than the other way around. That gives the school the ability to ensure that all its students have the academic background and skills they need before they focus on their so-called "capstone" experience that will mark their final two years: up to 30 credit hours of research, internships, study abroad or other type of exploration in their chosen field.

It also means that UMR can coordinate its curriculum so that concepts are picked up and reinforced throughout a student's education, combating what Lehmkuhle calls the "Las Vegas" approach to learning that dominates at traditional institutions, where "what goes on in the classroom, stays in the classroom." Too often, he says, students study disparate ideas and concepts—and subsequently forget them—because it's not clear how those concepts connect to other disciplines or are otherwise relevant to their lives. Professors design courses they want to teach, and academic departments are financially rewarded based on course enrollments



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rather than student progress.

UMR has taken a radically different approach. “We want to make sure we actually build a curriculum, and not just individual courses,” said Neuhauser. “A new campus is such an opportunity to do things that are hard to do at an established university.” Its small size is also a distinct advantage: With a current enrollment of 140 students and just 20 faculty members, UMR is

able to be far more flexible and innovative than larger institutions.

A mathematician by training, Neuhauser began focusing on interdisciplinary instruction after she had her own “Las Vegas”-style experience in education in the mid-1990s, when she was teaching calculus at the University of Minnesota’s Twin Cities campus. The students didn’t seem to appreciate why they should bother with the subject. “I knew it was important, but it wasn’t reflected in the course I was teaching,” said Neuhauser. Recognizing that students learn better when they learn in context, she went on to write a calculus textbook specifically designed for biology majors.

At UMR, interdisciplinary assignments ensure that concepts don’t get lost in one course, but are picked up repeatedly. For instance, freshmen enrolled in both sociology and statistics have tried to figure out how much a pack of cigarettes would have to cost to cut the number of smokers in half; chemistry students have made glucose, then studied its effects in biology; students in bioethics have examined issues surrounding animal testing, specifically how big the animals’ cages should be and yet still be efficient, then designed and built cages in their statistics class.

“What we want to get them to do is understand that what they’re learning has practical applications in the world they’re going to be in,” said assistant professor Rebecca Bamford, who teaches bioethics. Bamford came to UMR from Hunter College, where, she said, she rarely had an opportunity to interact with faculty in different disciplines; her only conversation with a chemistry professor, for instance, was on a bus on

the way to a graduation ceremony. At UMR, by contrast, the professor who teaches chemistry is just down the hall, and Bamford has attended his classes to figure out ways they can collaborate. Faculty often sit in on each other’s classes; in some ways, Bamford said, it feels like “we’re actually taking the courses ourselves.”

Interdepartmental rivalries are non-existent because there are no academic departments. Instead, UMR has divided the traditional duties of a professor into separate jobs. There are tenure-track “design-based” faculty, who are responsible for designing the curriculum they teach as well as continuing research in their field of expertise; and “student-based” faculty, instructors who help implement the curriculum and are available outside of class to answer any questions the students have. Classes are team-taught between them. The school also has hired student “success coaches” who function as academic and career-path advisers throughout the students’ time at UMR.

Because it’s so new, there are few data by which to judge UMR, which will not graduate its first class until 2013. But students said that they like its highly structured curriculum and interdisciplinary approach. “It makes me more interested because then I can see [a subject] from all perspectives,” said Mary McCoy, a sophomore who helped research and design the poster about malaria that hangs outside Chancellor Lehmkuhle’s office.

Lehmkuhle was hired to take the helm of UMR in 2007, after many years at the University of Missouri, where he served in several senior administrative positions, including vice president for academic affairs. With a Ph.D. in experimental psychology, his interest in learning goes back to his days as a graduate student. Specifically, he studied how the brain processes visual information. Isolated brain cells, he notes, are ineffective at encoding information; the brain’s tremendous abilities derive from interconnectivity among many cells. Lehmkuhle believes that is an appropriate metaphor for an effective university as well.

So at UMR, connections are the name of the game. Connections between faculty, who coordinate teaching modules and assignments; connections between faculty and students, who are continually called upon to provide feedback about teaching methods (the faculty through research, the students through evaluations); and connections between the school and the Rochester community, especially with its renowned Mayo Clinic, which provides guest speakers and other opportunities for students (such as job shadowing and observing surgeries) as they explore careers in the health sciences.

Those connections are reinforced by the school’s location and layout: It occupies the third and fourth floors of University Square, a high-end mall that connects with much of downtown Rochester, including the Mayo Clinic, through a series of skywalks and underground passageways. Classrooms, known in UMR parlance as “learning labs,” are designed so students face each other to optimize interaction and small-group work. All students are issued Lenovo ThinkPad laptop computers that they lease from the school, so they can network with

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each other and broadcast onto central classroom monitors. Private study rooms, administrative offices and a number of the classrooms surround a student commons area that contains a cluster of comfortable chairs and sofas and tables where

students—and often faculty as well—hang out when they are not in class.

UMR has quickly earned the respect and support of the Rochester business community, said John Wade, president of the Rochester Area Chamber of Commerce, which is hoping to see 8,000 to 10,000 new jobs created over the next decade. The school's innovative, collaborative model is exactly what Rochester needed, according to Wade. "It's absolutely essential to the growth and development of this community," he said.

But the modest setting wasn't necessarily what folks in the Rochester community had in mind as they lobbied for years to get the University of Minnesota to locate a branch campus there. "People think of universities in terms of infrastructure and sports. They wanted a lot of students. They wanted to be big. They wanted a football stadium," said Lehmkuhle.

But Lehmkuhle believed that economic realities required him to develop a niche-based, tuition-driven school. So what the community got instead when UMR welcomed its first 57 undergraduates in 2009 was a lean, highly focused academic institution, a place where the library, called the "information commons," consists of a couple of shelves of reference books, a dozen computers and an interlibrary loan program; a university that has a mascot—the raptor—but no sports teams; and where the local YMCA functions as the student gym.

None of which seems to bother the students much. Sophomore Evan Doyle, who's from Canton, South Dakota, and is president of UMR's newly created student government—the Rochester Student Association—said that what the school lacks in traditional extracurricular activities it more than makes up for in the opportunity to help build UMR from the ground up, to create new student clubs and activities, and to contribute feedback for the development of the curriculum. In fact, Doyle joked, "The hardest part about going here is convincing your friends that it's a school—because it's above a mall."

There are no plans for a football team or stadium, but UMR is involved in a private-public partnership that will provide student housing and additional classroom and office space in a downtown building next year. The new building will be a complete living-learning environment,

and will accommodate enrollment growth: UMR plans to increase its freshman class by 50 students each year, Lehmkuhle said, until total enrollment hits 1,000, not including another 400 to 500 students enrolled in joint programs UMR operates in conjunction with other institutions.

Long-range, the school does intend to have its own campus on the edge of downtown, but it will be limited in scope; the school is likely to retain its current space above the mall as well. "Bigger is not necessarily better. So I don't want to measure our success on how big we are, but rather on how good we are," Lehmkuhle said.

That's fine with sophomore Hannah Salk, of St. Cloud. "I don't feel like I'm missing out at all on the things a large school has," said Salk, the great granddaughter of Jonas Salk, who developed the polio vaccine. On the contrary, she prefers the small environs of UMR. "I like that professors know my name and where I'm from, and that they can gear their classes to the students," she said.

With their encouragement, she has also starting to explore and value her own learning style. After struggling to understand and remember biological processes—such as aerobic and anaerobic respiration, calcium absorption and DNA replication—Salk, an enthusiastic artist in high school, took to sketching them on paper bags. When her professor, Robert Dunbar, saw the drawings, he suggested she use them for an independent study project. Now she is working with him and a professor of literature to turn those drawings into an instructional book for kids. That's something that probably would not have happened at another university, she said. "Anywhere else, they don't care how you learn as long as you learn. Whereas here, they focus a lot on different styles of learning," she said.

But that was a secondary reason for enrolling. A former patient at Mayo, Salk decided to attend UMR



Mary McCoy, a sophomore at the University of Minnesota Rochester (posing next to a poster about malaria that she helped to research and design), appreciates the campus' highly structured curriculum and interdisciplinary approach.

in large part because of its ties to the medical clinic—a connection that she said has paid off. On three different days during March, for instance, she and her classmates from anatomy and physiology descended the escalator and walked through a passageway to Mayo Clinic lab where, supervised by their UMR professor as well as two professors from Mayo's department of anatomy, they were able to dissect and examine human cadavers.

"It was a huge learning experience. And not just in an anatomical sense—in a tactile way," Salk said afterward. She was struck by how spongy the heart is, and by the size of the aortic valve and esophagus. And she was excited to feel how tight tendons really are, and to learn where the nerves innervate the muscles.

It was an unusual opportunity for underclassmen, and Salk was thrilled. She had originally wanted to be a dentist, but now, after being exposed to other options at UMR, she plans to become a doctor. "Studying from a book gets old," she said. "Going to a lab like this just reignites the passion." She said that she felt completely prepared on both an emotional and intellectual level, thanks to numerous discussions she'd had in different classes.

"Pretty much since the get-go, we've been talking about using cadavers," Salk said. During the first semester of her freshman year, her humanities class discussed different cultural attitudes toward death. In her second semester, her ethics class addressed questions associated with the use of cadavers, while her biology class had the option of attending a lab where Mayo Clinic faculty, staff and medical students pointed out anatomical features in cadavers that had already been dissected. (Salk was fascinated, but the experience prompted some of her classmates to realize they needed to rethink their career goals—an equally useful result.) Prior to that lab, the students had a presentation by Mayo Clinic faculty and staff on what to expect in the lab.

When Salk returned to school as a sophomore this past fall, a UMR literature professor with expertise in historical medical texts visited her anatomy and physiology class, where she tried to get them to think about the human body as a learning tool without completely objectifying it. As part of that discussion, students partnered up and identified superficial anatomical structures such as muscles and tendons on each other's bodies—in the process, learning how to be personally and culturally sensitive. And just prior to the three cadaver labs this spring semester, the director of anatomical services at Mayo came to Salk's class and gave a presentation explaining how the cadavers are procured (most die from natural causes, and all have chosen to donate their bodies) and about appropriate behavior in the lab.

"I had all the tools that I needed," Salk said. "So I knew what to expect."

True to UMR form, her professor, Robert Dunbar, administered a survey of the students before and after the labs. What he discovered was encouraging, he said: After the lab, more students said they would be willing to donate their bodies to science. "They really saw the value in the experience," Dunbar said.

Like his UMR colleagues, Dunbar, an associate professor who earned a Ph.D. in neuroscience, was hired because he has a passion for teaching as well as research. So he often checks in with his students to get their reactions. Based on student feedback, he adjusts exam dates, assignment due dates—even assignments themselves. Now Dunbar, who has an interest in learning and memory, is studying the dynamics of group learning, by having his students take exams twice: once as individuals, and once in small groups. He has discovered that the group scores are consistently 15 to 20 percent higher, and he is trying to figure out why.

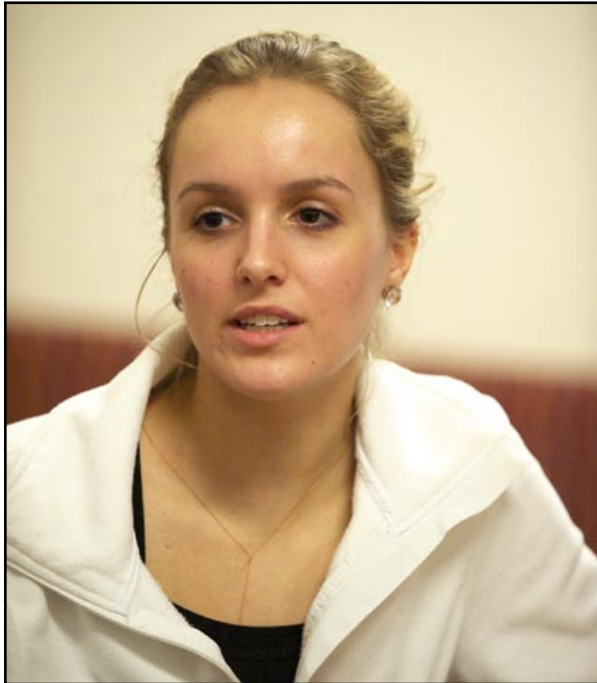
As for the interdisciplinary nature of UMR's program,

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Student "success coaches" function as academic and career-path advisers throughout the students' time at UMR.



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“it’s just incredible,” Dunbar said. “The depth of my understanding of a topic is improved tremendously by engaging with people outside my discipline. And that manifests itself in the classroom.”

Also like his colleagues, Dunbar acknowledged that the interdisciplinary approach is a lot of work. “It can be a pain,” he said. “It can be much more labor intensive than doing it on your own.” Just as the students sometimes struggle with working in groups, so, too, do the professors, he said.

In fact, it has been more challenging than anticipated to coordinate the curriculum, said Vice Chancellor Neuhauser. Initially the plan was to have all students take the same courses for the first two years, and for learning modules or units to be taught across all the classes students were taking. That has proven to be unwieldy, because some students—transfers, for instance—might not need some of the required courses. And it is too difficult for faculty to coordinate subjects across the entire curriculum. Classes are still designed and taught in modules, and faculty still endeavor to know and reiterate what their colleagues are teaching. And they continue to design interdisciplinary assignments—just not in every course that students are taking. “Obviously, building a totally new program is a challenge,” Neuhauser said. “But overall I think it’s working quite well.”

At this point, Neuhauser’s conclusion is based on anecdotal evidence and retention rates. Only 43 of 57 students who enrolled at UMR in the fall of 2009 returned the next fall; the sophomore class is now down to 35. But this year, 98 of 102 freshmen who started in the fall returned to campus for the spring semester, where they were joined by seven new students, for a net gain of three

students. Chancellor Lehmkuhle said he believes that the retention rates have improved, in part, because UMR is getting better at identifying and recruiting students whose interests and academic abilities are suited to the program.

Soon, UMR hopes to have more sophisticated means to assist its students. Typically, an institution records only student grades. UMR is capturing not only grades but all of its students’ assignments, which are preserved electronically, in essence saving a portfolio of work that the entire faculty can analyze, the same way doctors look over a patient’s entire medical record to diagnose them and prescribe a course of treatment. “Over time, we will begin to mine that data to look for relationships between how students perform in different concepts in different courses,” said Lehmkuhle. That, in turn, will enable UMR’s administration and faculty to adapt its teaching techniques to be more responsive to the needs of individual students, he explained.

Both students and faculty appear acutely aware that they are involved in what could be an important experiment. “I feel a little bit of responsibility to this university,” said student government president Doyle, who plans to become a doctor. “I feel if I don’t succeed, then this university won’t succeed.” So while the constant course evaluations students are asked to fill out can sometimes be “annoying,” Doyle and his peers take them seriously. “Students want to impact the success of the program as much as the faculty do,” he said.

“What really attracted me to this job was that they were trying so many unique and creative things with teaching,” said Molly Dingel, an associate professor who teaches sociology. Not everything has been successful, she said. But, she added, “When you’re trying new things, not everything is going to be successful.”

Chancellor Lehmkuhle agrees. “We’re building and flying the plane at the same time,” he said. He does hope that as higher education is redesigned, as he believes it will have to be, UMR will be able to serve as a model for other institutions looking to deliver education tailored to the needs of the modern world. But to be effective, higher education must continue to adapt. So ideally, UMR will be a constant work in progress. Said Lehmkuhle: “Once we think we have it figured out, we’re doomed.” ♦

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