Mary Boone came to the MBA program at Carnegie Mellon University’s Tepper School of Business in Pittsburgh, Pennsylvania, as an engineer with an interest in product development. To get a more complete picture of the product design process, she enrolled in Tepper’s 14-week course on integrated product development. Boone worked with two design students and two engineering students to develop a ventilated truck-driving shoe to improve truckers’ circulation after long hours on the road.

“I wanted that cross-disciplinary experience,” says Boone, who now works as director of market development for an electronic display company in Pittsburgh. “You can’t just put a product on the market and hope the market wants it. It took our team’s combination of perspectives to discover what truckers need, not just what business thinks they need.”

Boone is among a growing number of business students who enroll in multidisciplinary courses in innovation and design—to learn to adopt the skills and tools of “design thinking.” In these courses, students quickly learn that creativity alone may not result in ideas that make good business sense. Instead, they discover that it often takes collaboration across functional disciplines to see all the possibilities and develop economically viable business solutions.

By working with their counterparts in design, engineering, and other disciplines, business students don’t just broaden their perspectives and advance their problem-solving skills, say the educators behind these courses. They also begin to appreciate the value a designer’s creativity and an engineer’s precision can add to their own views on business.

**Special Teams**

Cross-disciplinary collaboration is a hallmark of innovation, says Laurie Weingart, a professor of organizational behavior and theory at Tepper. Yet, it can be one of the most difficult hurdles for students to clear. “Students often lack an understanding of the language and thought processes of other disciplines,” she says. “And people often resist what they don’t understand.”

Weingart taught Boone’s course in integrated product development with two professors of marketing, a professor of engineering, and a professor of design. In the Tepper course, she explains, the first step is to help students appreciate the different skills and viewpoints their teammates have to offer. In fact, her students’ first assignment is to go out together for drinks and social interaction. “Students enjoy the assignment, but they often don’t know why they’re doing it,” says Weingart. “But later in the semester, when the pressure’s on, they realize why they needed to understand each other better.”

Mitzi Montoya-Weiss, professor of marketing innovation at North Carolina State University’s College of Management in Raleigh, agrees that students gain a new understanding of the innovation process when they realize what other disciplines have to offer. She saw that process in action when a student team in one of her courses was developing a new single-dose inhaler device for asthmatics.
“The design students wanted to go on a nature walk, as a group, for inspiration. The business and engineering students complained that a nature walk was a waste of time,” she says. “But guess what? It was the design group that eventually came up with the mechanism for the product, using the same flow matrix that you see inside a sea shell.” That’s a lesson in inspiration that business and engineering students often have to see—and experience—to believe, she says.

Empathy & Ethnography
Once students are comfortable on their teams, they begin to employ a three-step process, one that many educators have determined are key to innovation. First, they complete intensive research to understand the needs of the users or environments in question. Next, they sketch, role play, or exchange ideas that can lead to solutions. Finally, they choose the most promising idea and develop a prototype and business model that can translate that idea to real-world success.

To develop a comprehensive understanding of the user—or “user empathy”—students engage in “ethnographic observation,” a technique often used in sociology to observe the ways users interact with a product or environment. Students go out into the field to conduct interviews, interact with users, and document processes via photography and notes.

This technique is much different from traditional surveys and focus groups that businesses often use to try to understand their customers. The trouble with those tools is that the information isn’t always accurate, explains Jeremy Alexis, an assistant professor of design at the Illinois Institute of Technology’s Institute of Design in Chicago. Customers often exaggerate or tell interviewers what they want to hear. Or, they may simply not know what they want.

Ethnographic observation allows students to witness needs that users may not even realize they have, says Alexis, who helped create a dual degree program between the Institute of Design and IIT’s Stuart School of Business. “To understand the long-term needs of customers, students have to spend a lot of time with them, interacting with them in different ways than most businesses currently do,” says Alexis. “User empathy is a huge element in design thinking.”

Once students complete their ethnographic research, they return to the lab to enter the prototyping phase. They act out scenarios, create storyboards, sketch drawings—techniques that are typical of the design world but are outside the experience of many in business. Finally, once they’ve created prototypes of their best ideas, they develop business models that take costs and other constraints into account to make those ideas work in the real world.

“A Course for Innovation
How one business professor brings the language and tools of design into the business classroom.
by Youngjin Yoo

The National Aeronautics and Space Administration has landed men on the moon and sent robots to Mars. The innovation consultancy firm IDEO has invented products ranging from disposable insulin injectors to space-age shopping carts. And the architectural firm of Frank O. Gehry has designed the gravity-defying Guggenheim Museum in Bilbao, Spain. What do these organizations have that others don’t?

True, NASA, IDEO, and Gehry benefit from exceptionally talented people, not to mention big budgets. But they’re also differentiated by their mindsets. They see themselves not as stewards of a world that they inherit, but as creative forces that shape and change the world for the better. They speak in the language of possibility, not limitations. In short, they see themselves as designers.

There’s a profound disconnect between the language these companies use and the language we use in typical MBA programs. At business school, we often teach students to focus on control and the status quo; they learn to make choices from a relatively narrow set of existing alternatives. The complex world of management is radically reduced to numbers—net present values, survey results, and spreadsheet reports—with black-and-white clarity.

I believe that business students can benefit greatly from adopting the language of design and innovation. I created the course “Designing Innovation in an iPod World” for the Fox School of Business at Temple University in Philadelphia, Pennsylvania, to give them that opportunity.

From Decision Making To Designing
Design as a core element of professional management is not a new idea. In fact, Herb Simon wrote in his 1996 book The Sciences of the Artificial: “Everyone designs who devises courses of action aimed at changing existing
Three-Dimensional Modeling

Over the course of the semester, students learned to analyze the users of a product, service, experience, or operation in three dimensions: time, action, and experience. Through such comprehensive observation, students could better empathize with the user and consider multiple perspectives as they sought innovative solutions to a problem.

For instance, I asked students to look for an innovation opportunity in the typical clothes shopping experience. They had to look beyond the act of choosing and purchasing an item and instead view the experience in three dimensions. First, they developed a timeline, following the shopper as he or she leaves home, drives to the store, enters the store, browses, selects an item, purchases the item, drives home, unpacks it, and uses it. Next, they identified all the actors involved, including not only the shopper, but also people such as the salesclerk, the child with her mother, or the husband waiting for his wife outside the dressing room. Finally, they explored the different experiences involved in shopping, including the emotional, cognitive, social, physiological, and cultural.

Such a three-dimensional framework requires students to explore the whole experience, rather than only one small part. In addition, this exploration allows them to better empathize with those involved, understand the experience more comprehensively, and see more opportunities for innovation.

Using the Tools of Design

As part of the course, students worked on a semesterlong team project in which they applied the methods, concepts, and frameworks they had learned to design a novel product or service. In this case, student teams spent one week studying the experiences of residents, commuters, and visitors in the city of Philadelphia, which recently implemented a citywide free wireless network. They conducted field research by following, observing, and talking to their target users.

I combined the introduction of these methods with discussions about the differences between decision making and design thinking: Decision making, for instance, asks the question, “Should we do ‘A’ or ‘B’?” Design thinking, however, asks the question: “What could we do to improve this situation? What are the possibilities?” I invited guest speakers from organizations that are embracing the use of design in their businesses, such as IBM, IDEO, Samsung, and the city of Philadelphia. These guest lecturers shared their stories and further defined the difference between making decisions and driving innovation.

Youngjin Yoo of the Fox School of Business with storyboards that his students created to develop new products. The storyboards were part of Yoo’s course “Designing Innovation in an iPod World.”
Based on their observations, the teams participated in a design workshop where they wrote narratives and role played, to better target aspects of the user experience that could be improved. Each team imagined alternatives, chose one that showed the most promise, and designed a prototype that they felt would transform the experience of using Philadelphia’s wireless network.

One group created a small device called the Philadelphia Urban Communicator (PUC), which used voice-over-Internet-protocol (VoIP), a pedestrian navigation service, instant messaging, and other functions to help pedestrians navigate the city more easily. The prototype also incorporated a system by which pedestrians could pass the device over a bar code on each building to obtain quick information about the offices, shops, and restaurants within. Another team designed a device for tourists that would replace a traditional city guidebook. The handheld computer would integrate with Google Maps and include information and visitor recommendations regarding landmarks, restaurants, and other points of interest. It could be sold to hotels and travel agents and rented to tourists through tourism Web portals.

Of course, both of these teams grappled with the challenges their products presented: How could they create alliances with the number of business partners that would be required to make their products work? How could they reach their target audience on the scale required to make it successful? But they addressed these challenges after they delved into all the possibilities open to them. Not hampered by limitations, they were able to go beyond the status quo to try to think of something new that met a user need.

Students also provided feedback and constructive criticism to other teams. In this way, they shared their excitement—and frustration—as they embraced a different approach to problem solving and wrestled with innovation.

**Limitless Possibilities**

Throughout the course, I had to overcome some misconceptions among my students. Many students, particularly those with strategy, entrepreneurship, and marketing backgrounds, responded well to these new concepts. However, those with mostly technical backgrounds struggled to grasp the notion of design; they came into the class thinking they would learn the technical skills for programming and development. Because of the title of the course, a few students actually thought they would receive a free iPod!

Some students simply weren’t convinced that they could learn anything by going out into the field and talking to people directly. These students returned to class with conveniently arranged interviews with their friends and family members. I was disappointed in this initial attitude and worked to overcome it. The group project, in many cases, addressed this problem. Once students built their physical models, based on the ideas sparked by their field research, they saw the value of observing and interacting with users to drive the innovation process.

In the future, I plan to incorporate the online virtual community Second Life into the course as a place where students can simulate their design ideas. I’d also like to stretch my students’ thinking even further by introducing other design tools and concepts, such as bricolage, which refers to the designer’s creative use of the materials at hand, and the notion of gestalt, in which a larger system is so well unified that it cannot be reduced to the individual patterns that comprise it. I’ll also face the continuing challenge of balancing the in-class discussion with work in the field. Ultimately, I hope to invite students from design, architecture, engineering, and urban studies to enroll in the class, to add their different perspectives to the process.

The rapid development of digital technologies presents seemingly boundless opportunities to innovate products, processes, and services. What holds us back is our inability to imagine a new future that we haven’t seen yet. To paraphrase the philosopher Ludwig Wittgenstein, the limits of our language are the limits of our world. It is precisely the limits of our language in management that restrict our ability to conceive and design a better world.

The business curriculum, too, needs a context where students can learn to be playful, imaginative, and empathetic. A course or program in design thinking provides students with the opportunity to learn concrete concepts and methods they can use to spark the innovation process. And it offers them a vibrant new language they can use to explore multiple—not limited—possibilities.

Youngjin Yoo is an associate professor of management information systems at Temple University’s Fox School of Business and Management in Philadelphia, Pennsylvania.
Solving Human Problems

Courses in design and innovation often revolve around “human problems,” in areas such as technology, the environment, or healthcare. “If a company needs to choose what software program to install in its manufacturing facility, that’s not a design problem,” explains Karl Ulrich, professor of operations and information management at The Wharton School at the University of Pennsylvania in Philadelphia. However, he adds, if a company needs to make its manufacturing facility more user-friendly for its workers, that is a design problem.

“For me, this process starts with sensing a gap in the world,” says Ulrich, who teaches the course “Innovation, Problem Solving, and Design” at Wharton. “This gap could be a customer need, but it could also be a need for an improved process in an operation or a need to improve an aspect of society.”

Heather Fraser directs the Design Initiative at the University of Toronto’s Rotman School of Management in Ontario, Canada. She also directs the school’s designworks innovation lab. In the lab, business and industrial design students work on a variety of projects, ranging from developing ways to help people maintain their brain functions well into old age to working with a cancer center to improve the chemotherapy experience for patients.

In the latter example, students look beyond what happens to patients as they enter the chemotherapy clinic, says Fraser. “They ask patients to take pictures and tell us stories of their experience, rather than answer directed questions. Rather than focusing only on what the staff does or the way the walls are painted, students learn more about patients’ broader experience before, during, and after chemotherapy. In that way, they can better understand patients’ needs.”

Not Just Creativity

Multidisciplinary collaboration will be crucial to many emerging fields, such as technology, environmental sustainability, and especially healthcare, says Gretchen Gscheidle, lead researcher at Herman Miller, headquartered in Chicago, Illinois. The prominent design firm works with InnovationSpace, a lab at Arizona State University in Tempe, which teams up students from four disciplines—business, engineering, industrial design, and visual communications. Student teams at InnovationSpace work together for two semesters to design new products or processes for real-world businesses.

Herman Miller, for example, asks students to look at ways to improve healthcare environments, both in the home for aging baby boomers and in critical care hospital environments. “These projects aren’t just exercises in creativity. We are bringing rigor to the process, so they won’t be surprised when they enter the workforce and are asked to work on long-term projects on cross-functional teams,” says Gscheidle. “We want to give them a head start.”

Intel, also a sponsor of InnovationSpace, challenges student teams to study two dissimilar user groups—audiophiles and the hearing impaired—and find ways both groups can optimize their hearing environments. It also has asked students to discover ways to camouflage technology in seemingly everyday objects, such as women’s purses. In both instances, teams had to develop strong concepts, write persuasive presentations, and sell the viability of their ideas.

“This approach mirrors our own approach at Intel in terms of mixing disciplines to tackle problems,” says Shauna Pettit-Brown, who works in exploratory market research for Intel’s health research and innovation division. “You can’t really make progress in our arena without covering all the value vectors that InnovationSpace teaches: filling user needs, finding business value, creating technologically feasible solutions, and doing good for the world.”

In the dual business-design degree program at the Illinois
Institute of Design, students used direct observation to help a prominent audio equipment company solve a mystery. Annual customer surveys revealed that, every year, fewer customers would recommend the company’s audio equipment to others—and the company didn’t know why. After spending time in one of the company’s showrooms and even following products to the customers’ homes, the students discovered a disconnect between customers’ excitement about buying the product and their experience of owning and using it. It turned out that customers were dissatisfied because the product didn’t do everything they thought it would.

That discovery was a real “aha moment,” says Alexis. “The students found that the company really needed to follow the entire customer experience, from consideration to use.”

From Abstraction to Action

No matter what their background is—design, engineering, or business—students must learn that interdisciplinary design goes beyond the creation of a well-designed object. They must also understand how they can apply design principles to a business’s entire operation, corporate culture, and future strategy, says Jeanne Liedtka, associate professor and director of the Batten Institute at the Darden Graduate School of Business Administration at the University of Virginia in Charlottesville.

To help students in her business design course make that connection, Liedtka asks them to bring to class an object that they believe is elegantly designed. They bring in everything from a corkscrew to a picture of a Porsche Boxter, she says. Liedtka then breaks the class into small groups to discuss each item. The students generally agree on the characteristics of a well-designed object. They’re simple and user-friendly. They evoke some kind of emotion. They are familiar while also possessing some novel quality. “After they talk it through,” says Liedtka, “I ask, ‘Does your business strategy have these qualities? If not, why not?’”

Sandy Shield, an architect and adjunct professor at the University of Richmond’s Robins School of Business in Virginia, taught the school’s first course in design principles to MBA students last year. To illustrate how much impact great design can have on a business operation, Shield took her students to a recently remodeled chain of bowling alleys. The spaces had been fitted with larger restrooms, brighter interior finishes, and cheerier restaurant areas designed to transform the customer’s perception of a bowling alley, from a dark bar environment to a family-friendly facility that would appeal to a wider range of customers.

“My students learned that simplicity consistently executed is better than sophistication poorly executed,” says Shield. “They saw how design thinking can empower them to view problem solving from a new, integrated perspective.”

Empowering people to feel comfortable with design, and see its value to business, is an important element of courses in innovation, agrees Alexis. He notes that even as interdisciplinary design gains ground in the business curriculum, there still exists a fear of the word “design” among business managers. “For some, the word implies fashion or fads, something that’s just temporary, that can’t be measured or controlled,” he says. “We have to show people that design thinking is a valid discipline that adds long-term value to the business curriculum.”

“The Next Stage of Education”

For James Hershauer, a professor of management with ASU’s InnovationSpace, the growth in interdisciplinary, design-based curricula isn’t surprising. After all, business is changing, and business leaders need to develop sustainable, design-based, user-oriented solutions to compete.

“In my 40-year career, businesses have moved from an emphasis on production to an emphasis on the customer. They’re growing more committed to helping society and improving
the environment,” says Hershauer. “They’re facing complex problems that require interdisciplinary approaches to solve.”

Design-oriented curricula that reach beyond the business school and across functional disciplines will be “the next stage of business education,” agrees Roger Martin, dean of the Rotman School of Management and a champion of business design. “It’s not enough to stick to the traditional approaches in business education, plain and simple,” he says. “By using design thinking—or integrated thinking—students learn not only how to choose well between existing models, but to create new models altogether.”

Business schools have taken this message to heart. Schools like Carnegie Mellon, University of Texas at Austin, and Massachusetts Institute of Technology offered the first design courses in the early 1990s. Schools like Stanford University and the University of California at Berkeley have established design-based innovation labs and programs in the last few years.

The Zollverwein School of Management and Design in Essen, Germany, launched its International MBA in Business Design in 2005. But its interdisciplinary approach already has attracted the attention of other educators interested in business design. “Because of their empathetic skills, professionals with creative training can identify customer needs and transform these needs into innovative products and services,” says Sonn. “They can anticipate future developments more accurately than even the best market research studies.”

The Tanaka Business School at Imperial College in the United Kingdom is also betting on design, taking part in Design-London, a new £5.8 million center that brings together design, engineering, and business. Launched in October, the center will accept its first student cohort in October 2008.

Design-London will include an incubator where multidisciplinary student teams will create new concepts and a simulator where they can test those concepts in real-world scenarios, explains David Gann, head of innovation and entrepreneurship at Tanaka. “All students in our innovation management courses complete experiential learning projects in innovation strategy and entrepreneurship,” says Gann. “Now they’ll do the same in design.”

In the future, more and more companies will look to innovation as an essential part of their long-term survival in a competitive global market, say educators in business design. And they’ll look to business schools for graduates who know what it takes to innovate: patient observation, energetic experimentation, and open-minded collaboration across the disciplines. Z