

# **Making Industry Meaningful in College**

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Making Industry Meaningful in College (MIMIC) is an innovative, multidisciplinary curriculum project that places students from engineering design, electronics, and business into entrepreneurial teams to select, design, prototype, manufacture, and market a product. Its purpose is to provide students with opportunities to implement and sharpen their technical and other critical workplace skills in a simulated industrial setting. Pioneered at a comprehensive community college, MIMIC is adaptable to a variety of disciplines and to a variety of school settings from high school through university.

## **The origin of the MIMIC concept**

In 1995, the engineering design instructor and a business instructor at Illinois Valley Community College developed a creative plan to provide their students with workplace experiences. As a project in one of their courses, the instructors integrated their students into teams to develop, produce and sell a product. The design and business courses were scheduled to allow the student teams, called “companies,” a common meeting time and to facilitate special training in such areas as group dynamics and communication. Student teams simulated an industrial environment not only by designing, producing and marketing a product, but also by participating in the types of communication situations required in the workplace.

In its first year, MIMIC received a Connections Award for Innovative Curriculum from the Illinois State Board of Education.

## **The MIMIC project today**

In the years since MIMIC’s successful debut, both the technical side and the business side of the project have been expanded, bringing membership on the student teams closer to an industrial setting. On the technical side, electronics students have been added to the program. On the business side, a MIMIC business course has been developed as a capstone for students in Associate in Applied Science degree programs in marketing, accounting, management, computer systems and information systems. For the engineering and electronics students, MIMIC continues to be a project within one of their classes.

The classes currently participating in MIMIC are:

- CAD 2208 – Engineering Design Projects, a capstone course in engineering, which enables students to use their skills to design products for production and supervise production as project managers.

- ELT 2204 – Digital Microprocessor: Principles and Applications, an introduction to basic logic gates and design procedures, which includes principles of adders, encoders, and multiplexers.
- BUS 2260 -- Integrated Business Operations, a capstone course which offers students credit for the business side of MIMIC companies.

In the past, the project has included students enrolled in an introductory Industrial Plastics class and in an introductory HTML and Web Page Development class. Because of staffing and scheduling changes, the plastics and web page students are not participating in the current project, but they may return in the future.

The students' classes continue to be scheduled at a common time to allow for company meetings and training sessions as needed. Integrating students from various disciplines not only fulfills the technical needs of the project but also provides valuable interaction and communication opportunities. Acting on the advice of the advisory committees for their career programs and utilizing a list of essential workplace skills<sup>1</sup> endorsed by the area Tech Prep consortium, the instructors who organize the project continue to make the development of teamwork and communication skills a major focus. In their companies, students experience how people in other disciplines think and work, and they are encouraged and trained to adapt and communicate more effectively with people outside of their disciplines. Experience with this project continues to reinforce the need for such training and practice.

Additionally, the students participate in formal communication exercises appropriate to their career fields. The engineering design students, for example, document their designs in technical reports and defend their designs in oral presentations before a large audience.

Instructors from other disciplines are brought into the company meetings or into the individual courses, as consultants would be in a business or industry setting, to teach workplace skills such as project management, teamwork, goal setting, problem solving, critical thinking and communication skills. While certain training sessions are routinely provided, others are added based on the needs of the students and student companies that semester.

### **Organization and scheduling of the project**

The one-semester project begins with the three instructors assigning students into their companies. Enrollment determines the number of companies and how many students from each discipline are in each company; typically, a company includes two engineering design students, two electronics students, and a mix of students from the various business fields. Companies meet immediately for orientation and for teamwork training. Communication channels, including e-mail and WebBoard, are established to allow students to conduct their company business realistically; students must take and disseminate notes of meetings, for example. During the weekly meetings that follow, companies decide on a product and corporate name, and training in various workplace skills continues. Students begin to assume responsibility for a portion of the project based on their discipline: marketing students survey potential buyers to

gauge product and pricing preferences and research any competition, engineering students consult with electronics students and produce designs, accounting students start on production budgets, business students plan the fair where the products will be sold. Students also assume responsibility for facilitating company meetings on a rotating basis, with engineering students taking charge during the design phase of the project, electronics students during the prototyping phase, and business students during sales.

After the engineering students create the product design, the student teams research and purchase materials, create and test a prototype and determine the final selling price. One week is devoted to producing the products with the students in all of the disciplines required to participate. The number of units to be produced is set by the instructors. Marketing students design packaging, and, prepare the written instructions for assembly and/or operation of the products by working with students in a technical writing class.

Business students are in charge of scheduling, planning, picking a theme, promoting and setting up an end-of-semester MIMIC Fair where the products are sold. All of the students assist in the sale of their company's product at that on-campus event. The final work on the project is completed by accounting students who prepare a cost analysis of the test marketing or sales at the fair, which culminates in a recommendation on the commercial viability of each product.






The project wraps up with a celebration dinner for all participants with awards and certificates presented to the students.

### **The Spring 2004 MIMIC schedule**

In Spring 2004, the MIMIC companies met each Wednesday during the semester. Deadlines, special events and other meetings were as follows:

- Jan. 12 – Meeting with all MIMIC students
- Jan. 14 – Companies meet for team training and to discuss product choices
- Feb. 4 – Companies meet to make product decision
- Feb. 27 – Engineering design finalized, engineering students give presentations to MIMIC students, instructors, members of college administration
- April 2 – Electronics students give presentations to MIMIC students, instructors, members of college administration
- April 12 – Production begins
- April 16 – Marketing students give presentations to MIMIC students, instructors, members of college administration
- April 19 – 23 – Production week for all companies
- May 5 – MIMIC Fair
- May 10 – Accounting students give presentations to MIMIC students, instructors, members of college administration
- May 12 – Final MIMIC meeting and celebration

**Products created by MIMIC companies**

	<p>The Kan Kuzzie, at right and left, is an example of the type of product the student companies design, produce and market. This flashing drink holder incorporates fiber optics with a tri-color LED and a printed circuit board. The top, bottom and battery holder were produced in a Rapid Prototyping Machine.</p>	
<p>The butterfly-shaped clock, at right, was one of several shapes and sizes produced by a student company. Each of the battery-operated clocks is decorated with chips of stained glass held in place by a grout mold. The mold shapes were designed by the CAD students on that team.</p>		
	<p>The lighthouse, on the left, and lamp, on the right, are two other student products. The lighthouse, intended as a yard ornament, incorporates a solar-powered light. Constructed of clay pots, the lighthouse is 18 inches tall. The Star Light Lamp features two-dozen stars that glow in the dark and continue to glow after the light is turned off.</p>	

## **Communication exercises integrated into MIMIC**

All MIMIC students give oral presentations in a 120-seat, multi-screen, electronic lecture hall. In addition to the student teams, the audience includes members of the faculty and administration. The presentations are scheduled throughout the semester with the students from each discipline explaining their portions of the project. Engineering students, for example, defend their product designs early in the semester; and accounting students defend their recommendations at the end of the semester.

The students also produce the types of written materials that would be required of them on the job. Engineering students detail their designs in formal, technical reports. Marketing students create sales slogans, advertising materials, and product descriptions. Business students prepare notes of company meetings and send invitations and thank you messages to faculty who serve as consultants.

## **Student learning in the MIMIC project**

MIMIC provides students with opportunities to learn about:

- the entire process of manufacturing,
- technologies outside of their discipline,
- thinking and communication styles of other disciplines, and,
- project and time management.

At every stage in the process, all team members participate in making company decisions, such as deciding on a product, purchasing components and pricing. All team members also participate in producing and selling the product. That participation, from concept to sales, helps them to understand how their role fits into the entire process.

As they work alongside students in other disciplines, the students are introduced to technology outside of their discipline. Engineering students are familiar with AutoCAD; MIMIC introduces them to Electronic Workbench. Accounting students are familiar with Excel; MIMIC introduces them to a Dimension Rapid Prototyping Machine.

The students also encounter different thinking and communication styles as they interact in their companies, and, with the assistance of training in group dynamics and communication, they interact more productively. Feedback from students indicates the need for that training:

- An engineering design student: “The marketing students want a prototype by Monday. We don’t even have a design yet.”
- An electronics student: “We can’t get the money out of the accountants to buy parts for a prototype.”
- An accounting student: “The engineering and electronics students won’t give me any numbers.”

- A business student: “The electronics and CAD students had their minds already made up about what they’re going to do. They wouldn’t listen to us.”
- An electronics student: “I kind of understand the CAD students, but I don’t know what those business students are thinking with. Instead of worrying about whether we can do it or if it will work, they just think about price and the schedule.”
- An engineering student: “Those business students are hard to work with. Marketing students said we’d never be able to sell it. Two days later our instructor found something like it selling for 40 bucks. The accountants said our idea was no good – too complicated. The others rushed me to get the design done – good or not. We worked okay with the electronics guys.”

Clearly, the issues these students identified and had to address are typical of the workplace.

Some of the comments above also mention scheduling and time problems, indicating that the project makes students aware of deadline responsibilities in a way that their usual, individual classroom assignments do not. In their interviews at the conclusion of the project, students routinely advise future MIMIC participants not to relax even if they are on schedule.

### **Evaluation and assessment of students and the MIMIC project**

The students involved in MIMIC and the project itself are evaluated from a number of perspectives.

- Instructors evaluate individual student and team contributions: the product designs, marketing surveys, promotional plans and materials, accounting reports and financial plans, prototypes and products, and teamwork skills.
- Consulting instructors assist in evaluations of oral reports, written reports, e-mail and memos.
- Potential buyers evaluate products.
- Students provide feedback on their teams, on the training provided by the consulting instructors, and on the entire project.
- Business and industry leaders provide feedback on the project and on graduates of the project.

In the first years, students indicated a need for more structure, and the instructors developed a guidebook spelling out instructor expectations and student requirements. More recently, exit interviews with students routinely reveal their initial reluctance and reservations about the project, their struggles during the project, and their eventual appreciation of its value. As one electronics student said: “At the time, I hated doing it. That was the best class I had.”

Business and industry leaders are overwhelmingly supportive of the program. As one industry supervisor wrote: “Our company requires one to two years training to become proficient at project management. Dan (CAD student) came to us well prepared.” A manufacturing manager said: “It’s great. These students run into the same problems we have.”

## **Funding for MIMIC**

Since its inception, the MIMIC budget has been approximately \$3,000 per year, with the project offered once a year, in the spring semester. The funds are allocated as follows:

- \$400 per year stipend for the engineering, electronics and business instructors, for a total of \$1,200,
- \$1,000 per year for product supplies,
- under \$1,000 per year paid to other IVCC instructors for providing MIMIC students with training in teamwork and other workplace skills.

For product supplies, each student company is allocated a budget that is determined by the number of companies formed that semester. Instructors, acting as consultants, are paid \$75 or \$50 for a one-session exercise depending on whether the exercise is new or a repeat.

The project is sponsored by the college's Tech Prep team; the \$3,000 per year has come from a mini-grant provided through Carl D. Perkins federal legislation. Product sales, after the first year, have covered some additional expenses for supplies, marketing, and end-of-project recognition for the students.

## **Adaptability of the MIMIC concept**

MIMIC is an adaptable model for integrating students from diverse disciplines, as illustrated by two spin-off projects at IVCC: a day camp and a puppet theatre. The day camp integrated students in early childhood education, psychology, and business to plan, organize, market and offer a one-week camp for children. An even bolder project, the puppet theatre, integrated students in engineering design, electronics, theatre, English, art, graphic design and business to design and build a puppet theatre and puppets; to write, promote and produce a play; and to develop and oversee a budget. The integration of technical students, not only with business students, but also with liberal arts students provided even more teamwork and communication challenges than the original MIMIC industry. As the theatre instructor said, "Design and electronics students approach a project differently compared to theatre students."

Integrating teams of students from diverse areas to produce products or provide services can also be accomplished at various educational levels. The Integrated Product Development program at Lehigh University<sup>2</sup> and The Enterprise Program at Michigan Technological University<sup>3</sup> create student teams to work on engineering projects. The Lehigh program is a capstone project that integrates students from a number of engineering, industrial design and business majors. The Lehigh teams produce prototypes and business plans in collaboration with industry partners. At Michigan Technological, The Enterprise Program option allows engineering students to work with industry partners in student-run companies or "enterprises" that exist beyond a semester.

Projects that more than mimic the world of work can be established with the commitment of instructors, cooperation from their supervisors, and minimal start-up funding. The nature or types of those projects is limited only by the creativity of the organizers.

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## **For further information about MIMIC**

Further information about Making Industry Meaningful in College is available from two web sites: [www.ivcc.edu/mimic](http://www.ivcc.edu/mimic) and [www.ivcc.edu/techprep/mimic/MIMIC](http://www.ivcc.edu/techprep/mimic/MIMIC).

### References

1. Essential workplace skills. Tech Prep at Illinois Valley Community College, Oglesby, IL  
<http://www.ivcc.edu/techprep>
2. Integrated Product Development. Lehigh University, Bethlehem, PA. <http://www.lehigh.edu/ipd/programs>
3. The Enterprise Program. Michigan Technological University, Houghton, MI. <http://www.enterprise.mtu.edu>

DORENE PEREZ, the Program Director/Instructor of CAD/CAE at IVCC, was one of the MIMIC program originators. A co-leader of the Tech Prep team, she has been recognized for her pioneering in the development of online courses. She is participating in a National Science Foundation funded revision of the CAD program at Moraine Valley Community College. Before teaching, she served five years as a CAD manager in industry.

JIM GIBSON is the Program Director/Instructor of Electronics. He currently serves as a State Director of the Illinois Association of Electronics and Electrical Educators and has hosted that organization's State Skills Contest. He has extensive industrial experience and continues to consult as a troubleshooter. He holds an M.S. and B.S. in Industrial Technology with a minor in chemistry from Illinois State University.

ROSE MARIE LYNCH, an English instructor, is co-leader of the college's Tech Prep team and co-director of the Center for Excellence in Teaching, Learning and Assessment. She provides communication training to the MIMIC students. In 1999, she was named Illinois Professor of the Year by the Carnegie Foundation. She holds a Ph.D. in English from Ball State University.