2004 Chemical Engineering Alumni Survey Results

This survey was distributed during the summer of 2004 to alumni from the calendar years 2001 and 1999 (3 and 5 years graduated). The survey was patterned on the 2001 Alumni Survey, with slight modification of several questions. The survey questions are available separately on the department assessment web site.

In 2004, for the first time, the survey was conducted in electronic form. We used the SurveyMonkey web site, which provided a convenient format for asking predefined questions and also inviting free-format responses, and captured the responses to a spreadsheet as well as allowing limited online analysis of responses. All alumni were given code numbers to allow us to note responses and send reminders to those who did not respond. We did not identify individuals or connect names to responses. Although there was slight concern that the web-based administration of the survey would bias the responses to more computer-literate alumni, it was our consensus that all of the 1999 and 2001 alumni were adequately computer literate and had access to the web at home or at work, and so this would not affect reliability of the survey results.

Between September 3 and November 9, 2004, 58 alumni responded. The group had the following demographics:

Graduation year	Female	Male	Total	Total graduated	Response %
1999	14	17	31	94	33%
2001	6	21	27	77	35%
Combined	20	38	58	171	34%

The overall response of 34% is regarded as typical for this type of survey. In our previous alumni surveys, response rates were 35% in 2001 and 29% (of 3- and 5-year classes) in 1996. The gender balance among responses (34% female) was within one reply of the 36% female population of the two graduating cohorts.

Continuing Education

Participation in graduate study, industrial short courses, or other continuing education activities was reported by 46 of 58 respondents (79%). Among the sample pool, this broke down by gender or year as follows:

Female:	15/20 (75%)	1999:	25/31 (81%)
Male:	31/38 (82%)	2001:	21/27 (77%)

We see that male graduates are more likely to pursue continuing education than average,. The fraction of our graduates participating in continuing education rises slightly with number of years out of UW, as might be expected. It is notable that the number of students pursuing an MBA or receiving other business training (19) is more than the combined total of students pursuing advanced degrees in science or engineering.

Topics mentioned include:

7	Graduate study in Chemical Engineering 5 PhD program, 2 other
2	Biomedical engineering
1	Computer science MS
3	Other engineering graduate study
3	Food chemistry, food science, enology
10	MBA
9	Other business training, including accounting, leadership, etc.
1 each:	Law, Medicine, Rheology, Wastewater treatment, Aerosol Technology, Spanish for international business relations, Packaging, Statistics, Preventative maintenance, Specialized measurements

Chemical Engineering graduate schools mentioned include MIT, Delaware, Purdue, Georgia Tech, Illinois (UIUC), and Stanford University.

Employment

Alumni reported that they hold positions at a wide variety of companies:

Multiple posts	**One alumnus each**
Kimberly Clark Corp. (8)	3M
General Mills, Inc. (3)	Alfalight Inc.
Abbott Laboratories (2)	Applied Technologies, Inc.
Frito Lay (2)	Curwood, Inc.
SC Johnson (2)	E & J Gallo Winery
UOP LLC (2)	Ecolab
	Equistar Chemicals
	General Electric
	Hydrite Chemical Co.
	Integrated Process Engineers & Constructors
	INX International Ink Co
	Kraft Foods
	Kraft-Oscar Mayer
	Lawter International, an RSM company.
	Merck and Company
	MicroStrategy, Inc.
	Procter and Gamble
	Ronin Capital
	Sigma-Aldrich Corpoaration
	SJ Schiller Construction
	TANN Corporation
	UC-Davis FS&T
	US Filter/Siemens
	USDA-Forest Products Laboratory

Responses also indicated the size of each company, the number of years each alumnus had been with that company, and their job titles. Respondents characterized their job activities as being in the following areas:

Consumer products	20
Pharmaceuticals, biologicals	11 (6 in graduate school)
Polymers	10
Food products	9
Pulp and paper products	6
Electronic materials or devices	5
Specialty/fine chemicals	5
Petroleum, fuels, primary petrochemicals	3
High volume chemicals	2
Metals and mining	0
Other	10

"Other" included water & wastewater treatment (3), medical devices, fuel cells, flexible packaging, commercial printing ink, trading bonds, and environmental/air pollution control.

Respondents indicated that their main job activities fell in the following categories: (multiple responses were invited)

Business planning, managerial functions	7
Economic evaluation	5
Laboratory research & development	20
Marketing and product sales	3
Pilot plant process development	8
Plant operations: scheduling and logistics	6
Process and equipment design	10
Process operations: monitoring, improvement, and troubleshooting	15
Product development	20
Project engineering/management	15
Software development	3
Other (chemical engineering)	2
Other (not chemical engineering)	3

Those who marked "other" included items such as checkup, startup, rheology, economic evaluation, building residential structures, and trading corporate and government bonds.

"Do you supervise the work of other chemical engineers?"

Yes 7 (14%) No 44 (86%)

"How long have you been in this position?"

Duration	1999 grads	2001 grads
5 or more years	3	-
1 to 4 years	19	19
Under 1 year	6	3

Respondents often provided a description of their job function and emphasis:

1-4 months at International customer sites to complete prestartup check, commissioning, startup, troubleshooting and guarantee test run of refinery process units. Also some short term

troubleshooting assignments. Most recent assignment was HyLube a new process to re-refine spent lube oil

I've held different roles, such as Maintenance, Potato Chip Packaging, and Extruded (Fritos and Cheetos) Resource. Manage/Lead a group of people of 8-20+. Help remove obstacles, challenge them to grow and help the company continuously improve through new systems/methods, technology, etc. Have helped with project management. Also support ad hoc functions such as safety, food safety, and environmental.

Environmental project engineer at consulting firm dealing with both municipal and industrial water and wastewater treatment.

Manage food manufacturing process.

I help develop new absorbent improvements by new materials, new product designs and new processes. I plan timelines for how they will fit into a current improvement program, work with engineers (ME & EE) to improve processes, work with mill personnel to make product for small scale & large scale use testing.

Develop packaging design and materials for new product ideas. Cost reduce materials in existing packaging. Attend multi-functional team meetings in order to launch new SKUs.

Design packages for shipping temperature sensitive product around the world safely.

Product development for major global diaper competitor.

Development of new products including management of multi-functional teams.

Develop commercial printing inks and coatings for packaging and publications. Perform raw material and cost reduction on ink formulations. Perform testing to evaluate products in development. Address and provide solutions and recommendations to customer problems.

Assist research mechanical engineer by modifying equipment and process for making wet-molded pulp/paper/wood/agrofiber 3-D composite test panels. Goal is to develop reproducible test panels for material property determination to use in finite element analysis. Long-term goal to reduce weight and material needed for wood based construction materials, conserving forest resources.

I work on designing new processes utilizing current plant equipment to bring co-packed items in house. I also work on scale up and execution of new product start ups at the plants. Additionally, I am involved in numerous productivity efforts on both product and process.

I am currently doing research on using microfluidic devices to study developmental neurobiology.

I engineer sanitary process systems from the date they are sold until they ship. Some projects also include installation and/or start up supervision. I am responsible for mechanical component selection and system design, tracking the budget, keeping the schedule, customer interaction, and system check out before shipment.

Project development to provide customer and consumer focused solutions. Project management of projects smaller in scope.

Research on novel enzyme

After graduation, worked in consumer products for 4 years in product development (bench research), process development (pilot plant) and technical team leadership. Have been back at school full-time for one year. Summer internship in marketing at a major medical device manufacturer with intentions of moving into business development/mergers & acquisitions in the biomedical/biotech industry upon graduation.

New Product development of reverse osmosis membranes on pilot plant scale.

The best description for all my work is process improvement and troubleshooting. From replacing obsolete and noisy test methods to repairing testing equipment to improving the human control on a process to equipment improvement and design, I am always fixing something that so it can not only run, but run better and is less likely to break down again.

Responsible for the marketing strategy development of a focus area of the janitorial chemical market. Supervising one MBA.

I am a process engineer working in the Foodservice division at General Mills. I am heavily involved in process troubleshooting and reduction in plant headcount through automation. I am also in the process of developing a pilot scale operation to simulate plant operating conditions, involving the

specification and capital purchase of the necessary equipment to achieve the objectives. In the past, I have worked much more extensively with the cross-functional team (Marketing, Sales, Consumer Insights) to identify and develop salty snack products for entrance into the marketplace.

My company designs, manufactures and installs air pollution control equipment. I'm involved in projects from planning, designing, scheduling, managing, supervising and installing air pollution control equipment. The project size can be anywhere from $50,000 to $1.5 million.

Develop/write Capital projects ranging from $2500 - 1.6 million. Help manage maintenance mechanics for 3 shift 7 day a week operation.

I am currently a shift supervisor that oversees manufacturing. I supervise approx. ten employees, which have various education backgrounds (chemical engineering, biology, wastewater or just have a high school diploma). My current position involves managing, trouble shooting, and improving safety within the work environment.

Product Development Improving Fuel Cell Durability

Process engineering, project management

I manage the capital projects for my department, which includes collaborating with my manager to develop the annual capital budget, writing RCE's (request for capital expenditure) and tracking expenditures. In addition, I calculate project cost savings for process improvement projects. I also perform lab work to support troubleshooting and process improvement projects.

Lead product developer for SCOTT bath tissue.

Troubleshoot processing problems on a daily basis. Train operators on new procedures. Update and compare procedures. Implement waste reduction programs.

Product developer for corporate brand paper towels.

I work on material development for diapers.

Recently transferred to centralized research for developing and improving absorbent systems. Previously, worked in research to support mill process monitoring and improvement, established quality standards, and worked in short-term product development.

I trade government and corporate cash bonds.

Process development and clinical manufacturing for vaccines and biologics.

I did the rough framing of houses; I built floors, walls, and roofs.

Develop consumer food products and the processes to produce them, from benchtop formulation, through pilot-plant development, scale-up, and production start-up.

Plan, conduct, record, and analyze the design and testing of various packaging materials and configurations and recommend alternatives and solutions in accordance with performance, regulatory, and cost containment requirements.

Manage and operate pilot plant systems for our membrane microfiltration technologies. Evaluate process improvements, work with sales dept. on NPW evaluations for full-scale plants and help design equipment for our full-scale WTPs.

System development (instrumentation) for semiconductor device processing, packaging, testing and data mining, data analysis and data reporting.

Material development, commercialization and converting

I am a graduate research assistant carrying out work in the field of natural product biosynthesis.

Sales and technical support

Research on enzymes that could potentially be used in industrial chemical processes.

I work in an ethylene production plant. My job consists of daily monitoring & optimization & process design for small & capital projects. I also fill in regularly for our plants unit specialist who is in charge of the first line supervisors & technicians

I am a field engineer. UOP designs and licenses petrochemical processes. I have been on site assisting with the initial startups (troubleshooting, revising procedures, performance monitoring, making sure proper procedures are followed, checking out the process and instrumentation). I

have also assisted in catalyst regenerations and loadings. I have worked mainly in reforming and CCR technologies.

Doing research on chocolate and peanut butter oil migration

Feedback on individual curriculum topics

Ratings of how well the UW-Madison ChE undergraduate education prepared students in:

Subject	Very prepared	Adequately	Poorly prepared	Courses not taken at UW-Madison
Mathematics (calculus, diff. eq., etc.)	31	20	0	3
Statistics	9	23	10	11
Chemistry	29	23	1	1
Physics	12	34	4	4
Computer Science	5	35	10	4
Electric circuits and electronics	7	35	7	3
Thermodynamics (ChE 211 and 311)	27	25	0	1
Process Synthesis, Control, Design	30	22	1	
Transport (ChE 320, 324, 326, 426)	27	24	1	1
Reaction Engineering	24	27	0	2
Materials, Polymers (ChE 440, 540)	10	34	5	3

In the comments, 4 students mentioned poor teaching in Physics, 6 mentioned Computer Science unfavorably, and several cited the Polymers area as one where they desired more preparation. Comments on standouts included:

I worked with instrumentation that was designed to measure flow. Knowing about Reynolds #'s, flow coefficients, laminar and turbulent flow profiles etc put me ahead of other engineers hired at the company that didn't have this coursework. On the other hand, the instrumentation was an electronic device and I would not have had enough knowledge of circuit design to enter the engineering of these devices.

I was not an undergraduate student in UW for the entire program (transfer).

Strong chemistry coursework with Honors 1st year and organic classes, plus 2 semesters physical. Thermo: rigorous, combined with grad course

Most ChemE courses are useful in terms of academic research and prepare me well to understand biological systems in an engineering standpoint. Computer science courses are inadequate because there is a lack of examples related to the ChemE curriculum. It would be more appropriate to have a course in computer programming to solve differential problems in a ChE related samples.

My knowledge and familiarity with the fields I selected as 'very prepared' is far greater than other ChEs with whom I have interacted at the Univ Washington from other undergraduate programs. I feel that UW gave me an excellent background in thermodynamics and transport phenomena that has really helped me excel in my current research.

I never worked full time as a chemical engineer, so it is hard for me to rate those courses. I worked in the IT field before returning to school. Because of that, I needed analytical skills that the fundamental sciences prepared me for. Engineering further developed my problem solving skills. I worked for what was then a Big Five consulting company. One could tell the difference between the engineers with no prior programming experience, the MIS majors, and the random other majors they hired. Even without programming experience, engineering students caught on the quickest at work. Now that I am an MBA student, I am working on a project with a startup company whose product is used in the chemical field. My background in chemical engineering is helping me to understand the process. I am better able to advise on legal and business matters because of this background understanding.

Mathematics: I took the advanced calculus track for the first two semesters (Math 275 & 276) and found the level of thought and instruction there to be outstanding. Physics, on the other hand, was among

the very poorest instruction I have ever received in any subject. I still struggle with some basic concepts in magnetic fields and wish I had had exposure to modern physics, which was not included in Physics 201-202.

I never took a statistics class. Only statistics I learned was from Genetics 466. I feel I was very well educated in math (calculus and differential equations) way ahead of my peers in grad school. I was very well prepared in chemistry, biochemistry, and organic chemistry. Physical chemistry (Chem 565) had too much overlap to ChE 211/311. I should have received a better education in computer science. I think CS 110 is a joke. I should have taken CS 302. When I got to grad school and my advisor asked me to write a program in C++, I couldn't do it. I had to go and relearn everything. Why do all of the other engineering programs require statistics and mechanics and ChE doesn't? I feel I was extremely well prepared in thermodynamics, transport, and kinetics. The core chemical engineering system was superb and I wouldn't trade my education at UW for anything.

The CS class that was required for completion of my degree, 310, was not a class that I gained very much from. I believe it was structured in the right way, i.e. with an emphasis on learning applications (Matlab, Maple, etc) rather than strictly on programming; however, it was not taught very well. Regarding process synthesis and transport. I felt my education was on par with or prepared me better than my colleagues at Merck. The process synthesis and transport labs were especially useful.

Transport (320) with vectors/tensors would have been very beneficial for grad level transport. Otherwise this category would be very prepared all else was great.

I use thermo dynamic in designing insulated containers. This background helped me understand the science and engineering behind thermal transfer of heat.

The topics I feel very prepared are the ones that were taught clearly and consistently throughout the ChE program. They were difficult but were very useful.

Physics - poorly taught for engineering

Math skills learned in math classes were very well reinforced in engineering classes. More statistics classes should be required and applied throughout engineering courses.

In general, the chemical eng. courses lay a great foundation that can be applied to your future employment

My college education was awesome. The background I received was 2nd to none. I was very prepared. I was also very beneclat (?) and found a job that would not require those specific skills.

I thought physics could have been taught better. It would have made other engineering courses easier because I would have been able to make the connections better. Statistics was not required and therefore I did not take and have been lacking those skills.

I have yet to feel unprepared when confronted with the need to draw upon my ChE education. In comparison to other ChE's from different schools that I work with, I have never felt at a disadvantage.

I believe that the UW ChE dept does a fantastic job in blending the theoretical aspects of the discipline with practical application. The professors are recognized experts in the field, and the curriculum forces one to learn the material, rather than simply prepare for a midterm through rote memorization.

very prepared - my use of these topics is not extensive so the preparation was more than I have needed.

Courses are 'poorly prepared' because they are elective. However, i find them very useful in engineering job functions. As for material and polymers, I have chosen to take ChE 440. Now I find polymer knowledge very useful for my job function, I should have taken it for my Adv. Chem elective.

Math appropriate for course work, overkill for day to day achievers chem same as math no stats course

I fell that the mathematics learned were applied very well in ChE courses. I had a good understanding of stats because of the DOE application we had to perform.

I think that UW Madison's ChE classes are exceptional. They are well planned and well taught.

I feel that the learning I received in these classes I can proficiently use now, or be able to use at some later time after some reviewing.

Computer Science course didn't use the software that I used later in my ChE program, much less in the 'real world'. ECE is just too removed from my current responsibilities, and had nothing to do with ChE. Polymers should have prepared me for what I am doing, as plastics are used in a great deal of packaging. I felt the course was too theoretical and not practical enough in nature. I was better off with the ME materials course.

ChE 430 was an extremely well taught course and I frequently go back to the basic principles taught in that course.

The Physics classes were not very helpful.

Overall UW-Madison has an excellent Chemical Engineering program, in my opinion.

Maybe it is that my job required a lot of knowledge in industrial control software (AB/RS) and electrical electronic equipment, but I found the CS courses lacking, specifically in ladder logic programming which is very common in industrial settings.

The chemical engineering faculty did a fantastic job on educating me. Going into those classes, I had minimal prior knowledge about chemical engineering. After graduating, I felt that I had a firm grasp on chemical engineering.

Overall, UW-Madison provided a strong theoretical background as well as a more 'practical' background in chemical engineering.

Math and Process Synthesis: I use these topics a lot in day to day activities. There was enough emphasis in the curriculum to prepare me for that. Electrical: In the real world, engineers from different principles work together. In order to understand and integrate all the principles, you have to have a better knowledge of other engineering skills. In particular, electrical and mechanical. There was definitely not enough emphasis on Mechanical Engineering as well.

The courses taken for Math and Chemistry covered very broad material well. The courses that were taught for CS and EE were kind of narrow and really aren't that useful for ChemE work or if they decide to go into a different field.

In most areas, I have learned more than necessary to perform my job, but having the background has been a help. Only in a few areas has my job stretched my understanding further.

I would have liked more prep in basic programming and/or other computer software.

The knowledge I gained in those classes exceeded that of my fellow chemical engineer at my previous employer.

Ratings of how useful these areas have been in the respondent's career:

Subject	Frequently used	Moderately used	Not used	Courses not taken at UW-Madison
Mathematics (calculus, diff. eq., etc.)	12	21	13	0
Statistics	21	20	7	6
Chemistry	11	36	7	0
Physics	5	24	25	0
Computer Science	10	13	30	1
Electric circuits and electronics	6	15	30	3
Thermodynamics (ChE 211 and 311)	7	27	20	0
Process Synthesis, Control, Design	10	22	21	1
Transport (ChE 320, 324, 326, 426)	9	30	14	0
Reaction Engineering	5	14	34	0
Materials, Polymers (ChE 440, 540)	5	26	19	3

Followup comments singled out Polymers as highly used and Computer Science as lacking relevance or being off target. Statistics was mentioned as being particularly important in 11 responses. Comments on items that stood out included:

Instrumentation is about process control and process control systems. The transport comes into play since much of what people are trying to monitor and control is the flow of product or materials.

My research relates to virology and did not require a lot of the traditional courses. Transport and polymers are actually something that I currently work with.

I rely on mass and momentum transport modeling to characterize the microfluidic devices I use.

I never worked as a chemical engineer.

My jobs in consumer products were light on technical details. However, Stats was used quite frequently...though I never took a formal stats class until into my job.

While at Merck, I used statistics, chemistry (in my case, more specifically biochemistry) and process synthesis quite frequently. As far as chemistry and process synthesis, the skills I used were learned at UW; however, I feel that my preparation in statistics was somewhat lacking. Statistics were used or brought up almost daily to compare and interpret experimental results. However, I graduated without taking a statistics course. I firmly believe that a statistics course that emphasizes experimental design and data analysis / comparison should be required (if it already isn't).

My research involves modeling of granular flows thus physics and comp si are highly utilized, while thermo & kinetics are not really used.

I work on fuel cells heavy in math, electronic, physics. I do some lab view and visual basic programming, the computer science class I took in ChE has been useless. I would have preferred more practical program used in industry.

I use thermo dynamic in designing insulated containers. This background helped me understand the science and engineering behind thermal transfer of heat.

The jobs require a lot of analysis since the company is a high tech engineering manufacturer.

My current position does not require use of computer sciences, physics or EE.

An ethylene plant is one of the most pure chemical engineering processes. I use my chemical engineering classes on a daily basis.

I do not do computer programming of any sort. Chemistry is a big part of how food materials react to heat and other process steps. The same can be said of Thermo and Process Design.

Statistics are always necessary in experimental design and evaluation because testing is expensive and results usually have high levels of uncertainty.

My job does not require the use of computer programming, nor does it require more than a working knowledge of electrical circuits. We have separate functions that are responsible for those aspects. As for basic Chemistry and physics, we use the basic principles everyday, but not necessarily the actual principles learned in those specific classes.

I don't do statistical analysis, mass transport is to theoretical and don't work much with electronics.

not used - my position is more mechanical in nature. my position uses established methods so I don't need the mathematics, etc. to devise new solutions.

Chemistry and polymers are frequently used because I actually work in print ink R & D. I actually work more as a chemist than engineer that is why some engineering courses are not used.

My job does not really employ many traditional chem eng. activities Statistics very useful

I use stats daily in my job for designing product, material and process studies as well as analyzing and discussing results.

I do product development on bath tissue. My focus is mainly on consumer perception... so I don't use my ChE classes per se, but rather the problem solving skills that I developed during these classes. I do use statistics fairly frequently to analyze consumer use studies.

I work on project improvements or new products based on consumer insights. Stats is the only class I find useful in analyzing such data.

In product and process development statistics are used to analyze designed experiments and draw conclusions. A course in the design of experiments would be helpful for the undergraduate.

I use statistics to analyze study results.

We do a lot of data analysis which requires use of statistics to decide which product/code is better than the others.

My current and past position working with consumer products seldom allows me to use learnings from ChE 430 and CS 302, though I believe in other positions or companies this would be applicable.

I work with materials that are being produced at other manufacturing facilities. I do not have to develop the films, I just work with their application.

Without the statistical experimental design courses, a lot of the Six sigma statistics would have been new to me, and much harder to pick up.

In biological processing we frequently need a good understanding of transport concepts (mixing, fluid flow, flow through packed columns) and kinetics (CSTR type balances, absorption kinetics).

I took Stats 424, it's subject matter I use very often and needs to be a bigger part of the curriculum.

I'm in a different field now.

Water treatment does not use much physics and my job duties do not/have not required much reaction engineering.

Not Used: Packaging Engineering rarely deals with these topics.

I have a job that I could have done right out of high school. I don't need a BS to frame.

My course work at Stanford University has involved taking thermodynamics, transport, and chemistry. I use kinetics and organic chemistry frequently in my research

Not working on process design or plant design. I'm constantly using computer programs and math.

I have been using visual basic often for programming in Excel, and it was very helpful to have Comp Sci. I do a lot of mass balancing, and also some controller tuning (I recently tuned a reformer in Pakistan).

My job gives me a lot of opportunities to use my ChE as well as other ECE, etc.

Water treatment does not use much physics and my job duties do not/have not required much reaction engineering.

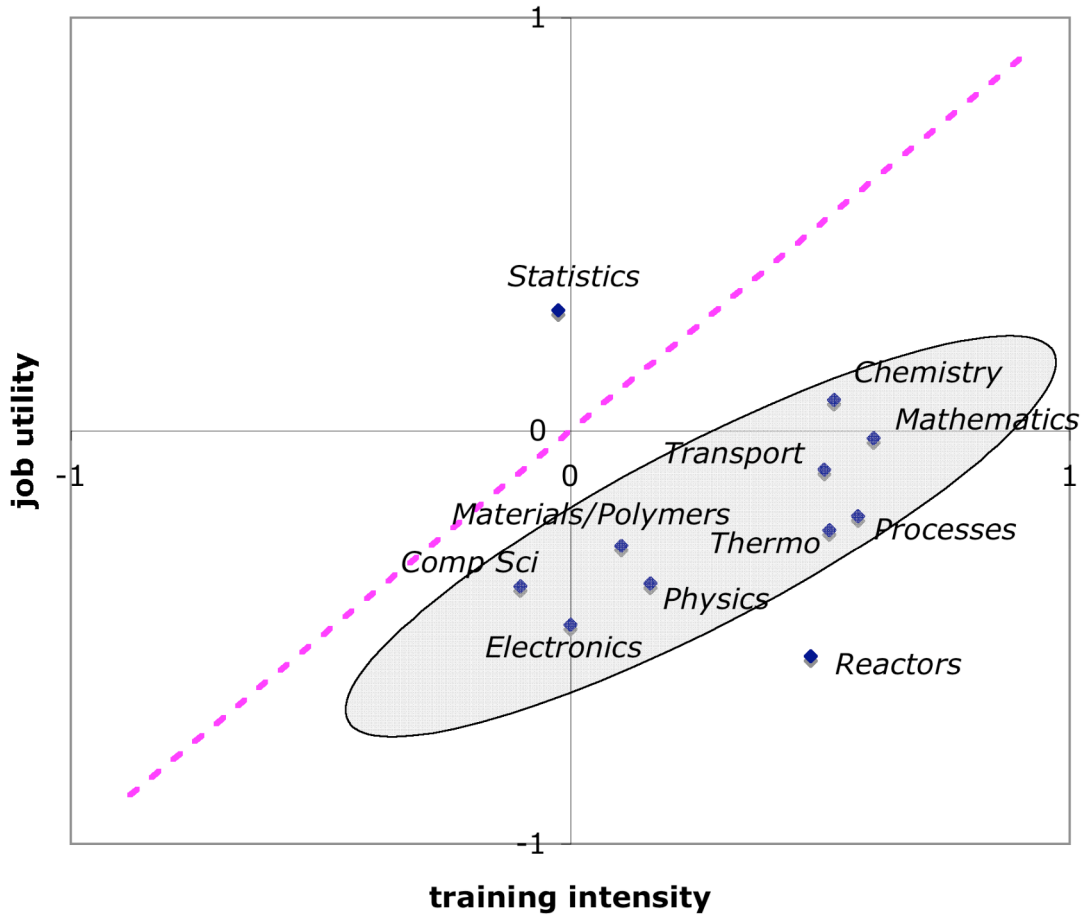
The last job I had (water treatment process/product design) did not use most of my engineering education. There was no use of mathematics, statistics only so far as mean and standard deviation and trend lines in Excel. I used my knowledge of chemistry and materials in very limited instances, transport only because it allowed me to exercise my mind, and that only in a conceptual sense. This is not the failing of the education I received, but of the management at the company where I worked. My current employer may have opportunity for me to make use of more of what I know. I am using that knowledge as a foundation for graduate study.

These ratings for how much preparation students receive at the university and how important these topics are in their jobs can be compared in an "environmental" plot. Here, we calculate average ratings using the following scales:

Very prepared	+1	Frequently used
Adequately prepared	0	Moderately used
Poorly prepared	-1	Not used

In such a plot, ideal results are that the most frequently used topics are those with the best preparation, and the topics not used are those with the least preparation. Thus, the ideal results would be spread from the upper right corner of the plot tailing down towards the lower left corner. Any topics above this ideal 45° line are more important than our preparation anticipates, and any topics far below this diagonal line may be receiving undue emphasis. With this scaling, the plot is seen to be:

"Environmental" plot (comparison of topic importance at UW and on the job)



The individual scores are

Topic	Training	T rank	Utility	U rank
Mathematics (calculus, diff. eq., etc)	0.61	1	-0.02	3
Statistics	-0.02	10	0.29	1
Chemistry	0.53	3	0.07	2
Physics	0.16	7	-0.37	8
Computer Science (CS 302 or CS 110/310)	-0.10	11	-0.38	9
Electric circuits and electronics (ECE 373 or EC 376)	0.00	9	-0.47	10
Thermodynamics (ChE 211 or 311)	0.52	4	-0.24	6
Process Synthesis, Control, and Design (ChE 250, 424, 450, 470)	0.58	2	-0.21	5
Transport (ChE 320, 324, 326, and 426)	0.51	5	-0.09	4
Reaction Engineering (ChE 430)	0.48	6	-0.55	11
Materials & Polymers (ChE 540 or 440)	0.10	8	-0.28	7

The ranked scores are

Training	Topic
0.61	Mathematics (calculus, diff. eq., etc)
0.58	Process Synthesis, Control, and Design (ChE 250, 424, 450, 470)
0.53	Chemistry
0.52	Thermodynamics (ChE 211 or 311)
0.51	Transport (ChE 320, 324, 326, and 426)
0.48	Reaction Engineering (ChE 430)
0.16	Physics
0.10	Materials & Polymers (ChE 540 or 440)
0.00	Electric circuits and electronics (ECE 373 or EC 376)
-0.02	Statistics
-0.10	Computer Science (CS 302 or CS 110/310)

Utility	Topic
0.29	Statistics
0.07	Chemistry
-0.02	Mathematics (calculus, diff. eq., etc)
-0.09	Transport (ChE 320, 324, 326, and 426)
-0.21	Process Synthesis, Control, and Design (ChE 250, 424, 450, 470)
-0.24	Thermodynamics (ChE 211 or 311)
-0.28	Materials & Polymers (ChE 540 or 440)
-0.37	Physics
-0.38	Computer Science (CS 302 or CS 110/310)
-0.47	Electric circuits and electronics (ECE 373 or EC 376)
-0.55	Reaction Engineering (ChE 430)

From these scores, we see that most of the "core" ChE topics are all perceived to be "overprepared" or "underused." All of these topics are rated between adequately and very prepared, as might be expected for topics that are chosen for the ChE curriculum. However, most of our curriculum topics fall below "moderately used" and have negative utility scores. Only Statistics and Chemistry have positive utility scores, and this is worth consideration in future curriculum discussions.

Most notably, **Statistics** stands out as being rated high for utility in job performance and being rated low in training quality during the university curriculum. This mismatch is also supported by the repeated mention of statistics in the comments sections above and below. This is certainly worthy of faculty attention.

Physics coverage is rated moderately low in both training and utility. Although this has been a high priority topic in EBI survey results, the low utility ratings indicate that this may not be an area of urgent need.

Electric circuits and electronics is rated low for both utility and preparation. This topic may be a target of examination to see what value it brings to the curriculum in upcoming discussions.

Polymers/Materials is rated moderately for both utility and preparation, but polymeric materials and practical knowledge in this field is recommended often in the comments section. This topic

may be a target of examination to see what value it brings to the curriculum in upcoming discussions.

Several free-response questions followed this section of curriculum ratings.

"In your view, what deficiencies do entering Chemical Engineers have? (Consider your own start, or other new engineers you have known.)" **Statistics** is singled out 11 times.

A greater knowledge of statistics would have helped in failure analysis and 6-sigma quality programs, some marketing experience would have opened more doors.

Comprehensive understanding

Lack of business experience.

WI ChE does a pretty good job of soft skills, but a required class on technical presentations would be helpful. I personally got a Business certificate. I think this opened up many job opportunities for me. If ChEs are to eventually be in project management, encouraging a managerial accounting class (not financial accounting- engineers don't need it) and a basic management class might not be a bad idea. The curriculum is already pretty stuffed, but for those with a lot of AP credits coming in, some of these courses might be worthwhile to take.

Again, statistics. It seems this should be taught less as a stand-alone class and more as a way to look at the world. Any way to integrate it more within the curriculum?

It is hard to say because I only worked for 6 months after I graduated and then went to grad school.

See answer above. A solid knowledge of experimental design and statistical data analysis.

Sometimes there is too much reliance on computer-generated answers not knowing where they come from & unable/unwilling to check & make sure it makes sense.

more stats. writing/technical comm.

I think the initiative to have undergraduate chemical engineers take biology classes is great. It can only help when entering pharmaceuticals or biotechnology.

the high barrier of learning the subjects that were extremely difficult unless you find them interesting.

Not enough real world knowledge/experience.

Little experience with statistics. Little experience in corporate world.

Practical knowledge of how actual unit operations work

There are not many deficiencies for an entry level job. The most noticeable would be a better understanding of computer software and programs that would be more common that some of the ones we worked on.

They lack basic understanding of how mechanical systems work. I know this wouldn't be applicable for everyone, but I lacked the knowledge of pump/compressor seals & bearings; what's the difference between a ball/globe/gate valve etc.

Honestly, in this job, I don't feel like I use much Chemical Engineering. Others here doing the same job come from other engineering fields, business degrees such as Operations management, marketing, etc. So the biggest opportunity I had was learning how to manage and deal with people and difficult situations.

Managerial skills real world application

If going into a food company, they are starting to expect some knowledge of food chemistry and food engineering.

The training we get is all technical, but most jobs deal heavily in some form of management: timelines, priorities, groups, etc. The abilities to coordinate and persuade are skills new engineers best learn quickly.

More than anything else, a lack of knowledge in communication skills, more in non-technical communication than technical. In my opinion, it is more critical to be able to discuss your findings to a non-technical crowd than to a technical one. Additionally, skills of influence and advocacy are

critical to the business world - selling your ideas is an important skill to have, especially if you have very strong convictions.

Real world experiences/hands-on. A lot of the chemical engineering classes are too theoretical and become boring. The most exciting classes, are the upper level classes and summer lab.

I think that chemical engineers are the most adaptive engineers so I don't think that there are any major deficiencies.

I actually start my first job as a process engineer in a plant. I realize that I have very limited knowledge in machines and mechanics. I personally think that the computer science course should be regarded by mechanical engineering course. Physical Chemistry Chem 561 and Chem 563 (lab) are not necessary also.

Statistics, easy to pick up on own with Math background but would be useful to have a formal class.

Project planning, running effective meetings I would recommend taking some business courses while an undergrad.

Statistics: Take more classes. A knowledge of stats is vital to my job.

At the time I felt way behind in Physics classes compared to others, but now I think the biggest deficiency was not knowing what classes would really be useful in the real world.

Knowledge of statistics and softer skills such as running effective meetings.

We have a great understanding of team work, etc. but I think that our school was so focused on chemical/oil processes that we didn't realize the opportunities available in the food and consumer products industries.

More statistics background would have been useful (was not a requirement, though I took an elective).

Not enough business/accounting knowledge.

Applied science. The fundamentals are important, but too much time is spent on information that is only used at manufacturing facilities and not on an industry that is a consumer product.

An active and vibrant job market. I spent nine months looking for work after graduation before I got a job at this company as a quality control technician. My potential has been recognized and I've moved up from there through research and development to a new process improvement group, but the hardest part was landing that first job to get me in the door. Everywhere I looked wanted mechanical engineers at that time, and I didn't have the CAD skills to apply.

The Chem E program does a poor job of practical industry training; most of the things we learn are very theoretical. For instance, using practical statistics (Design of Experiments perhaps?) in 324 and 424 would have been very useful.

Not enough exposure to other possibilities out there.

Practical scale-up

Project Management is a key skill for any Engineer. I personally received no/little formal training in this discipline. Project Management involves managing multiple projects, defining projects, resource management, creating a project schedule, and ways in which to measure and present the progress of a project. Quality is probably another area where my education had a deficiency. This is related to statistics. How large of a sample is required in order to determine whether the whole lot is good or bad.

More statistics would be appropriate.

Real world co-op and intern experience during college years. I personally had 1 yr of co-op experience that was VERY useful in preparing myself mentally. Not so for other engineers who did not do that. On top of that, it also assisted greatly during job search.

It would be nice to have had 1 more programming class.

I didn't really know what I was getting into at first, but I don't know how you find out without doing.

Practical, practical, practical experience

Interpersonal interaction skills, understanding of variation in the real world, understanding that the equations are a tool to reach a simplified (tractable) description of the physical reality, appreciation for the skills of people not well versed in math and science.

"What are the most important qualities or skills that a Chemical Engineer should have? Why? (For example: working independently, creative thinking, problem solving, time management, communication, working in a team, intellectual curiosity, confidence in field, ethical responsibility, etc.)"

All of the above - everything comes into play. But good communication is key, being able to convey your ideas effectively.

Creative thinking and problem solving

-teamwork -problem solving -ability to keep learning: confidence in knowledge area and ability to learn additional areas

working independently, critical thinking, problem solving skills, team work, time management, human resource management

Curiosity, problem solving, confidence in their academic preparation, team and people management

Professionalism and time management. Also, critical thinking skills.

ChE covers a broad field. Some skills are more important in certain situations than others. Regardless of final occupation, I'd say there are two key qualities needed: * Communication skills * Ability to work with and manage various people: co-workers, upper management, union employees, etc.

Not sure I am the right person to answer this question because I don't feel I am a typical chemical engineer. I personally value breadth of interest and life experiences, plus creativity; however, I am not sure these areas make a good chemical engineer. In fact, I feel that these interests have led me away from the field to broader areas like medicine, business and public policy.

Problem solving - in an engineering career, or any career, the ability to analyze and solve problems is essential. I also believe team work and communication skills are important as so much of what we do requires working with teams. These skills are especially important in cases where not everyone has the same educational background.

Problem solving and communications, you need to figure out tough problems to help contribute to the company and then be able to communicate results and conclusions in a clear way.

project management, ethics, communication - personable, organization, multiple task management.

Problem solving and time management. We are employed to solve problems and it is important to do so in a timely manner. The business world has lots of deadlines, so being able to manage your time well while getting the job done is important.

Being able to grab a technical book and make sense of it very quickly without needing too much help. You'll do very well in ChE and in jobs.

Confidence in field, working independently, problem solving.

Good work ethic-easily developed as an undergrad. Time management-very important; need to learn different time management skills as an employee compared to a student Ability/desire to continue learning-without it, you can't do a very good job.

Problem Solving - Can be applied to almost any application Communication - Can't be a good employee without good communication skills

I feel the most important skills are communication and intellectual curiosity. Companies are looking for new grads to bring a fresh perspective and they need to be curious and follow through on that. Ethical responsibility is a given, but very difficult to teach.

Technical aptitude, initiative, results orientation, good communication skills

In this job, problem solving, time management and working in a team, and communication are huge. I think if anything about my degree has helped me succeed here, it has been the soft side skills that were gained, not the formulas, hard core book material. I know I don't remember much of it, if any since I don't use it daily.

The ability to see any process and take it apart, so you can understand it, the variability and the needed outcome. Like a ChE won't always work in the field of education they need the ability to adopt to a new situation and understand why/how things happen.

Communication is key in any position and probably the most important. If you can not effectively communicate your expectations, thoughts, or questions it does not matter how book smart you are. Creative thinking and problem solving are the next most important. Most jobs center around solving problems in unique money saving ways that still meet the final design or product quality.

The most important skill is problem solving, because most of the time the problems we need to solve are not found in the textbook. If they were, they would have been solved already. Confidence and competence in the field is also important because it usually isn't very long before a new engineer might be the expert in a particular area, so they need to speak confidently and competently to others who are not in a position to question their recommendations.

As stated above, I feel that non-technical communication, influence and advocacy, as well as team skills and problem solving abilities are all critical. However, i would also say that, given that a chemical engineer will most likely be looked at as an expert in his / her chosen area, that person also needs to have a fundamental sense of personal safety, as well as the safety of others. This includes an awareness of self and situation, that is not necessarily taught in school, but needs to be recognized as an important skill, in building trust for yourself and the team you are working with.

Need to be proficient at all of the skills above: (working independently, creative thinking, problem solving, time management, communication, working in a team, intellectual curiosity, confidence in field, ethical responsibility, etc.) for job security and growth.

For me, the most important qualities have been time management, communication, confidence, and ethical responsibility.

Problem solving, working independently, creative thinking. I think most projects are problem solving projects that require creative thinking. In addition, a lot of companies have limited human resources. A lot of the times, I just work independently on my own.

Dynamic problem solver ability to pick up new technology and ideas quickly as well as apply them.

Problem solving, since there will always be a problem to solve! Creative thinking the only way to get ahead of the competition. Working as a team you need to be flexible, yet stick up for what you believe is right.

Primary: Problem solving. Companies like KC hire ChE's because we are problem solvers. Not necessarily because we can size a pump and solve a distillation column. But, the one thing that all ChE jobs have in common, whether in the petroleum industry or the food industry is the need for problem solving. Also, the ability to work in a team is crucial in the real world. No one is an island. Although we are all responsible for our little part in the process, projects are a success or a failure based on the abilities of the team, rather than those of an individual.

I think they just need a willingness to work hard because there are so many jobs available to fit everyone's unique personality.

Problem solving & communication are both important skills, the problem solving skills are the reason many companies hire chemical engineers. Being able to effectively communicate is critical to making an impact and learning from others.

problem solving, working on a team

Problem solving, working on a team, focused, determined, analytical

Problem solving Intellectual curiosity Confidence in field Time management Working independently or in a team My work duties range greatly, but the above skills I find necessary to succeed in any job.

Problem solving, decision making, communication.

Problem solving and working in a team. I think these two elements are what make a ChemE hireable across any of the engineering disciplines.

everything listed in those examples is a necessity to a chemical engineer. One that isn't listed is applying what you know. One of the most useful skills that a bachelors level student never really learns is the mechanical functions of the process equipment they use and how to repair that equipment. This is a real benefit when something goes wrong. You know the equipments weak points and can identify the source of problems quickly.

Teamwork, problem solving, creativity

The ability to work under uncertain, non-ideal circumstances is key.

Problem solving/creative thinking.

Team working skills, communication skills (to be able to communicate results to people of diverse technical backgrounds), time management

Project Management is of utmost importance. This involves leading a team, working independently, and good time management. Problem solving is another key element as this skill translates to many job positions in engineering, as well as other fields. Communication is also important. My education at Madison taught me good technical writing skills, but much of the communication done in business by engineers is of a non-technical nature. Business presentations are being given, emails are being written. I think that more needs to be done to prepare the students for how to communicate properly to non-technical personnel. Decision making skills and confidence is also important. Many young engineers are unwilling to give their boss a recommended course of action, even though they are the most knowlegable employee on that particular topic (since they were given the task of researching the topic). Engineers need to be willing to make a decision or at least a recommendation in order to add value to the organization. Also, they will sometimes need to make a difficult decision without getting a second opinion or having much time to analyze the data. They need to be comfortable doing so. Basically companies today are expecting their engineers to be very well rounded and resourceful. Therefore, all of the traits listed above and in the example are important. I need to work independently and in teams. I need to communicate will all levels of employees, both orally and in written form. I need to manage my projects. I need to solve many problems and do so creatively. I need to balance the needs of many different interests (ease of use by internal production, customer friendliness, market appeal, cost, efficiency, quality).

A chemical engineer should be able to work through every problem, hence should have very good creative/critical thinking skills.

Chemical engineers need all of the examples listed above. I have needed many of these skills in graduate school. With that said, writing skills are important.

Problem solving. I view all the hard work in school as training for my brain in the real world.

Problem solving is the most important quality. Even though a Chem E doesn't know the answer to all problems, they usually know how to go about figuring it out. It's always good to have good communications skills as well since it's important to build good relationships with coworkers and to let them know what is going on in your project.

Communication is very important. Customers especially sometimes make me very angry, but I still need to be diplomatic so we can work out the problems. The group work that I did was more of a friendly situation. Managing people was not covered in college. Time management is also very important. The customer tends to demand a lot of my time. I need to get the job done, but I need to balance the customers' needs with keeping personal time.

From what I've seen, even Chem E's not working directly in a Chem E position are valued for 2 things especially; problem solving and ability to work w/a team. And with good reason-these are two of the most important qualities.

Problem solving/ creative thinking.

What I think is important and what managers value are two different things. I value creative thinking, problem solving, intellectual curiosity, ethical responsibility, thinking about long-term consequences, and team work. Industrial employers (based on my experience and that of several ChE grads I know) value time management, following orders, organization, rapid resolution of problems. There is no emphasis on seeking optimal solutions, just quick and dirty answers with minimal attention paid to long-term effects.

Thus, problem-solving skills (mentioned 28 times), teamwork, and communication are repeatedly singled out here, even though the context of this question was related to the list of core curriculum topics.

"Which skills would you like to see the ChE program encourage or improve on?"

Presentation skills, maybe a more formalized definition of the skill sets received in this area - something to put on the resume that says we're skilled with presentations. Maybe a focus on communication skills in general.

Recent bio topics

management skills.

I'm pretty happy with the skills I learned.

Soft skills: presentation skills for both technical and non-technical managers

The single most useful experience of my undergraduate years was studying abroad through a UW Engineering program. I think the world would be well served by encouraging more people--engineers and others--to put themselves in an uncomfortable position and experience a different culture.

Summer lab needs to be restructured. Students get burnt out and don't take as much away as they could if it were during the semester. If the same course were taught over a semester, students would learn much more.

A greater emphasis on statistical analyses and experimental design.

Stats-encourage ECE-encourage Comp Science needs improvement

project management.

Innovation is always a highly prized attribute in engineers in industry. I think encouraging students to think creatively and 'outside of the box' when solving problems in the ChE program would be helpful.

I feel that there should be more emphasis on material science processing. A lot of epitaxial engineering jobs are available, but people with ChE from other school are more suited for the jobs?

Curriculum applications to real world industry.

Statistics. Real-world problem solving skills. I think most of my problem solving in school was math-based and that is hardly ever the case in my job.

Management skills. It doesn't take long for many ChE's to get into management (3 years) and something to better prepare them could be important.

I would encourage an elective course on plant operations that would get more into the nuts & bolts of process/production engineering.

That's tough since you can go into so many fields. I don't know how but I definitely the most challenging thing coming right out of college is not knowing how to deal with people who have had little education, have been doing the same job for 20+ years. All they used to have to do is punch in, do their job, and punch out. Now we are asking them to work above and beyond normal job duties, become engaged in the business and drive business results. It can be a tough thing to do. Maybe require some management courses that may be offered through a operations management degree. Whether you go into research or operations, if you are going to advance in your career, you are ultimately going to manage people. They are much more dynamic than any chemical equation or reaction.

real world apps.

more creative thinking would have been helpful, if for nothing else than the practice. It's hard to be a creative thinker when you are under a timeline and have certian criteria to meet.

1. Writing shorter and more effective reports. It's important to teach writing formal lab reports as we do in summer lab, but most of the time 1-page is the max that anyone will read. 2. Engineering Intuition. Young engineers coming out of school now have the ability to do some phenomenally complicated calculations, but sometimes lack the ability to make a good back of the envelope guess. Sometimes order of magnitude is all you need, but you don't have time to plug numbers into a HYSIS to get it.

See above - non-technical skills.

communication, ethical responsibility

I think that the ChE program did a good job of exposing me to many different topics and prepared me to be capable to go into positions that were directly ChE related and many that were other engineering related.

Some mechanical engineering courses added to improve understanding on plant equipment and machines. Add some field trips to improve knowledge in practice. Most ChE courses focus too much on calculations that are complicated and tedious. Such kind of manual calculations are not used so much in industry. Instead, more should be focused on the theory and understanding of how things worked.

statistics, creative thinking, documentation

Business skills, stats

Team work. See above.

More creative process design as related to consumer products and some product development/consumer insights type classes, more stats and Spanish- a lot of businesses have or are moving production to Mexico, Latin and South America.

Intellectual curiosity and creative thinking

Problems we do in class all had givens/assumptions- in the real world no one gives you these- teach more about how to make assumptions for real life situations (determining which factors are significant).

Communication and creative thinking

Biochemistry. It seems to be the only place in our field that is growing robustly.

Definitely project management, problem solving, and practical applications

They need classes on project management, some that focus on the business side of the engineering field. Pricing projects, working with vendors, etc.

Working independently. I think most ChE students rely on fellow students and Ta's too much.

Project Management, Communication (especially non-technical, i.e., good diction, sentence structure (syntax), organization of ideas)

Experience and case studies from alumni who had been working in the industry. There was enough emphasis on the academic side, but not enough on the industry side.

Computer skills

1. I don't remember many presentations (although I remember lots of reports). I think oral communications skills are very useful and could be started in undergrad. 2. internships or co-ops should be required.

Project management skills. Goal setting, scope, critical chain project management. Perhaps some general introduction to industrial engineering. How to present complex topics to managers with 2 minute attention spans.

Clearly, management skills and statistics are both strongly recommended by the respondents.

Advising

The next question asked for a rating of the quality of career advising.

very adequate	13
somewhat adequate	25
somewhat inadequate	4
very inadequate	6
not applicable	5

The average score falls in "somewhat adequate." While these scores are generally satisfactory, there may be a need to ensure that the minority of students who are strongly dissatisfied with their career advising are provided with alternatives or otherwise assisted. Advising quality still varies from advisor to advisor. More advice on long-term trends and non-traditional fields is

proposed in some comments. Respondents had a large number of suggestions on how career advising could be improved.

- Advising on path to graduate school and best coursework and undergraduate research experience for this path.
- expose ChE undergrads to opportunities in different industry and how a ChE fits into the industry. Workshop on career preparation (resume writing, cover letter, interviewing skills)
- It would have been nice to have more opportunities to meet and socialize with faculty. I think they are an incredible resource that I never really got to know or utilize. I regret that somewhat now.
- I had a lot of luck in getting my two semester co-op with Dow Chemical and summer and winter break with Boston Scientific. I started early (interviewing in the sophomore year, and got a co-op for what would have been my fourth semester in school. I sort of learned the ropes as I went along so that I was more focused by the time I graduated. I do not think that random job opportunities were fully explained (like the IT consulting jobs) and I know of 5 or so from my class that went into that field. I wish I would have known more about non-traditional career paths, office politics, and how to manage a career once graduated (asking for promotions, handling sticky situations at work, etc).
- I wish I had been better apprised of opportunities that engineers were qualified for, but were not traditional engineering careers. Examples include management consulting, investment banking, medicine, law, etc.
- I don't think it could be better. At my current institution, they don't advise undergrads nearly as UW did. They practically ignore undergrads at my current school and they end up dropping out or taking longer to graduate.
- My advisors were not particularly interested in helping or making recommendations. I assume because they were interested in their research and I wasn't working under them.
- I came in as a transfer student my junior year and found that I was behind on the internships. I would recommend more guidance to transfer students to help them get on board and encourage them to get an internship. I didn't have that, and without it, was at a disadvantage when searching for a permanent job after graduation.
- Advising time geared to students' interests. For example, have an afternoon where students can be advised by industry/faculty on field they wish to enter, such as food or petroleum, etc. You could hold panel discussion or one-on-one time.
- I got some help but I was mostly on my own trying to find the right job/internship.
- More personalized.
- I received some good advice and my advisor was willing to spend time answering questions. I would have appreciated more questions from my advisor to help me figure out a career path, but overall I was satisfied.
- I didn't really take advantage of the program enough - encourage students to really get to know their advisor
- In recruiting at other schools, I see that WI had a good career services program. Facilities are top-notch & organization/ turn out at UW career fairs are excellent.
- I really don't feel like I had any. Maybe that was my own fault since I really didn't know 'what I wanted to be'. I felt like my advisors were there to just go through the motions but honestly some of my managers are the same way. But like I said, so many of us just learn how to manage from each other, we were never 'trained'. I'm not sure that my advisors were ever taught how to 'advise'.
- On the surface the program was good, but there were many inconsistencies on who and how to schedule interviews. The prep sessions stressed certain things (company background, ask interviewer questions, etc.) that were not helpful for first interviews. I do agree with the message, but there was too much emphasis on the other things and not on how to present yourself and answer the questions.
- More face to face time with the advisor.
- Perhaps a university-sponsored mentoring program for students with willing industry representatives, most likely alumni...

Better placement and giving all engineers an equal opportunity to interview with all companies.

I think the ECS did a very good job. The improvements that come to mind are more on my end and not something that they could have done anything about.

Most advisors do not spare enough time to really talk to students about the curriculum, not to mention career advising.

excellent

Communication could be improved for Freshman & Sophomore years when students may not have many engineering courses.

Keep expanding the list of companies who have a campus presence.

I don't think I used the career advising department enough when I was there since I had consumer products in mind from the start.

ECS was very important in preparing me for my job search for co-op & full time opportunities. I think the main way to improve is to stress the importance of utilizing these resources to new students.

I had very little idea of what career path I preferred while in school, and a bit now (which is not unusual for most people). I partially chose my company because it was typical. I would have liked to research different career paths, and have more advising on graduate programs prior to graduation.

Not all chemical engineers take technical positions- some get into management/supervision- make sure students understand there are options.

I felt that Kathy Myhre was the most help in the department, and now she's not there any more. The interviewing process was helpful, the co-op program is SO VALUABLE. I never felt like the professors knew the full scope of career opportunities. I felt limited on who I could talk to.

Show entry engineering students long term trend data on different fields and their long term growth.

Outside of the student organizations, I didn't get much from the College. I question if the COE is the right place to go for career advising in the first place if you are looking to go into industry.

Work with the freshman and sophomores more to give them more exposure to what the different engineering fields can entail, so by the time they are ready for graduation they have a firm handle on their possibilities.

Dr. Yin was a great advisor who took the time to understand my career goals and intellectual interests.

Career advising should be done with alumni who had spent time in the industry. Input from professors was helpful, but they may not get 1st hand information in the industry.

It would have been nice to be able to specialize in some kinds of products to be able to target an industry you want to work for.

My official advising consisted of a ChE faculty telling to graduate in 4 years period.

I did not really make use of the career advising.

Discuss the actual jobs and geographic locations where entry level engineers end up. Discuss, as early as possible, the vast differences between the coursework, and the real work engineers engage in.

"How well prepared do you believe you are to compete within your field or current area of employment?"

very adequate	30
somewhat adequate	18
somewhat inadequate	1
very inadequate	0
not applicable	4

Comments:

An engineering degree allows me to think as an engineer as well as a biologist

I'm very happy with my preparation. At the time it was very rigorous but comparing my education and preparation with that of my peers from other universities now and during an industrial coop, I find that the education I was receiving was one of the best.

I'll be taking the CPA exam next summer!

Chemical engineering has given me the confidence and credibility to be successful in new things, especially the intersection of business and medicine. I am consistently able to attract attention from top academic institutions and employers.

Although I thought there were some deficiencies in the education, I feel I really learned how to study and learn. I was able to teach myself many things like Visual Basic and electronic hardware configuration because I catch on so quickly. I think that's where problem solving comes in and ChE at UW taught me that!

I'm not really doing typical Chemical Engineering work, however, I have the tools to succeed in my job today - communication, project management, integrity, teamwork, etc.

I gained a lot of experience during my first couple of years by doing lab work and supporting the plant. I am confident that my experience in both lab and plant work will help me to compete in my current area of employment.

I'm not anECE so being in the semi-conductor industry is challenging, but ChE laid enough background for me to learn anything.

I think a ChE degree from UW-Madison is a big plus.

I had the general technical training, but had virtually no exposure to my current industry (which is why I took continuing educational classes)

I am very well prepared to compete in the ChE field, but have chosen to follow the business side of the company.

I feel that I'm as technically sound as anyone else I've met in the company w/my experience level. My boss has commented in the past that the UW grads he has employed have all been very technically competent. The other thing I learned was the work ethic required to excel.

With a ChE background 5 years of front line management I can now go where I want to and do the projects I want to.

I have always been a hard worker and strive to understand that which I do not. My UW education is a great foundations which I have built upon during the last four years.

Experience in my chosen field has helped me to reach my career milestones thus far, not necessarily my education per se, but the mode of thinking developed when getting my education.

Need more project management and business skills.

Since my position is not directly ChE related there are areas that I had to pick up on the job. The ChE program prepared me very well to be able to do that. An example is that I was taught how to handle a problem in general, not just specific problems.

Because the UW program is quite strenuous, I have found that I and other UW graduates are efficient and adaptable in a work environment.

Other than stats, I was very prepared. Really challenged in college such that I was sure I could do what ever lay ahead.

I believe I have been well prepared since I have received 2 promotions since starting (which is considered good in our company).

I believe that UW Madison's ChE program is better or at least equal to any program in the nation. Within our field, our credentials are well respected. Within my current area of employment, I believe I am well prepared to succeed, by using the skills I learned (if not the classes I took).

It's hard to say much credit I can give to my ChE degree though. I think if nothing else it at least gave me a lot more confidence.

The quality of the chemical engineering curriculum helped to ground me with a strong analytical skill set. I think a lot of the softer skills are easier to pick up as you progress in your career.

I feel that I am on the same level as most people I work with.

Between the skills learned in college and the broad experience I've received at work, I feel well prepared to compete in my current area of employment.

I pick up things fairly quickly- I attribute that to learning how to learn in ChE.

After making it through the program, I felt like I could accomplish any task after that. No challenge I've come across in my career has been as grueling as some of my classes were.

In my current position, my background and skills make me a force to be reckoned with.

I'm in a different field now.

I am almost 3 years removed from getting my degree, I have no chemical engineering experience, and I have been doing nothing even remotely related to chemical engineering. About the only things my job is doing for me are honing my people management and time management skills and taking on responsibility.

Compared with students from other educational institutions my chemical engineering background was very broad and complete.

Again, more real-world experience would be ideal.

The Chem E courses give us a very good background for dealing with all sorts of different problems.

People in my position at UOP tend to get a lot of experience quickly, so they are typically able to get another position if they so desire fairly easily.

UW gave me a very solid technical education.

Be it my God-given talents or the education I received at UW, but I am always being offered new jobs and am receiving excellent reviews.

I do not intend to work at this educational level in chemical engineering, because the available jobs do not use the material I learned that fascinated me (transport, statistical models, materials). Most of the available jobs do not use the creative and analytical brainpower of the people they hire; what they use is the organizational skills, and they prefer 'the man in the grey flannel suit', the person who comes in every day and never questions orders to someone who is creative, analytical and desires challenge.

"How does your undergraduate education compare with that of peers in your field from other schools? (Example: advantages, disadvantages)"

My education is more theoretical than many others. I go back and forth on this, but I think that's a good thing.

Same for other ChE's.

I feel that we (from UW) have strong problem solving skills.

Ohio State has more support for co-oping. My company has been hiring a lot more ChE's from Michigan State and Minnesota lately, and I don't know why.

This may be hearsay, but I'll type it out anyway. One of my WI ChE classmates is currently doing his PhD at Georgia Tech where I am doing my MBA. He TAs for undergrads. He says that they can't write lab reports, and they hardly know what is going on. Working with many engineers (not ChE, but mostly EE and IE) in the MBA program at Tech, I don't think they are as 'polished' as the ones I met at WI.

Equal or better.

I think we all think we had the best training. I have several friends from Purdue and they think the way they learned was the only right way to be done. I beg to differ because think Madison is a step above the rest and is fully respected as such.

Very well, especially in process engineering, thermo, and polymer knowledge.

My education level was similar to other entry-level engineers.

I think that the UW-Madison ChE program is a lot more intensive and covers more than other schools.

Compared to a former colleague from Michigan Tech-outstanding in terms of analytical ability and conceptual understanding. She knew how to do the math. I know what the math meant, what concepts were important, how to make the leap from 'this unit in front of me' to 'all units with similar characteristics'. Some of that may be differences in our personality, but a lot is due to the emphasis of fine teachers on the PROCESS of approaching problems.

Advantage in the technical areas. Disadvantage in the softer areas - no time to take other courses of interest to round out your knowledge base, just an engineering and chemistry focus.

Much better breadth and depth!

Most of the people that I have worked with have had UW-Madison ChE or ME degrees or have worked their way into their position over the years without an engineering degree. Therefore, I do not feel that I can make a general comparison.

I got BS in Seoul National University. Advantage : Lots of kinds of classes Disadvantage : Lack of independent projects

Seems similar, though perhaps a bit more theoretical/less practical than others (e.g. Purdue).

UW gave me an advantage in knowledge that surpasses most all other engineering students I've come across.

No comparison... advantage in report writing... we have done quite a few.

Advantage: My education began with the theoretical principles before getting to the applications of said theory (particularly in the area of transport phenomena). Disadvantage: All the theory and applications I learned were based on the petroleum industry, and I feel disadvantaged a a result of not getting additional practical applications in different industrial fields.

Advantages: Better thinking and problem solving skills Disadvantages: With a good reputation from Madison, some superiors may be over-expecting.

adv: quality education disadv: none

Most of the engineers are UW-grads, two are Mich.Tech grads. Don't see much a difference.

comparable

I think having a lot of theory is helpful because it encourages me to think about problems scientifically. I think there are some practical things that could be learned by having more lab exercises along the way.

Overall, UW Madison's program is exceptional. Some disadvantages: We are very petroleum based. Keep trying to broaden classes... see if there is a way to add an elective course focusing on consumer products.

Less statistics than some others. I feel I have a good general understanding of basic concepts (reactor design, process controls) better than others.

Some other undergrad programs do provide product development type training.

Similar for the type of work we do.

I believe the education I received from UW-Madison ranks high amongst my peers. Advantage - I think the professors are dedicated to both teaching and research, increasing the value of education received. Disadvantage - Some other schools strongly encourage (or require) interns and co-ops. It is easily available, but this did not come up in advisor sessions (encouraging a broad experience).

I am way ahead of my peers in not only the knowledge base but my analytical and problem solving skills.

I don't know anyone from other schools who are chemical engineers.

I think academics are as good as anybody else if not better but a well-roundedness from UW-Madison surpasses most peers.

Very well, especially in process engineering, thermo, and polymer knowledge.

Unless I choose to go to material processing/chemical processing, it's hard to compete. However, the intense academic learning in ChE allowed an even playing field.

clearly better than average

Compared with students from other educational institutions my chemical engineering background was very broad and complete.

I feel it holds its own weight certainly.

The UW courses appear to be much more difficult and stringent that those at other universities.

Technically I think I was best prepared. Many of the other schools had a large emphasis on biological systems, while at the time mine didn't. I was able to focus on classes that would help in the future.

I think UW Madison students are very smart, hard working, and well prepared academically. I have noted that the graduates from Michigan universities having trouble with Visual Basic and doing

mass balances more than Madison students. I can't think of much more, but that there were a few engineers that weren't pulling their load at UOP, but none of them were from Madison.

"During your undergraduate study, what subject areas, if any, would you have liked to study more? Why?"

Here, there were lots of suggestions; statistics and business and real-world examples lead.

statistics-necessary in any operating environment economics

Again, I go back go management. Although, I don't know if I'd have said that 5 years ago when I was still in school.

Stats, accounting, marketing -other applicable business classes.

Material Science. It's more of an applied science vs. theoretical.

Business & Physics & Dance. Business was useful. Physics was fun & interesting. My one year of ballroom dance was great. I wish I took other types of dance as well. One can't work all the time. One needs time to relax. Not to mention, at fancy dress balls given at my past job, one needed to know how to dance! Much more important as a social skill than knowing any thermodynamic equation!

Reaction Kinetics because I liked Dr. Hill and thought it was very easy to learn things from him, and reaction kinetics was somewhat interesting.

Thermo, chem. kinetics and polymers. I understood the theory behind these areas and also enjoyed the subjects.

Chemistry, 'hands-on' labs helped me learn more.

I would like to take some mechanical engineering course. I should have taken both ChE 440 & ChE 540 because polymer knowledge is needed for me in my job function. Some engineering economics course should also have been encouraged or added to the program because most projects in the industry depends on the profitability and return of the projects.

Polymers

Applications of engineering processes in the field, be it food, chemical, etc. We spend too much time on distillation columns when in fact no more than 1-2 people in my graduating class actually work with them in any capacity.

Reaction Kinetics and Fermentation Processes - Have a strong interest and would apply directly to current position

World history-personal interest. I would never give up the education I received but I wish I had more time to take other courses.

I would have liked to take some other engineering courses in non-ChE degrees (like ECE 376) but there isn't enough time. Having a little knowledge of what other engineers you encounter are doing aids in communication.

Statistics, due to its frequent use in my work.

Bio, it was mixed field of everything I learned.

Areas outside of engineering, especially: biology (specifically cell biology, immunology, physiology); economics; political science; and humanities.

Biochemical engineering. This would have opened so many more doors to me than I have right now.

Business part of chemical engineering. Entrepreneurship.

Food science / engineering and business.

Industrial Engineering / Economics / Business. After all, this is a world revolving around money and companies appreciate engineers understanding the cost effects and supply & demand.

This may sound like abolute....but more real world stuff. As in where am I going to use this. The best class I had was ChE 424 and the knowledge this is truly used.

biological systems and modeling in engineering. transport phenomena in biological systems and human physiology

controls and biochemical, interesting courses.

Polymers I wish I knew them better, the one class I had was not sufficient.

Pharmaceutical separations - the class that is offered through BSE is great! It gave me a good starting point when I entered the working world because it covered topics specific to my field that were applicable to my project work.

Food science. I would have liked to have a better background in food science, because one of my interests was working for a food company, and I wish I would have taken more classes in this are.

Problem solving strategies: to gain more confidence. Statistics: I have little knowledge and think I could be more effective with more knowledge of statistics.

Math, but that's just because I liked it- it wouldn't really have much relevance to my job now. I also was interested in food science since it seemed to be the closest thing to consumer products we had.

statistics

I would have liked to have taken ChE 540 to improve my understanding of polymer science.

Literature- a field that I was not heavily into due to the preponderance of science courses.

I really think that I got a full and comprehensive education at UW. With three majors, I really felt that I got my money's worth at an excellent education that prepared me well for grad school.

I really enjoyed ChE 430 with Professor Hill, so I would have liked to learned more about reaction engineering.

Food Chemistry, but with the credit load required there was little room for it.

Additional math would have helped me.

Thermo, Chem., Kinetics and Polymers. I understood the theory behind those areas and also enjoyed the subjects.

Material science because I'm using it a lot more in my jobs.

polymers, material development, statistics

I have a pretty thorough and broad course load as an undergraduate.

Materials and electronic components.

biological engineering computer programming

Unit Operations - I wish we would have had more time to get into the nuts & bolts.

I think my education was quite adequate for what I am doing and wasn't lacking. If I would have known I was going into Petroleum (which I didn't) I would have liked to have known something about the industry and what an engineer there does.

Computers and electrical components. In plants, it would be nice to be able to understand most of how instrumentation works. On the lab side, it would be nice to be able to set up experiments.

Laboratory Experience

"The ChE degree requires 15 credits of laboratory courses involving Chemistry and Chemical Engineering. Please rate the value of this laboratory experience to your career and comment on why you rated it this way."

very valuable	28
somewhat valuable	15
of limited value	10

Over half of the students chose "very valuable." Comments are constructive to scathing:

I remember a lot of ideas clicking in lab, after reading/talking about them earlier.

The only value would come from writing technical documents. I have had very positive feedback from Capital Appropriation Requests that I have written (request for money from headquarters to complete a project).

I don't do lab work now, but having the background on lab work does help.

Lab experiments helped with techniques and how to perform lab write ups. We always need to write up what we did, how we did it and the conclusions.

Mostly the forced writing of the lab reports. I still need to document what I discover, and let's face it, **Engineers ain't speakin' no English good. The more practice the better.** Although I wouldn't shed even one tear if you were to kill Summer Lab. I still shudder to think about it.

I hated them at the time. I still despise many of my former lab partners. But, it was the best way to bond with people. My non-despised lab partners are the ones I still keep in touch with. The lab writeups taught us to be precise in what we say, use a standard presentation style, & statistics. More oral presentations might have been good.

I don't really do typical ChE work today, so I'm not using any of those lab skills or knowledge.

This was one of the times that we found the applications of formulas and numbers to actual systems. I actually would like to see more lab experience to further the translation between book problems and true-life experience.

Labs reflect real-world experiences. This knowledge and experience is invaluable.

Hands-on experiences are always useful because in the industry, everything is in practice and no longer in books.

Physical Chemistry lab spent hours waiting for equilibrium-primary benefit was teaching how to analyze the relative error contribution, and to appreciate that someone else was willing to stand around collecting the physical property data chem engineers need.

Controls was extremely valuable. Analytical chemistry was a waste of time.

Improves technical writing skills

The lab experience is probably the largest thing that differentiates my education from other ChEs I have met. I think this an invaluable requirement.

My positions have not involved labwork or reports so it wasn't of a lot of value to me but I am still glad to have experienced it.

The practical hands-on experience was valuable as well as the process of analyzing the results, applying coursework, and drafting the reports. This was very helpful in preparing me for the technical documentation that I do in my work.

I got BS in Seoul National University in Korea. But those in UW should be very valuable.

I never particularly enjoyed chemistry lab as an undergrad and never particularly enjoyed lab work during my first four years of employment. That's why I switched out of the lab. Interestingly enough, I greatly enjoy lab in classes I'm taking as part of my Masters degree at the medical school.

I could walk into a research lab and have all the laboratory skills to work there, and engineering lab practice gave me good firsthand experience on troubleshooting equipment, allowing me to repair or direct repair on most all equipment on site.

Some labs are not good, but OPS lab while tough, made a difference.

Teaches you the value of scientific method, but does not allow the flexibility to modify test plans on the go - necessary to maintain the fluidity of a plant production atmosphere.

Lab courses assisted me in understanding the academic courses, but it was of no help to my work. There are not that many jobs out in the industry that requires lab work.

very little in my current job. However I would not change it.

useful in development critical thinking skills esp. in summer lab

Develops good problem solving skills.

I work in research and development where lab experiments are key and the lab classes were much more instrumental in teaching me what I needed for work than the other classes.

The labs, although being way too theoretically based, provided an opportunity to learn writing skills essential to my job.

A lot of new engineers spend at least part of their time in the lab. Being comfortable in the lab and having some prior experience is helpful.

Lab classes take theory to practice and are vital to the learning process.

Lab courses were generally good experience. For a process engineer in a large plant, the lab courses were not very 'real world'. They were too focused on theoretical concepts.

The lab time itself wasn't valuable at all, but **learning to write technical documents has been very helpful** and I use those techniques all the time in my job.

I don't do a ton of lab work, but when I do, the education has helped.

The laboratories broaden the educational experience by providing direct hands on experience. I spent many hours in the laboratory or out on operation machines, which I could picture how things work.

A lot of time...if you've done one lab you've done them all for the most part. Be better off learning to understand project development.

I took Botany 151/152 as laboratory electives and I didn't get very much out of them. ChE 324 was extremely valuable in terms of writing skills.

It was helpful seeing what was learned in class in action.

Running experiments is what I do, and you don't learn how to do that by just reading a book. It is also important to learn the shortcomings of experimentation and get a feel for the importance of uncertainty and variability.

I would say that the ChE courses were better than the Chemistry courses. In general I felt that the Chemistry department at Madison was not of high quality (this is in comparison to the ChE dept and the chemistry department of Wheaton College, which I transferred from). I felt that the ChE lab courses were in general worthwhile. It is good to know how to analyze data, present data and results in the form of a report, work as a team, design an experiment, and prepare for a project. The analytical chemistry lab that I took was fairly worthless. I ended up knowing more than the TA.

In my opinion, little beats hands on experience especially in the ChE labs. PChem lab though seemed to be of little help in terms of professional development.

Labs reflect real-world experiences. This knowledge and experience is invaluable.

I think the hands-on skills and teamwork skills developed in these laboratory classes are of great value.

I haven't done too many lab works in my job, but the lab analytical skills do come in handy.

documentation! keep up with lots of different activities

Greatly aided in understanding material covered in classes.

It's rigorous and prepares you for the worst that could possibly confront you in the business world.

We had our asses worked, and it taught us important lessons in managing time.

-the part of summer lab that was *not* a scripted lab was valuable for experiment planning, hypothesis generation and testing, etc. -324 was of limited value for its applied statistics, but overall an efficient waste of time -organic lab was valuable fo

I think my technical writing skills are very good as a result of the lab courses. The chemistry labs I never use, but the ChE lab material I use on a daily basis.

Report writing is very important. I always have to write reports, insert figures, etc. The lab course taught me how to do this neatly and correctly and quickly. The experiments were also useful in demonstrating that results don't always work out according to theory. Working with data is also very important.

Lab is where we got to apply our knowledge and work on pilot plant type stuff.

"Please rate the value of the summer laboratory course in particular."

very valuable	33
somewhat valuable	15
of limited value	4

Overall, 63% of respondents chose "very useful." Comments were very strong. Seven students explicitly mentioned the Oviedo lab and others mentioned London, so the overseas sections were also appreciated. Three students declared summer lab their "best overall" course, while others requested we "kill" it. Many asked for more up-to-date equipment.

It's always easier to understand something once you work with it hands on. This lab provided that.

I was fortunate enough to go to London. I loved the 1 opportunity I had as a chemical engineer to study abroad. I learned a lot about chemical engineering, but this was a great opportunity to travel, see the world, meet others from other schools, and gain confidence in traveling on my own. I loved it!

It demanded creative and independent thinking and brought the theory into the real world.

Since I was lucky enough to go to Oviedo Spain, I think the course was more valuable from a life experience stand point than course material. But attention to detail and technical writing skills gained were also very valuable. But where else can you see some of the most beautiful countryside, experience a totally different culture, and deal with difficult situations such as being so far away from home and get almost stranded. :) I had all my money, passport, plane tickets stolen 2 days before returning home. It was the worst experience of my life but I think I learned so much at the same time. Survival, trust, respect, etc.

Good problem solving course.

For same reason as above… just more intensive because of the number of labs as well as the broad range of topics.

Ah, I should have read ahead. At the time I was told that it was to 'prepare us for the real world'. Well, having been there for nearly 5 years there's no way in hell I'd ever lose that much sleep for my job. NEVER. Nor does anyone else here. It was 5 weeks with no income as a student during the only time of year I could work full-time. Kill summer lab, please.

Most people had jobs lined up when they took the summer lab. There were those who were concerned about their grades, but half did not care at that point. It wasn't nearly as bad as people had made that class out to be, though. The main benefits I saw were meeting the people in the labs in the basement for building stuff in the machine shop. That would have been good to know earlier on. Two months before graduation, it no longer mattered.

Although I think that hands-on skills from the labs are very valuable, I do not see the summer laboratory as particularly valuable over the other labs. Summer lab is definitely useful though.

Summer lab taught extremely valuable skills in rapid assessment of a problem and solution definition. The labs teach valuable understanding that the real world is variable, imperfect and subject to instrumental/experimental failure.

Great to see the operations in action rather than in a book only. Report writing is a bit tedious, but it helps hone the skills.

Real good hands on exposure to small scale unit operations

The summer lab was of tremendous value to me from a time management standpoint. It was also valuable because 4 of the experiments were more like a workplace - someone gives you something to do and you have to take it from there and complete it.

I went to Spain, to Oviedo for my summer lab. This provided me with an opportunity to experience another culture for an extended period. The rigor of the course was also valuable and at the end of the course made feel that I had accomplished something worthwhile.

This class is a blur, mostly because I was quite sick for most of it. However, I do remember enjoying the instructors and thinking I would have learned much more had I not been sick.

In retrospect, I see that that was a firsthand preparation for my current job. We don't have a pilot facility, but it was a great opportunity to see what I'm getting myself into and coalesce all the knowledge gained through the courses

Helped to prepare me for the stress and demands of a start-up type situation in a plant.

Again, there are not that many jobs out there that require lab work or research and development.

The best class I had was ChE 424

Develops great problem solving, time management, and teamwork skills.

Best class in ChE I took it in Spain and it was one of the best experiences of my life.

Summer lab and 324 probably gave the most applicable knowledge.

The summer lab course really drives home the meaning of all the coursework. In fact, I think after completing the summer lab work, I understood some of the theory better. I was able to make observations and evaluations on real pieces of equipment.

It is a bear and a half, but it is an important course. I like that UW offers this class as a summer course, and forces its students to live and breathe it... it focuses you on the fundamentals. Other universities offer ops lab as a one or two semester class. I think that would have diluted the learning process.

It helped me realize how much I had learned in previous courses. I think it could be improved with more real-world labs (less theory).

Again the specific things done in lab weren't that valuable, but the way the lab promoted creativity and real world application was great and again, the technical writing was very useful.

I don't do actual chemical engineering, so I don't use much of what I learned, other than writing reports.

I took summer lab in London, which I found worthwhile from more of a cultural experience than a heavy use of my technical skills. Of course, this would have been a different rating if I took it somewhere else where we have more opportunities to deviate from a standard laboratory experiment.

A rite of passage...it does actually tie everything you've learned together, in a way.

Too much information crammed into 5 weeks. It would be better spread out over a semester. Students would learn more that way.

Not only did one get to see chemical engineering processes in action, but critical thinking was needed to develop a method of experimentation for the informal labs. Not only that, but time management was essential. The load was at times overwhelming, but not impossible, something that is very possible in the real world.

Summer lab brings it all together.

The summer lab was most likely more labor intensive then it needed to be. However, it helped develop the discipline required to meet the expectations of the job in urgent situations. Also teamwork, planning, data analysis, communication, organization and presentation of data, design of experiments, problem solving, were all learned from this course. The independent projects are critical to the value of this course.

It builds character.

It demanded creative and independent thinking and brought the theory into the real world.

The time management, problem solving, writing, and technical skills developed by the summer lab are invaluable.

I learned what working really hard feels like.

Especially international aspect.

Greatly aided in understanding material covered in classes. It also provided additional practice with technical writing

The lab reports were overkill, but the hands-on experience was valuable. It would have been nice to have some more up-to-date equipment in the lab. I think instrumentation and a control system would be a great addition to the lab.

Emphasis on creativity, hard work, a little troubleshooting, teamwork. Invaluable experience although I didn't necessarily think that at the time!!

As commented above, it was valuable. It was a bit much, however. I took summer lab in Spain. For me it wasn't worth doing it in Spain. I took a semester in Spain, and I had a much more 'Spanish' experience (I was able to speak the language and interact with the Spanish students there). During summer lab I was working all the time and I was mostly with other Americans. I would recommend to someone interested in visiting another country to skip summer lab abroad and study abroad during the 2nd or 3rd year of Engineering.

It was a valuable experience even though it half killed people. It would be nice if they stretched it out a bit.

Independent Study – ChE 599

Of the 53 responses, 33 students (62%) took an independent study semester as part of their courses. The most frequent rating was "very valuable."

very valuable	17
somewhat valuable	13
of limited value	2

Many had comments to the follow-up questions.

"Why do you rate it this way?"

I learned a lot but mostly it motivated me to think about what I wanted to do.

The two different 599's I took could have been more challenging. Basically it seemed like I was hands to do lab work, being told every step.

I didn't have as much freedom to do what I wanted with my study, therefore I didn't go all the way to very valuable. However, being able to have my research published is excellent for the resume, and was something I could talk about in interviews. The research itself didn't enhance my skill base, the copious amounts of lab credits had already covered that area.

I got to see the drudgery of graduate work. I worked for a PhD student under Dr Hill. It demystified the grad students for me.

The work was very rewarding, but not very useful outside the particular subject area.

I was given an idea of our research in the academia was performed. I learn how research was conducted. It combines both a learning and work experience.

It was difficult for me to spend the time I wanted to achieve the breadth of results I wanted. Some of my perception is because I already had significant laboratory experience, so I did not gain as much as my fellow students from the experience.

I gained insight of graduate student work that helped me make the decision to go straight into the field rather than pursue a higher degree. I don't think I could have made that decision as resolutely without that experience. I was also able to apply class learning, which is always exciting.

It is really good to get research experience at the undergraduate level.

Was a good introduction to an academic lab, but results from the research were minimal. The biggest value came in realizing that I did not want to go to grad. school in Chem Eng.

It gave me a firsthand look at how I manage projects and how I would work in the field. It also provided insight into the pulp and paper industry, which has value to me now in the printing ink chemical industry

Job experience

My independent study was designed solely to get the last ChE credit I needed to graduate...the subject matter was nothing more than developing lab experiments for first-yr undergrads.

It was a way to train the brain to apply what I learned and solve real-world problems.

It was great to see some of my classroom learnings in action.

expose me to research activities within the dept. article reviews are useful as well

again...it helped me learn how to work in a research and development mode.

I think the 599, which I did in conjunction with Engineering EXPO, gave me a lot of real world experience in completing a project.

I used independent study to prepare for the engineering expo for AIChE. We did a project with SC Johnson Wax (Candles). The process was the closest thing I got to a consumer products related course, and I learned a lot about product development during that time.

I gave a presentation at the end of the semester that was a good experience. The 599 helped me know I did not want to work in a lab for my primary job.

It was an application of principles learned, and was intended to fulfill an unmet (world) need.

I took Mol Bio 681/682. It was real life lab experience that prepared me for grad school.

The independent study course that I took lacked direction/oversight. We didn't really have a clear objective, and the project that we worked on had too large of a scope for a semester course. As a result we were able to get 1/2 through the 1st step, but then were unable to learn anything about subsequent steps. The project was so time consuming that the majority of the learning was achieved within the first 3 weeks of the class, and the remaining time was simply spent making samples of a polymer that we were to test, however we ran out of time before we could actually test the materials that we made.

Provides a good way to get into research.

The work was very rewarding, but not very useful outside the particular subject area.

Doing an independent study course was a great introduction to 'real life' problem-solving and laboratory work. It introduced me to the types of problems I would run into in a research environment.

Gave me a feel for what chemical engineering research looks like. It provided an opportunity to explore new areas in greater detail.

It allowed me to focus on a particular facet of the field.

599 allows an undergraduate to see the research side of science, instead of just the theory that courses offer.

I was a TA for ChE250 and found it very valuable to work with students for helping me decide my career path.

It was interesting to see what kind of research was going on and to see what possibilities there were of going deeper into a field. In a way it was valuable, in that I found I wasn't that interested in research.

"How, if at all, could it have been improved? Be as specific as you can."

There needs to be more research opportunities available for undergrads in the department.

Better define the purpose/desired outcome of the project. Ensure that there is adequate input/oversight by the faculty advisor/TA. Offer projects that will maximize learning, and that are not labor intensive or time consuming. Offer projects that will subject the student to a variety of knowledge areas/topics. At the beginning of the class come up with a project plan/timeline so that the expectations of the class are clearly defined.

I should have started with 599's earlier if I was going to get involved with research. I know some people were involved with 599, but I didn't feel that the professors encouraged it that much.

More independence in the independent study, I was more like a grad student's assistant. Part of that issue, admittedly, was that I wasn't more outspoken about the situation to the professor.

My contact with Dr Hill was limited. I mainly dealt with the grad student, who, in my opinion, was rather lazy and didn't know what was going on.

Try to translate the material to other subject areas.

I felt as if I sort of blindly did experiments without gaining much perspective until the end-of-semester writeup. I feel the plan could have been laid out better at the beginning so perhaps I could have understood things better as I did them.

I think it really depends on the person and the professor.

??? The course served its purpose - I graduated!

It would be helpful to publish a list of all professors, research students and grad students along with their emphasis and area of study. That way it will be easier for undergrads to pair up with someone of their interest. It would also help to advertise the availability of taking independent study classes.

presentation by students about the experience of engaging in independent project

I would have liked a parter to work with.

I had very little contact with the professor; worked mostly with grad students.

I wish I had more freedom in deciding the research path.

"In what ways, if any, did your independent study experience influence your choice of career?"

I worked w/Randy Cortwright and Prof. Dumesic and went to a work for a catalysis company. I loved it.

I'm working exactly where I co-oped. I think it was a huge influence. Before I co-oped/interned, I thought I wanted to go into a research field.

It didn't do much.

Not one damn bit.

It taught me to not consider going on for a PhD (not like my grades would have permitted that anyway!)

None

It didn't

I find out if I am interested in doing research or not and whether research is suitable for me.

Helped me understand the nature of research.

See b) above--though the interest in the biological content of the independent study kept maturing, leading me to eventually quit my first job to pursue biomedicine.

It did give me an experience that I used to get in the door at my current job.

not at all - I already had made up my mind and, in fact, already had a job offer. Actually, it was the other way around for me - my job offer influenced the type of independent study that I pursued.

It supported my decision to enter the environmental field. My independent study field was in water chemistry and ambient air quality.

It did not influence me one way or the other.

none at all

I ended up working for a consumer products company-- the independent study course reinforced my interest in that industry.

My career is not primarily lab work like the 599 was.

Somewhat. I chose my initial career more so because the work I do (or did) was to give a noticeable benefit/response.

It made me want to pursue an advanced degree.

Confirmed my thought that I'd like engineering research, going to grad school.

None.

It definitely started me down the road toward research. Even though I have switched careers to medicine, I want to continue doing research in some way shape or form.

I decided to go to graduate school based on my experiences.

It made me decide to go to grad school.

helped me pick grad school and a continued path into academia

I couldn't see myself doing the research like other grad students were doing.

"If you went to graduate school, in what ways, if any, was your graduate school experience influenced by the independent study?"

It was fun. You worked on a project that no one else had pursued before. It was a new area of science that you were making headway in.

I'm going for business management. This was more influenced by my business certificate. Also, managers are needed everywhere, and ChEs are not. I wanted flexibility in choosing where I live. I want to be able to move when I want to and not worry about if my company can transfer me or not.

Not at all.

research methodology and thinking are important for conducting good research

In no way is my MBA work influenced by that course.

I had at least an idea of what research would be like.

It helped me decide what specific research field I was most interested in.

I knew what areas in graduate school that I wanted to do research in. I might not have had any idea if I didn't do any independent studies.

answered above. ALSO, though, it should be said that I was involved in research for over 3 years in undergrad that was NOT part of a ChE599 and was handled separately with a chemistry professor, working for pay by the hour.

Feedback on individual soft-skills topics

Ratings of how well the UW-Madison ChE undergraduate education prepared students in:

Topic	Very prepared	Adequately prepared	Poorly prepared
Ability to function on teams	28	25	0
Ability to communicate effectively	21	28	2
Knowledge of contemporary issues	3	34	16
Understanding of professional and ethical responsibility	14	37	2
Understand impact of engineering solutions in a global and societal context	4	36	12
Ability to engage in lifelong learning, and recognition of its necessity	24	27	2

Comments on standouts included:

I HAD to function in a team setting if I ever wanted to finish my homework problems or a lab report. Since all my major projects are team based now, this was very valuable. I had classes directly relating to ethics, and I have come across situations in consumer projects where I remembered examples given very closely resembling situations I'm currently dealing with. I'd be bored if I didn't continue to learn, I'm not sure if college is responsible for that (probably not). Other than the papers I'd read while bored in class, none of my courses dealt with contemporary issues. Global and societal context, hmm...I'm pretty sure engineering solutions weren't explained in the context of the real world period.

As stated above, I think that my classmates and I were very professional. I took non-required engineering classes (most were 1 credit, if I remember correctly) that covered the ethics and contemporary issues. I don’t think they were part of the ChE required coursework.

I think I learned all of these skills in school.

Very little coursework directly related to contemporary issues, in my opinion.

I think that the UW-Madison ChE program is overall a very good program, students are given the chance to engage in various team projects and working as a group. The entire learning atmosphere is very intense and the demand from the instructors instill he concept of professionalism and to engage in learning throughout life. I can see that students from UW-Madison ChE program have better professional and work ethics over students from some other programs. However, the instructors rarely relate lecture topics to practical and contemporary issues. These issues should be used as examples in lectures.

Much time was devoted to 'the basics' and I received a very thorough grounding that I have used for addressing contemporary issues. But then, I was a returning adult student and was already aware of contemporary issues, so by comparison, the university coursework could not address contemporary issues in the depth that life does.

No time for contemporary issues - always busy with learning the textbook.

very prepared - these have been some of my strong suits in the workplace and part of the reason is because of my college experiences.

The ability to communicate effectively especially in written format was well taught through the laboratory work which was required.

Please see my above comments regarding effective communication. I feel that is a topic students are not actively taught - in fact, I did not even realize how poorly I was prepared for what I would call the non-technical communication aspects until I began writing this survey.

My prep class for summer lab in London, the lab itself w/Prof. Hill taught me many things about communication. By the best classes I had my career today, as a manager forces me to communicate in many different styles, use ethics on a daily basis and be aware of how to solve problems.

2. I was well prepared in communications because of my TCC not ChE classes. 3. I think UW taught me valuable problem solving and learning quickly which has been very useful

The way the classes teach you to work in teams was very valuable.

I believe that our courses prepare us to be good writers-- you have to be to survive the lab courses.

I worked with other students on most problem sets and labs, which prepared me well for working with a wide variety of co-workers. There was little discussion in classes regarding global impact-an environmental engineering course would be a good addition, or maybe just move discussion of waste reduction, etc.

I just felt like a, b, d and f were essential to graduate with a ChE degree at Madison. If I had not learned those skills I never would have graduated. Contemporary issues I felt were seriously lacking; the majority of topics were the same ones that have been around for 100 years and all were very real ChE topics. At graduation I had no clue what a ChE might do in the pharmaceutical industry.

Working in groups in college definitely helped prepare me for a work environment where you work on teams constantly.

I felt that I was not exposed enough to the possibilities that exist for engineers.

450 and 324/424 really taught us how to communicate effectively and function on teams. The group projects were excellent examples of problems that engineers solve.

The lab reports required concise statements that are easy to comprehend, not some long-winded story. The oral reports emphasized practice, and preparedness in the sense of being able to answer all questions effectively.

I worked on teams a lot in school, enough to learn how to do it.

Very little coursework directly related to contemporary issues, in my opinion.

I think the ability to engage in lifelong learning is perhaps the most important thing I learned while completing my degree. I think performing research while in school went a long ways towards encouraging this.

I feel that ChE prepared me really well to work on a team because I find myself having to work in a team a lot in school and at work.

Impossible to complete ChE at Madison without teams. Learn how people work together. Could be beneficial to randomly set up more teams to learn to deal w/more people out of your comfort zone. Doumentation (lab courses) Confidence to take on anything

Very little coursework emphasized new technologies employed in industry (with the exception of computer modeling). This knowledge was gained through internships. Little emphasis was placed on ethics and the role chemical engineers play and can play in society both good and bad.

-problem sets and lab write-ups often geared toward small teamwork and effective -not enough lecture or example of global/political/societal/etc impact.

Homework sets very often force you to work in a team setting. In addition the lab work was all in teams.

We didn't usually delve into what technology people were using currently and how what we learned fit into it.

Ratings of how useful these areas have been in the respondent's career:

Topic	Frequently used	Moderately used	Not used
Ability to function on teams	46	6	0
Ability to communicate effectively	45	7	2
Knowledge of contemporary issues	14	35	3
Understanding of professional and ethical responsibility	23	27	1

Understand impact of engineering solutions in a global and societal context	14	33	5
Ability to engage in lifelong learning, and recognition of its necessity	33	18	1

Comments on standouts included:

Communications: my first few presentations were chaos! my report writing is well above average though.

In my job I continually work with other people in a variety of settings. I need to be able to adjust my communication to the appropriate audience (director vs team member). Ethical decisions need to be made on a daily basis and we need to know how to voice our opinion if we believe a poor decision is being made. I continue to take courses through K-C and through Oshkosh because I want to advance my learning and career.

Aw, jeez, do I really need to comment on every single one? I work in a consumer industry for a global company on multi-functional teams...enough said.

Southeast asia is where I am focused on, and where I have lived for some time. In addition to the above skills helping me at work, I think they are useful while traveling and living abroad, particularly in developing countries where, for example, a new road brings not only good things like medicine to tribal people, but it also brings the end to their isolated way of life, religion, traditional farming, etc. The engineer who designs and builds that road needs to understand all of the impacts it may have.

They key to getting projects done is teamwork and communication. I use both of these every day. Ethics is always a concern in large corporations and I use this every day as well.

Team work and communication skills are very important in my, and most jobs.

In a work environment, people are working with other people. Being able to work with people and communicate with people effectively is definitely important. It is also important to be able to view your job professionally and continue to learn new skills in order to perform well in a job.

Work occurs in teams-people who can't figure out how to understand other personality types will fail to achieve the goals set before them. Effective work only occurs when people can communicate effectively and do not make assumptions about the skills, abilities and value of the people with whom they work. Products designed to meet a limited set of goals, ignoring long-term or non-target effects can lead to significant problems; environmental, legal, health, etc

It is vital to be able to function on teams and communicate with those teams. If you can't do that then it's time to reconsider your future with any company that promotes teamwork.

My experience in graduate school has emphasized the importance of these factors.

frequently used - I have to work with electrical and controls engineers on every project and sometimes they are outside of my office and/or company.

In my work it is necessary to work well in teams and in order to do so, communication is critical. As a business it is important to understand the legal, regulatory, environmental issues which are in place as well as the needs that our consumers and customers have today and future trends will impact these.

These are all extremely important areas--the practical side of how things get done in a professional setting.

Teamwork and communication are staples in a business environment.

Class projects helped in my ability to function in teams.

Teamwork has been essential to making projects I have worked on successful. It is important to be able to collaborate with other engineers as well as people from other functional areas to get the job done.

Team work and communication are essential in my job. And the ability to communicate effectively across functional areas, for instance talking with Marketing, is crucial. Communication is not all about technical writing.

Communication needs to be effective constantly--through email, presentations, and talking face to face with other engineers or with operators. (Very important topic)

I feel that all of these topics are used everyday in my job, and these are the real skills that I got with my ChE degree rather than any of that technical stuff.

Because I work on a team, it's important that I be able to effectively work on a team, and communication is very important with that as well.

The interpersonal skills learned in the ChE department were superb. All of us were treated like professionals by both faculty and peers.

At my job, I am more often in a group of 2 or 3 than alone. It takes less man-hours to have, say, someone cut and someone built than it is to have only one person cut and build. Effective communication is essential in carpentry. Too much information often leads to confusion and blank stares, and not enough information leads to assumptions that often seem to be erroneous. Erroneous assumptions lead to projects taking more time since something has to be undone, then redone correctly.

Team work and communications skills are very important in my, and most jobs.

The ability to work on a team and continuing to learn every day I think are the two most important skills I have developed and need to develop further in my professional career.

Team work and communication are quite important in an engineering company like mine. ChE labs, classes really put students to work a lot in teams.

C.Traditional ChE does not really apply to my job. A.B. used daily to do my job. F.I think every 6 months there is some new area that I need to teach myself about.

As a graduate student I have had to write papers for publication in scientific journals as well as give talks at conferences.

As a plant production engineer almost all of the listed skills are a function of my daily work.

I am always working in a team of some sort, so of course it is important. I am always trying to convince the customer to do what my company advises (what is best for them!) and it takes skill to do that. I've worked in Chile, Venezuela, Mexico, and Spain since joining UOP, and know Spanish has helped mountains.

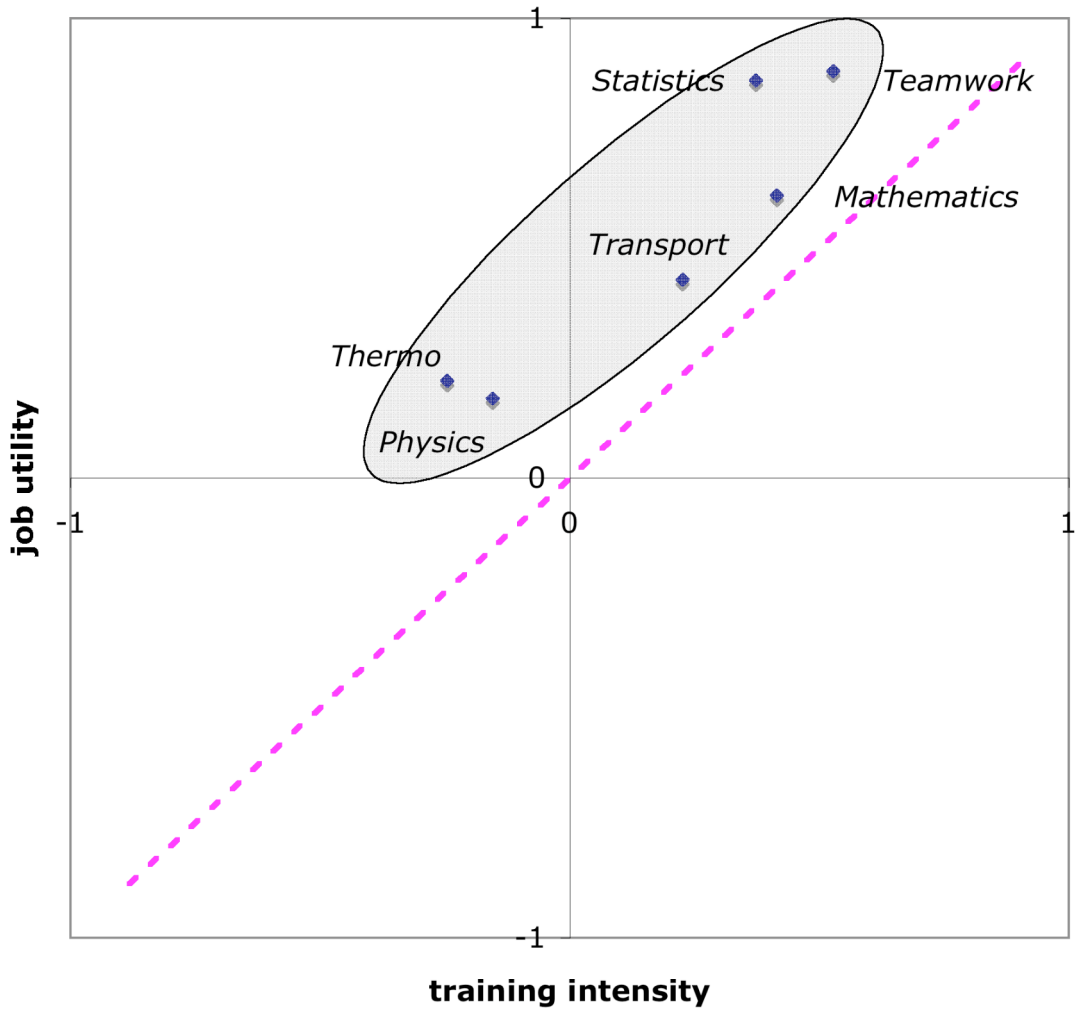
The most important skill is to be able to communicate with others. Whether it's office politics or to solve problems together, it's good to be able to talk to everyone in the group.

These ratings for how much preparation students receive at the university and how important these topics are in their jobs can be compared in an "environmental" plot. Here, we calculate average ratings using the following scales:

Very prepared	+1	Frequently used
Adequately prepared	0	Moderately used
Poorly prepared	-1	Not used

In such a plot, ideal results are that the most frequently used topics are those with the best preparation, and the topics not used are those with the least preparation. Thus, the ideal results would be spread from the upper right corner of the plot tailing down towards the lower left corner. Any topics above this ideal 45° line are more important than our preparation anticipates, and any topics far below this diagonal line may be receiving undue emphasis. With this scaling, the plot is seen to be:

"Environmental" plot (comparison of topic importance at UW and on the job)



The individual scores are

Topic	training	t rank	utility	u rank
ability to function on teams	0.53	1	0.88	1
ability to communicate effectively	0.37	3	0.87	2
knowledge of contemporary issues	-0.25	6	0.21	5
understanding of professional and ethical responsibility	0.23	4	0.43	4
understand impact of engineering solutions in a global and societal context	-0.15	5	0.17	6
ability to engage in lifelong learning, and recognition of its necessity	0.42	2	0.62	3

The ranked scores are

training	topic
0.53	ability to function on teams
0.42	ability to engage in lifelong learning, and recognition of its necessity
0.37	ability to communicate effectively
0.23	understanding of professional and ethical responsibility
-0.15	understand impact of engineering solutions in a global and societal context
-0.25	knowledge of contemporary issues

utility	topic
0.88	ability to function on teams
0.87	ability to communicate effectively
0.62	ability to engage in lifelong learning, and recognition of its necessity
0.43	understanding of professional and ethical responsibility
0.21	knowledge of contemporary issues
0.17	understand impact of engineering solutions in a global and societal context

From these scores, we see that the training intensity and level of need or use on the job again are strongly correlated. Unlike the comparison of the academic (curricular) topics above, this time the utility levels are consistently 0.2-0.5 units higher than the UW preparation levels. Teamwork is the clear leader in both rankings. Communication skills run a close second in utility.

At the bottom of both training and utility lists we find "knowledge of contemporary issues" and "understanding impact of engineering solutions in a global and societal context." These topics are not perceived as receiving much emphasis (below "adequately prepared"), but they are still found to be needed at a substantially higher level (above "moderately used").

Co-op or intern program

Among those answering this question, 36 of 52 (69%) of the alumni respondents participated in the organized COE co-op or internship program. Of these, 29 (78%) rated this as "very valuable", and only 2 described it as "of limited value." Those who did have co-ops were asked a series of supplemental questions:

"How, if at all, could it have been improved?"

In retrospect, I wish I had done one earlier and then had a second one. I wish I had the opportunity at the time to take an internet based course at the time so I wouldn't feel like it 'set me back'. Companies look at it for hiring, and it REALLY helps a student focus on what the would/wouldn't want to do after graduating. I'M SO GLAD I DID A CO-OP!!!!

I had the opportunity to work at 2 very different companies. This helped me understand how different businesses function differently. I was also able to take the 'pros' from each place and apply them to my current job. To develop a program where a student can co-op at two different companies.

More preparation for office politics. Dow was very nasty. I didn't get involved, but watching the research engineers around me act in childish manners and screw over other co-op students did not endear me to them at all. It was a live, observe, and learn experience for me. I wished I was more mature before I went there. Some training on how to handle bad situations at work before I left for co-op would have been useful.

It should be mandatory and the dept. of ChE should have helped students arrange for internships. When I was in college, it solely depends on my chances of getting a job offer from an interview. I have had one internship that is not very educational and relevant.

My co-op experience was mostly menial tasks and running VOC emissions testing equipment. I would have liked to been involved in some sort of project (from start to finish).

I can't think of an improvement at this time.

The department should STRONGLY advertise the availability of co-op jobs, and should be a strong advocate to the benefits of a co-op experience. It taught me things that I would not and could not learn in college, including the type of work I want to do and real-world situations (layoffs, etc.). To be the best program, the department should liase with companies and negotiate the availability of co-op or intern experiences to ALL students.

I had a great experience with M & M Mars and Frito Lay

I worked in a job that used limited ChE, it would have better suited an ME

I wish I would have had the opportunity to do multiple terms with my employer, M&M Mars. It just wasn't feasible from a timing standpoint.

My specific job was not in a plant environment which I would have liked. A requirement to give a presentation on the experience would have been a good experience.

The college should make sure the student has a defined objective. I felt I was somewhat overlooked because my mentor was so busy himself and shouldn't have had a coop.

I worked part-time instead of participating in a co-op experience. I worked for a company that specialized in designing separation processes. It was a direct application of my education.

I really don't think it could have been improved.

The program needed to be more concrete, with more formal expectations and measures for accomplishment.

All the necessary tools to succeed are given

The fact that I was a co-op and not an actual engineer made it less interesting from an engineering perspective. Some of my projects were not important, I didn't quite feel like one of the team. Some of the people were not so friendly. However, I learned more from these 'negative' things (especially working with people) than I would have if it would have been easy and enjoyable always.

"In what ways, if any, did your co-op experience influence your choice of career?"

It was absolutely necessary to making a decision on my career!

Yes- it made me realize not all ChE's do hard-core chemical engineering.

Since I worked at two different companies, I had the opportunity to evaluate what type of roles I enjoyed and which ones I wanted to avoid.

I knew after co-oping that I didn't want to be a supplier, or do any manufacturing that involved carbon black (it gets everywhere). Seriously, it was a great experience in the sense that I had a taste of what was to come. (Not to mention disposable income for the first time in my college career.)

I learned that there was no way I could sit in the same cube for 20 years. I sought out jobs where I'd be moving around a lot.

I realized I loved working in an office setting and not a production facility like some of my other offers were. I also realized that i had a lot of passion behind working on consumer products.

It certainly enhance my knowledge technically and enhance my work experience. I also find out about my strengths and weaknesses--that helps me a lot in choosing my career.

I knew I did not want to go into environmental testing

I decided I didn't want to spend my life making soap.

My co-op was in a factory. It re-enforced the idea that I preferred industry over research.

I ended up working full time with my co-op employer.

Co-op was after my freshman year when I thought I wanted to be an electrical engineer. The experience taught me that I did not, so I switched to Chemical Engineering. I also interned with the company with which I was eventually employed full-time for four years.

My co-op experience further solidified my preference to enter the environmental industries.

I leanred I liked the food industry but did not like research (M& M) I did like operations (Frito Lay) and am currently still employed with Frito

none except I knew that it wasn't what I wanted to do.

It further reinforced by interest in working for a food/consumer products company.

Helped me know I was interested in a scientific job.

My coop was in consumer products and just confirmed that's what I wanted to do full time.

It made me realize that I enjoyed applied chemical engineering learnings, but that I wanted more variety and a short-term result from my work. My current position is an extension of this thought, to broaden my experience so that I can find my nitch.

I found out that in a way I was not really going to fit into a corporate environment! So it was probably a good thing for me- I did get a taste for what real engineers do on a day-to-day basis.

It was a great experience, but it showed me one thing I didn't want to do.

I discussed this in 599 question.

While I liked the pace and problem solving in this process eng. position, ultimately I became bored with the redundancy. Hense, I wanted work that would be interesting & present continual challenge.

My co-op experience had a huge impact on my choice of career. I found out what I did not like and had the opportunity to take classes and do research that put me on a path that I have found very rewarding.

It directly lead me to my current job.

Loved my co-op experience, went to work for company

The experience showed me what opprotunites are available for chemical engineers with only a B.S. Helped me decide to go to graduate school.

Hands-on, real world experience cannot be duplicated in the classroom, it gave me an idea of what to expect.

It made me realize that I was not going to enjoy any bachelor's level degree in Chem. Eng.

It showed me that the more research-ended parts of industry were still far from academic research and influenced me to stay in academia.

Yes, I knew after my coop that I wanted to work in a plant production environment that applied my chemical engineering degree directly.

I focused more on where I wanted to live after being rather bored in my co-op location. I didn't put any thought into quality of location before that.

Overall, 4 responses indicated that co-op terms led to permanent jobs. Twelve responses indicate the student learned what type of job they did NOT wish to pursue.

"If you went to graduate school, in what ways, if any, was your graduate school experience influenced by your co-op experience?" (6 responses)

I learned that MBAs run the companies. True, something like half of all Fortune 500 CEOs have engineering degrees, but most also went on to get management degrees. Also, if I ever start my own business, I need to have some business background.

I realized that I really need to love what I do and that encouraged me to go to graduate school.

Not sure of a direct connection between grad school and internship, except that the company I worked for as an intern and eventually full-time helped pay for my MBA.

Made me realize that an advanced degree would be in my best interest. Made me realize that I could go farther than a BS degree.

The experience showed me what opportunities are available for chemical engineers with only a B.S. Helped me decide to go to graduate school.

The co-op really had no effect.

Overall Preparation for Career

Overall rating of how well the UW undergraduate education prepared the responding students for their careers:

very good	27
good	21
fair	1
no response	4

Comments supporting individual ratings:

I believe most of the ChE graduates from UW Madison have been very successful at KC and have made great contributions to the company.

Again, I really think with my degree I could do a complete career change and be fine...I really think of it as one of the biggest challenges of my life. Ask me again after I've had kids.

I'm very happy with my experiences at UW-Madison. I feel that I've led a very interesting life since I graduated. I have had nothing to do with ChE work, but I feel confident that I can handle nearly any situation in nearly any country.

I think I receive a very good professional and well-rounded training at the ChE dept. Not only on technical knowledge but more so on personality. I do not rate it as 'very good' because I think that there are still room for improvement, e.g. some courses are redundant while some should be mandated but not enforced at my time. Some courses are too overloading: learning too fast may impair solid foundation. The co-op program should be improved, the ChE dept should be more involved in the program. More career advising should be made possible during advising also.

Strong technical background with classes and opportunity to learn what real life as an engineer is like with co-op.

My undergraduate experience really prepared me for a successful career. My hands-on and theoretical knowledge gives me a firm understanding of the work I currently do and allows me to ask interesting questions and solve problems.

As previously stated, my position is not directly ChE related but my undergraduate education prepared my to be able to adapt to it and succeed.

The coursework was very challenging and covered a large spectrum or scale from the atomic to macro scale. The senior project course was helpful in simulating the type of team work required in the real world it helped me to think in new ways and I am proud to say I was able to complete the Chemical Engineering coursework at the university.

I liked the broad training in scientific and engineering disciplines. However, because of the intense, narrow, aspect of engineering, I need to continue enriching myself in other non-technical fields.

Put me in a position to excel right out of the gate and getting a good start is in valuable.

It prepared myself for my professional career well. If the department can: a) eliminate a few lab courses b) add a few business related subjects c) add compulsory co-op experience it would make this program the best ChE program in the nation.

While I did get burned out, I would not change my education for anything. I believe I could have used more real life examples, or learned more about managing people. But again I had a great education and learning environment/experience.

Because of the TCC and problem solving skills I learned in ChE classes I feel confident I can figure out anything my boss asks of me.

My ChE classes taught me to be a problem solver. That skill is crucial to success in my current job.

I feel confident that I earned a ChE degree. I had to work hard to learn concepts and pass classes. I think this gives me confidence that I can be effective at work. I don't use high math (calculus) or very many specific ChE concepts (mass transport, reactor design) at work but I think learning those concepts taught me how to learn.

I said good because I wanted to rate the items from question 20 as a very good, but than had to change my mind because of the lack of consumer products and product development training.

My education helped develop skills needed for most careers, and gave me confidence in my ability to apply these skills.

I think I have a strong background with an ability to think critically.

The ChE program was both rigorous and rewarding. I haven't done anything harder, worked so hard at it, and received so much out of it.

Learning the scientific and engineering principles, doing the calculations, writing the reports is the easy part. Learning to push myself further than I thought I could go is what really prepared me for my career.

I think there were a lot of good things in my undergrad education & very few bad things. And I am happy and proud to be a UW-Madison ChE alum.

The curriculum, professors, support staff, and my peers at UW challenged me and had a great positive influence on my academic and interpersonal skills

I think that my undergraduate education gave me enough background to work in my current job, but I find that I still need a lot more learning to be able to step up in a corporate sector. You need a master or PhD these days to be more competitive in any jobs.

confidence to do anything

I felt that the coursework in the department was very extensive and gave me a solid and broad background in chemical engineering. The program also helped develop my problem solving skills and gave me an opprotunity to practice writing.

I came out of Wisconsin knowing that I worked hard for 5 straight years, and everything seems less diffcult compared to my undergraduate study.

solid foundation of skills: problem solving, teamwork, communication, etc. Adequate foundation of knowledge: chemistry, physics, math, computer science, statistics, etc

I feel technically the department does a great job. The practicality of the material at times needs more emphasis but this is also a function of time. My technical writing skills are excellent compared to my peers.

I feel I was adequately prepared to solve engineering problems; however, I feel more help in the internship/co-op field for transfer students would have been helpful.

I was lacking in knowledge only in subject areas outside of the ChE department (CS & ECE). In most cases, my knowledge exceeds that of other chemical engineers from other schools.

There are parts that were lacking. I felt that I learned little in 426 since we did not have a text book or curriculum.

Lots of backgrounds

I feel that UW gave me the tools I needed in order to continue learning the specifics of the role I was getting into. I developed the necessary problem-solving skills that are so critical for any engineer, and feel that is a direct result of the curriculum used at the UW in the ChE department.

very relevant in my research career.

Again, classes should be more hands on, not so theoretical.

The curriculum was very challenging and taught me many skills. Once again, the primary focus was on preparing us for grad school in Chemical engineering. Not basing anything on data, I would say that most of us are NOT in school to go to grad school.

The undergraduate ChE program is rigorous and required a lot of dedication. I think what I learned in class definitely prepared me for my professional career. Additionally, my undergraduate education taught me how to solve problems, how to work on a team, how to study difficult problems and how to manage my time.

I feel my education prepared me for my career well, learning problem solving, but I don't do actually chemical engineering, so I can't comment on the actual content.

I was lacking in knowledge only in subject areas outside of the ChE department (CS and ECE). In most cases, my knowledge exceeds that of other chem. engrs. from other schools.

I hardly call carpentry my professional career. I am still looking for an engineering job.

The final free-format input requested any other input that might be helpful in improving our undergraduate curriculum, with the following responses:

Consider offering a volunteer mentoring program. Even long distance on the telephone. Would get alumni involved to help advise current students. Don't force everyone to have one. The ones who take the initiative to request a mentor when they hear they are available should get one.

The quality of instruction was markedly better when taught by professors rather than teaching instructors/visiting professors. More classes should be taught by tenured faculty.

Some of the professors need a personality injection, don't let retired professors teach undergraduate programs, and kill summer lab.

Keep up the good work.

Thanks to all the faculty, staff and instructors who helped give me the foundation that I have today!

Career Services is a joke, at least when I was there I felt the system for interviewing and signing up to be interviewed was extremely poor. I hope for the sake of students it has been fixed some since I was in school.

Please add more statistics requirements and allow students to gain practice using statistics in multiple classes (similar to how calculus is learned and applied). Less theoretical labs/problem sets and more real world examples. How do you gather information you can use, problem solving skills, how do you present data to management to gain approval for a project, etc.

I would suggest soliciting more industry involvement in class work. In an earlier comment I spoke about a potential plant operations class. This would be a great venue to bring in industry eng. to speak to specific topics of plant oper.. I know recently the dept. was moved to a more biol. focus. I'm glad I graduated before this change was made. I took biology class in college (Biochem 501) & absolutely hated it. Requiring these classes for me would have added no value to my career. I don't know the current curriculum but I hope you give the people the option of taking these classes.

Excellent Program!!! P.S. Prof Root and Prof Hill were my favorites. Excellent professors overall, though.

Make stats mandatory and make it applicable to analyzing experiments, designing experiments, and test data. Not probability - but real statistics. We do not need to know how often Jane will pull a red ball out of a bag. Internships are almost mandatory these days. There needs to be better communication of this prior to Junior year.

See above regarding non-technical communication

More various types of student presentation among classes will be beneficial for future career (esp. presentation suited to difference audience)

Need more hands on or focus on the labs more. Go over real life problems and processes.

Need to give us more practical industry capability and not concentrate on the next PhD!

Make an internship a requirement to graduate! Employers want experience. A degree just opens the door; experience gets you through it. I had thought that good grades would get me through. A 3.5 GPA at a world-class institute such as the UW doesn't mean a damn thing with out experience. Fellow chemical engineering friends of mine had 3.0 GPAs and experience and were snatched up immediately, while a 3.5 GPA and no experience is framing houses.

Please continue to encourage students to do internships/co-ops, to study abroad and to participate in extracurricular activities. It may seem difficult to fit these things in with the ChE coursework, but they really are valuable experiences to draw upon in professional and personal life.

On Wisconsin!