

# **Education Needs of Agri-Industry Facility Designers and Managers**

**A Focus Group Discussion**

Pyle Center  
December 17, 2003  
8:30-3:30

## **Education Needs of Agri-Industry Facility Designers and Managers A Focus Group Discussion**

**Aim:** To identify educational needs of engineers who will be employed as agri-industrial facility designers and/or managers within the next 10 years.

**Who is "listening":** University faculty, ASAE members, and engineers employed in the agri-industrial market sector within North America.

### **Agenda**

- 8:00 Refreshments
- 8:30 Welcome  
Introduction of Attendees  
Aim of Focus Group and ABET Overview  
Overview of Agenda
- 8:50 What entry and mid-level engineers will be doing in the next 10 years
- Positions Titles and Responsibilities
  - Knowledge Required in Positions
  - Prioritize
- 12:00 Lunch
- 1:15 Continuation of Morning Activities
- 2:15 Review and suggested modification of *ABET Program Outcomes and Assessment*
- 2:30 Break
- 2:45 Recommendations for industry involvement in student recruitment and mentoring, cooperative education, classroom instruction, continuing education programs, etc.
- 3:15 Summary and next steps
- 3:30 Adjourn

## Focus Group Members

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## **Other Attendees**

Gary Anderson, Professor, South Dakota State University

Robin Connelly, Assistant Professor, Biological Systems Engineering, University of Wisconsin-Madison

Sundaram Gunasekaran, Professor, Biological Systems Engineering, University of Wisconsin-Madison

Dave Hogg, Executive Associate Dean, College of Agriculture and Life Sciences, University of Wisconsin-Madison

Van Kelly, Head, Agricultural and Biosystems Engineering, South Dakota State University

Steve Pohl, Associate Professor, Agricultural and Biosystems Engineering, South Dakota State University

Thatcher Root, Associate Professor, Chemical and Biological Engineering, University of Wisconsin-Madison

Ron Schuler, Chair, Biological Systems Engineering, University of Wisconsin-Madison

Marty Schipull, Associate Professor, Agricultural and Biosystems Engineering, South Dakota State University

Pat Walsh, Professor and Chair Elect, Biological Systems Engineering, University of Wisconsin-Madison

**Moderator:** Mory Cotter, Office of Quality Management, University of Wisconsin-Madison

**Moderator's Assistant:** Kurt Zimmerman

**Organizer and Emcee:** David Bohnhoff, Professor, Biological Systems Engineering, University of Wisconsin-Madison

## TRANSCRIPT: A.M. SESSION

### Introduction of Guests and Opening Charge and Video Presentation by Dave Bohnhoff

**Moderator:** The aim is to identify the educational needs of engineers who will be employed of agri-industrial or bio-industrial facility designers and managers within the next ten years, so they can be used by faculty at a number of institutions across the country in the design of their curriculums.

What we are going to do for the bulk of the day is a process that will lead to a very interesting product. We will start by identifying these position titles and the responsibilities of those titles and then we will put that aside. We then will say what are the educational needs in general for engineers in this industry. Then we will do a matrix that says here are the positions, here are the needs and what are the priorities that relate to that position, and what's important for people in those positions to know. And if that works it should be a very interesting product that essentially answers the questions about the positions and needs and prioritizes them and should be helpful to use. We will spend most of the day developing that as an end product and guide. After that we will look at the ABET program options and assessments and get your input on those, and recommendations for industry involvement, recruitment, etc.. So that's the agenda. Any questions about the agenda?

Here is what we have to start, and I think of you have been involved in putting these together. This is a starter list, and hopefully pretty close, of position titles that are typically that engineers go into. Look at this first list. Is there anything missing or anything we would phrase differently? Is there anything that is essentially the same thing and you can combine them?

#### DESIGN, PLANNING, CONSTRUCTION

- Structural Engineer
- Electrical Controls Engineer
- Process Engineer
- Mechanical Engineer
- Planner / Designer
- Construction / Project Manager
- Packaging Engineer

#### OTHER FOOD INDUSTRY SUPPORT

- Systems Engineer
- Sales Engineer
- Product Design Engineer
- Food Technician

#### FACILITY OPERATION, MAINTENANCE & MANAGEMENT

- Facility Manager
- Plant Manager
- Plant Superintendent
- Production Manager
- Product Development Engineer
- Quality Manager
- Engineering
- Production Planner
- Environmental Safety & Health Engineer
- Environmental Permitting

**R. Potter:** I don't know if it's a category, but environmental permitting. .

**Moderator:** So would it be a separate title under here or a subtitle?

**R. Potter:** I would call it an environmental permitting.

**J. Wille:** Since we're designers, strictly designers and planners, we split ours a little differently. We have project managers, project engineers, remembering that being agriculture in nature, we encompass really all of that as engineers. We don't define structural engineers, we define it as project engineers and project managers.

**Moderator:** So when you have a project engineer and project manager I understand that would be like a combination of all of those in the other group.

**J. Wille:** All those would be project engineers.

**G. Williams:** Well it really varies by the size of the company. If you are a small design house, the guy will have to wear more hats. I made that first list and we're a little bigger company. We have project structural engineers, project managers for structural engineering, project managers for electrical engineering, project manager for process. So those are kind of like subtitles for more description of position or rank.

**Moderator:** When you have project engineers and project managers does it also include those kind of roles?. (*pointing to list of O&M positions*)

**J. Wille:** It doesn't for us because we are not into operation and maintenance.

**D. Wilson:** I would say as a manufacturer, the project engineer does not represent basically these over here.

**D. Bohnhoff:** Just a quick point to help you out. We've got headings at the top that's more facilities operation, maintenance and management there, and planning and construction here. So to help the moderators out, let them know what sector you're talking about.

**D. Petrick:** On the facility design side, the category of the planner and designer, there is one other very important function which is estimating and capital planning. A number of our customer/clients definitely need that function per say.

**Moderator:** This would typically be a slash designer or a slash estimator, so we would put this here then as, Planner/Designer/Estimator and Construction /Project Manager/Estimator.

**G. Williams:** Or estimating might fall down under the next category down -- construction project manager, it depends on the company.

**J. Wille:** Another one similar to that, that you tend to forget about is the specifications writer. Frequently you will have a separate specification writer.

**Moderator:** Is that a separate responsibility?

**J. Wille:** Ah yeah, it's whoever you can force to do it. (*laughter*)

**Moderator:** Which of the categories does it belong to?

**J. Wille:** I understand others would have it in other areas, but we would have it under designer.

**Moderator:** Specification writer?

**J. Wille:** Yes, Specification writer.

**Unknown:** I think what he is saying is that no one wants to do that full time. (*laughter*)

**J. Wille:** We even tried to certify for it and still nobody wants to do it. (*laughter*)

**R. Potter:** I have another one that I would add, document manager. Which at least in our business is absolutely critical and we have found very little understanding of that from someone coming out of school. I would just list it as document manager, I'm not sure what it fits under.

**Moderator:** And that's an engineering role.

**R. Potter:** Right.

**Moderator:** I think what's probably important in this exercise is not to make sure we have every possible role, but that we have the major type of roles so that we can take it to the next step and make sure we're asking the right questions.

**D. Steinman:** The four areas we hire in, we break down into operations, engineering, R and D and quality. And the bulk of the people that come in as engineers end up either in operations or engineering. But I'm going to speak to Kurts sheet over here, the operations side. A large number of people with engineering backgrounds come into operations and you show the roles up there that they may get to in 10 to 15 years -- plant managers -- but these people are starting out as team leaders on the floor on 3<sup>rd</sup> shift. I think you need to represent that because surely it's a different skill set for people coming out of school. Nobody comes out of school as a plant manager. So team leader is a roll to put in that position.

**Moderator:** Calling attention to that level. Does that level need to be represented any place else?

**D. Steinman:** I think it is for us and others on the design, planning and construction. Everybody I think that Jerry said, that everybody for us is a project engineer with a core competency, either it's packaging, processing, or controls and electrical which you have represented. Up there in the quality group they come in as a quality engineer. You've got a quality control managers, you may want to put quality engineer there too, because that's entry level for us. And the last piece, R and D the product design engineer and product developer that's represented.

**Moderator:** Is this at least 80%?

**D. Bohnhoff:** I would like to follow up on that, you may want to slash off manager across the board over there. That's something I would like the group to discuss. That's something I struggled with when I looked at it. It should be a production engineer or an operations engineer.

**Moderator:** Does that make more sense.

**D. Bohnhoff:** We want to focus in on entry level, something they would be doing in the first 10 years.

**J. Marra:** We will start people out with what they call a supervisory level. Dave used the term team leader. They may actually supervise two or three maintenance mechanics or supervise a sanitation crew on 3<sup>rd</sup> shift. That's a pretty popular one to start people off on. (*laughter*)

**D. Steinman:** Also one of those that's not a life long job. (*laughter*)

**J. Marra:** But you know it's extremely important. We have a lot of success stories at Kraft, where people have started out as 3<sup>rd</sup> shift sanitation supervisors. Really, what they are doing is they are punching their ticket. They are saying that down the road I've got that plant floor ground level experience. I always tell people, they can never take it away from you. So it's critical that you kind of capture that. I think it's just as Dave Bohnhoff pointed out. You just don't come out of school as a production manager.

**Moderator:** What if we say facility engineer slash manager?

**J. Marra:** As long as we capture the fact that they are not going to start at that level. The fact of the matter is that someone whose going to aspire to the position of plant manager at Kraft, is going to be on this board, and this board, and on a board that doesn't even exist before they get to that point.

Previous list with revisions and additions below.

**DESIGN, PLANNING, CONSTRUCTION**

- Structural Engineer
  - Electrical Controls Engineer
  - Process Engineer / Machine Design Engr.
  - Mechanical Engineer
  - Planner / Designer / Estimator
  - Construction / Project Manager / Estimator
  - Packaging Engineer
- (Project Engineers) (Project Managers)

**OTHER FOOD INDUSTRY SUPPORT / EQUIPMENT SUPPLIER**

- Systems Engineer
- Sales Engineer
- Product Design Engineer
- Food Technician

**FACILITY OPERATION, MAINTENANCE & MANAGEMENT**

- Facility Manager / Engineer
- Plant Manager / Engineer
- Plant Superintendent
- Production Manager / Engineer
- Product Development Engineer
- Quality Manager / Quality Engineer
- Engineering / Maintenance Manager/Engr.
- Production Planner
- Environmental Safety & Health Engineer
- Environmental Permitting
- Team Leader (Product Supervisors)
- Manufacturing / Industrial Engineer

**Moderator:** OK. Should we move on. What we are going to do now, is take essentially (and I'm sure how it's going to workout) but we will take them one by one and say what are the responsibilities typical of that type of position. Does it make sense where to start, does it matter?

**R. Jacob:** Could I make a comment from Del Monte perspective on design, planning and cost. Our entry level position on that is what we call a plant engineer, who is just a generalist who does a lot.

**Moderator:** OK. So that's another one here.

**Bunch of others:** It's already up there.

**Moderator:** So what I'm going to do then is start with that list. So if we say that facility manager/engineer ...what are the typical responsibilities for someone in that position?

**L. Pfeil:** I have a job description that basically says, direct maintenance type activities, assign plant production equipment so that production schedules and quality objectives are achieved.

**Moderator:** So that's directs maintenance. If you are an engineer are you directing it or are you working?

**L. Pfeil:** Well yea, it depends upon what level.

**Moderator:** So really, the core of it is to focus on maintenance, right?

**D. Steinman:** Do you want to focus on the entry level?

**Moderator:** Yes, so what are the entry levels for someone just coming out of school?

**L. Pfeil:** Within Hormel, it would be direct maintenance activities.

**Moderator:** Even at entry level.

**L. Pfeil:** You bet.

**Moderator:** Does anyone else here have somebody with that type of position? *(no response)* No? OK. Lets move on then. The next one is plant manager/engineer.

**D. Steinman:** I would just call it a plant engineer and that probably encompasses a lot of what's up there. There are a lot of other roles up there that are going to fall under plant engineer.

**Moderator:** Such as!

**D. Steinman:** You have plant project engineer. A little bit farther down there, engineering, maintenance manager/engineer. At the entry level the responsibilities are pretty similar. You have some very basic people, supervision. We want to put people on the floor to get a feel for their ability to manage people. There are large groups. Per, Jerry's point, there may be 2 to 3 people. We are looking for communication skills, leadership within that small group, ability to solve problems, and David had a great one up there on one of his slides, about analyze and interpret data. A lot of people can gather it, a lot of people can put the numbers together, but determining what does it mean, solving the problem, is much different. So those are very basic for every position that people go into in a facility.

**Moderator:** Do we want to focus specifically on engineering knowledge, or do you want those kinds of things too, like communication and data analysis.

**D. Bohnhoff:** Educational needs?

**Moderator:** No, this is responsibility here.

**D. Bohnhoff:** Well, that's getting into to obvious qualifications or educational needs to a certain extent.

**Moderator:** Do you want to focus more on engineering knowledge?

**Guna:** Communication is part of the education.

**D. Bohnhoff:** Yes, I don't think you want to include that on a list of every position. You are kind of getting into educational needs.

**Moderator:** How many of you have people who are called plant engineers? *(counts to eight)*

**J. Marra:** Another thing you could add to the list to make it distinct from what's listed already; our plant engineers are responsible for executing what I would call plant level capital projects.

**Moderator:** OK.

**D. Steinman:** What level Jerry? Under a million?

**J. Marra:** No, under like \$100,000.

**D. Steinman:** Yea, ours is under \$200,000, generally for an entry level. We will give people projects that match their skills, working with people on the outside, putting specs together, and coordinating projects.

**Moderator:** Is that true? Raise your hand, that's typical. *(O.K. Good many raised hands)*

**J. Kiedrowski:** Our plant engineer is responsible for the infrastructure of the facility. Everything that does not directly produce beer. Anything from office air conditioning to ammonium refrigeration, compressed air, electrical generation, power house, everything that is not a beer producing piece of equipment.

**J. Kern:** We use ours for vacation relief of production supervision.

**Moderator:** OK. Anything else on that one? Plant superintendent, is that something we want to skip over? Yes, because it's essentially the same. So, production engineer. What are the responsibilities? How many of you have production engineers? None. OK. Let's go on to plant project engineer.

**J. Marra:** Hold it. Could I go back to that production engineer. I don't think it's germane to this discussion. But we have quite a few what are manufacturing engineers who are industrial engineers that are monitoring efficiency of our lines, looking for bottlenecks and where improvements can be made and very often those are entry level positions. Now typically they are people who are specifically industrial or manufacturing engineers. So I don't know if we really need to discuss that here.

**D. Bohnhoff:** Actually, I think we would actually want to include that. I think they will interface a lot with this group. It's a fringe area. It's like saying. Honestly I do think that some of the industrial engineers that are going to this field will want to take a processing course. We could get those people into our program.

**Moderator:** What's the title?

**J. Marra:** Manufacturing Engineer.

**Moderator:** So, Manufacturing Engineer. Who has manufacturing engineers?

**L. Pfeil:** We have industrial engineers. It's the same thing Jerry described.

**Moderator:** So, manufacturing/industrial engineer. What are the responsibilities? How many have manufacturing/industrial engineers? *(counts to 4)* What are the responsibilities?

**J. Marra:** Improve line efficiencies, reduce waste, supply chain management.

**J. Kiedrowski:** Identify cost reduction opportunities.

**L. Pfeil:** Measure productivity.

**D. Steinman:** Are those entry level positions? We have two roles like that at General Mills; systems engineer and reliability engineers, but those are not entry level positions.

**Moderator:** Project Engineer. How many of you have Plant Project Engineers? *(counts to 4)*

**D. Steinman:** They really are under plant engineer aren't they? It's basically the same description as I see it. *(general agreement)*

**Moderator:** So should we cross that off? Then, product development engineer. How many have them?

**J. Marra:** I have my hand partly up. *(much buzzing among focus group)*

**D. Steinman:** We don't have that role in the plant. It's like an R & D engineer.

**Moderator:** So what do they do?

**D. Steinman:** Product design. Prototype the process.

**P. Boor:** Market research, they talk to market guys, sales guys to find out what the market want.

**Moderator:** Market research.

**P. Boor:** Sure, marketing guys, that's what I said. *(laughter)* Research is better.

**D. Bohnhoff:** I do think that it is important that we put down multiple titles for these, because that's what I'm seeing when I look at job bulletins and descriptions; these different titles. I think we need to make sure that if we are talking about the same thing that we say we are talking about the same thing. For example, would you also call this person a process engineer?

**A couple people:** No!

**D. Bohnhoff:** No, you would not?

**Moderator-1:** So, Daves point, anytime you see two that are similar, say so. So, we can go to Quality Control or Quality Engineer. How many of you have a Quality Engineer? *(counts to 5)* OK. What do they do? *(no reply)* no one knows? *(laughter)*

**D. Steinman:** Sanitary design.

**L. Pfeil:** Assure consistent quality control. Enforce safety requirements.

**J. Marra:** Related to all those things, they oversee our specs and standards, customer specs.

**L. Pfeil:** Regulatory requirements. Are your quality engineers actually engineers, I mean agricultural engineers by background or food scientist?

**D. Steinman:** Chemical engineers?

**Moderator:** Chemical engineer?

**D. Steinman:** A lot of people in the quality area are chemical engineers, a lot of them with a heavy food science background.

**Moderator:** Anything else for Quality Engineer? O.K. then where are we? Maintenance Manager/Engineer.

**D. Steinman:** It's a Facility Engineer *(lots of simultaneous discussion with agreement it's under Facility Engineer)*.

**Moderator:** So another title for Facility Manager Engineer is Maintenance Engineer.

**J. Marra:** There's one other thing that we use specifically Maintenance Engineers for, that maybe is just taken direct a little more specifically -- Maintenance Planning. And that can be an entry level position.

**Moderator:** Let me ask how many people have a Facility/Maintenance Engineer? *(counts to 4)*. OK. So then we have Planner/Scheduler. How many have a Planner or Scheduler?

**J. Marra:** Is this meant to be a production person?

-----: That gets back to supervising, we got Maintenance Planner on the sheet that Jerry talked about.

-----: We've got Production Planners.

-----: We have Construction Schedulers, but that's under the Project Engineers on the other sheet.

**Moderator:** So what do you call it?

**J. Marra:** Production Planner.

**Moderator:** *(points to other sheet)* So what did you call it?

**R. Potter:** Ours is on the other sheet.

**Moderator:** So how many people have a Production Planner? (*counts to 5*) O.K. and what do they do?

**D. Steinman:** Schedule and plan production, coordinate inventory.

**Moderator:** Anything else? O.K. Environmental Safety & Health Engineer. How many of you have one of these? (*counts to 6*) What do they do?

**D. Petrick:** Maintain the permits.

**D. Steinman:** Manage regulatory programs.

**L. Pfeil:** Regulatory compliance.

**D. Petrick:** Be in charge of safety programs.

**J. Kiedrowski:** Develop environmental initiatives, reduce impact on the environment.

**Moderator:** OK. So then we have Environmental Permitting.

**Severall:** That would fall under the same area.

**R. Potter:** I would put that under the other list, the construction list, add permitting.

**Moderator:** Just the permitting one, just permitting. OK. Then, Team Leader. How many of you have a Team Leader?

**D. Steinman:** It's a production supervisor, put Team Leader/Production Supervisor.

**Moderator:** How many of you have one? (*counts to 6*) And what do they do?

**D. Steinman:** They are really your Planner/Scheduler.

**J. Marra:** That's not what I was thinking. They supervise the hourly workers on the production line.

**D. Wilson:** In our case, they do the planning of the production day basically.

**D. Steinman:** They do all the performance tracking for their area.

**R. Jacob:** At Del Monte, production supervisors are responsible for maintenance.

-----: Raw materials. They order that.

**J. Kiedrowski:** Labor relations.

**D. Steinman:** Responsible for overall performance of the line: throughputs, waste reduction, we talked about these in other areas.

**D. Petrick:** Employees safety.

-----: GMP

-----: Process control.

**Moderator:** O.K. That's the end of that list.

Following is the result of the previous discussion. Numbers in parenthesis indicate how many companies use the title for positions in their companies.

**FACILITY or MAINTENANCE MANAGER / ENGINEER – (4)**

- Direct Maintenance activities
- Maintenance planning

**PLANT ENGINEER – (8)**

- Project Engineer, Engineer maintenance, Facilities
- Communications, leadership, solve problems, analyze and interpret data
- Plant level capital projects, under \$200,000
- Infrastructure facility
- Vacation relief of production

**PRODUCTION ENGINEER – (0)**

**MANUFACTURE/INDUSTRIAL ENGINEER – (4)**

- Improve line efficiencies
- Reduce work
- Supply chain management
- Cost reduction opportunities
- Measure production

**PRODUCT DEVELOPMENT ENGINEER – (3)**

- New product design, Prototype process
- Assimilate marketing research

**QUALITY ENGINEER – (5)**

- Sanitary design, Assure consistent quality food, (often chemical engrs.)  
Food safety, Oversee customer specifications, Related regulatory requirements

**PRODUCTION PLANNER – (5)**

- Schedule and plan production
- Coordinate inventory

**ENVIRONMENTAL SAFETY & HEALTH ENGR. – (6) (Environmental permitting)**

- Maintain permits
- Manage regulatory programs
- Regulatory compliance
- Safety programs
- Develop environmental initiatives, reduce impact
- Training

**TEAM LEADER / PRODUCTION SUPERVISOR – (8)**

- Plan / schedule
- Supervise hourly workers – production line
- Performance tracking
- Maintenance management
- Inventory of raw materials
- Labor relations
- Overall performance of the line, waste reduction
- Safety
- GMP's
- Process control

**Approximately 25 pages of transcript missing here**

## TRANSCRIPT: P.M. SESSION

### Chart

- **A – K - Important / Satisfied  
- Discussion**
- **Continuing Education needs**
- **Partnering opportunities**
- **Prioritize basic technicals**
- **Resume highlights**

**Moderator:** Here's what we are going to do this afternoon. In order to get a sense of priority for your needs, we are going to take ABET A – K and we are going to do an importance/satisfaction ranking here. What we're going to do is say, how important is A and how satisfied are you with it. And with that we will create a window like this that says, this is how important and this is how satisfied. Will be able to start with the things that are highly important and that you are satisfied with and we will talk about them. We will ask why you are not satisfied with things that are important to you. Then we're going to ask you about your thoughts about continuing education. What would you like to see for the people you have on staff? What are the things you would like them to learn, that you would send them to take a course for? The last thing that was on the agenda was a question about partnering, recommendations for industry involvement in student recruitment and mentoring. And then Dave is doing a matrix to get your sense of priority about some of the basic technical and educational things that we provide. So that's the agenda for this afternoon. Any questions about that?

We have up here on the board what we did this morning just in case there is anything you want to look back at (pointing to charts taped onto the blackboard). We identified the positions of the three categories here, primarily focusing on the two categories. And then for each of those position titles we said, "What is it that they are responsible for?" We did that all the way (pointing across charts) to here. We developed five categories of educational needs. They are Basic Technical, Design, Leadership Excellence, Business Perspective and Social and Ethical. For design we had a list in front of us to look at (and these were the major categories under those lists). We asked the question about that here in terms of design what are some of the things you would like to see done more of or differently. Codes and regulations, sanitary design are some of the item we identified there, and there are a few other things added which you captured and will give to Dave, right. OK. So we took the Basic Technical and we had a quite a few categories listed, what Dave is working on right now will give it a little bit of a sense of priority on those things. And then we talked about Leadership Excellence and Social and identified some of the educational needs there. As you look at this all spread out like that, (across blackboard) any comments or anything that stands out that you didn't think about piece by piece. OK.

So, here's what we're going to do right now. This little exercise. Look at the list in front of you -- the questions A – K on the gold sheet. And I'm going to give you a few minutes to just think about those. And what you are going to do for each one of them is you are going to ask yourself "How important is this?" High, medium or low? And how satisfied are you? High, medium or low? So, you're going to go through A – K and ask those two questions. Then we're going to ask you how many say high, how many say medium and how many say low for each one of the questions A - K. Then we have a chemical engineer that's going to do the math.

**Thatcher Root:** We won't give you a requirement of how many highs or how many lows, like 4 highs, 4 mediums and 4 lows. But please don't rate them all high because that doesn't really tell us a whole lot. We hope you have some discrimination of which ones are higher than others and which are lower than others.

**Moderator:** We will assume you mean that they all are important, but this is relative to that. So, take a few minutes and then we'll continue on with the questions.

At this time the panel is checking over the questions of A through K.

*Tape #2A (at 4.9 mark) Tape #3B (at 2.0 mark)*

Following are the questions of A – K that the panel is checking over at this time, ranking each question as to how important it is, high, medium or low and how satisfied, high, medium or low.

### Criterion 3. Program Outcomes and Assessment

Although institutions may use different terminology, for purposes of Criterion 3, program outcomes are intended to be statements that describe what students are expected to know or be able to do by the time of graduation from the program.

Engineering programs must demonstrate that their graduates have:

- (a) an ability to apply knowledge of mathematics, science and engineering
- (b) an ability to design and conduct experiments, as well as to analyze and interpret data
- (c) an ability to design a system, component, or process to meet desired needs
- (d) an ability to function on multi-disciplinary teams
- (e) an ability to identify, formulate, and solve engineering problems
- (f) an understanding of professional and ethical responsibility
- (g) an ability to communicate effectively
- (h) the broad education necessary to understand the impact of engineering solutions in a global and societal context
- (i) a recognition of the need for, and an ability to engage in life-long learning
- (j) a knowledge of contemporary issues
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

After the panel finished going through the list of questions A – K the moderator asked the panel how they ranked each question starting with question A. Following is the chart on the outcome of how IMPORTANT and how SATISFIED each panel member was in terms of High, Medium and Low for the questions A – K.

ABET Criteria	IMPORTANT			SATISFIED		
	High	Medium	Low	High	Medium	Low
A	11	-	-	9	2	-
B	4	6	1	-	10	1
C	9	2	-	2	9	-
D	10	1	-	1	8	
E	8	3	-	-	10	1
F	3	8	-	2	7	2
G	9	2	-	1	6	4
H	1	7	3	-	5	6
I	5	5	1	-	10	1
J	-	3	8	-	7	4
K	8	3	-	2	8	1

**Moderator:** So, the chemical engineer will take the results of this ranking and do a little math and create a chart for us and in the meantime we're going to move onto the next question on the agenda.

**Moderator:** So, the next question on the agenda is continuing education needs. So, you have people on staff. What are the kinds of things that you are willing to pay for in sense of your staff being able to learn and the importance of their continuing education.

**J. Marra:** I would start with sanitary design.

**L. Pfeil:** Buildings and equipment.

**D. Petrick:** Everything you listed on leadership and business

**G. Williams:** Regulatory training, new codes.

**J. Kiedrowski:** Safety improvements.

**J. Wille:** Communications

**J. Kiedrowski:** Software development.

**D. Petrick:** Automization training.

**J. Wille:** Emerging Technology, but it's different than the technology that we talked about before, basic technology.

**Moderator-1:** Anything you could include, for example.

**L. Pfeil:** In the food industry, radiation .

**The following chart shows the list of continuing educational needs that panel members suggested would be of importance to their companies' continuing education program.**

**CONTINUING EDUCATION**

- **Sanitary Design (buildings, equipment)**
- **Leadership and Business (whole list)**
- **Regulatory Training - New Codes**
- **Safety Improvements**
- **Communication**
- **Software Development**
- **Automization Training**
- **Emerging Technologies - Radiation, ex.**

*Tape #2A (at 5.0 mark) Tape #3B (at 2.5 mark)*

**Moderator:** In terms of giving this list of continuing education a priority, lets give them a number of 1, 2 or 3 with 3 being the highest in how much you would like to see a university offer this. So, lets start with Sanitary Design, how many give it a 3, how many give it a 2. At this time the numbering system seemed to confusing so the moderator switched to rank them as high, medium and low. So moderator then goes through the list and asked the panel members to raise their hand to indicate their priority as high, medium or low and entered the results for each item.

**CONTINUING EDUCATION**

<b>Topic</b>	<b>High</b>	<b>Medium</b>	<b>Low</b>
<b>Sanitary Design (buildings, equipment)</b>	<b>7</b>	<b>1</b>	<b>2</b>
<b>Leadership and Business (whole list)</b>	<b>10</b>	<b>2</b>	<b>0</b>
<b>Regulatory Training – New Codes</b>	<b>5</b>	<b>6</b>	<b>0</b>
<b>Safety Improvements</b>	<b>2</b>	<b>7</b>	<b>1</b>
<b>Communication</b>	<b>6</b>	<b>5</b>	<b>1</b>
<b>Software Development</b>	<b>0</b>	<b>2</b>	<b>10</b>
<b>Automization Training</b>	<b>0</b>	<b>4</b>	<b>8</b>
<b>Emerging Technologies</b>	<b>3</b>	<b>9</b>	<b>0</b>

**Moderator:** Any thoughts/comments as you look at this list and rankings?

**R. Jacob:** A number of those things in a sense are better served by private sector initiatives because they can keep focused on the application that you are looking for.

**Moderator:** So then, maybe we should also ask this question. Which of these things you would go to someplace other than a university to get this continued education.

**P. Boor:** I guess the question on that is, perhaps is it readily available somewhere else?

**J. Wille:** That might be a better question.

**P. Boor:** In other words you would just be simply duplicating, say what Dale Carnegie does and a number of other private sector.

**Moderator:** So why go just because it's not available where?

**P. Boor:** If you can't get it anywhere else.

**J. Kiedrowski:** It should belong in a university setting.

**Moderator:** So, say that question once more.

**J. Kiedrowski:** Does training in those areas of continued education belong in a university setting?

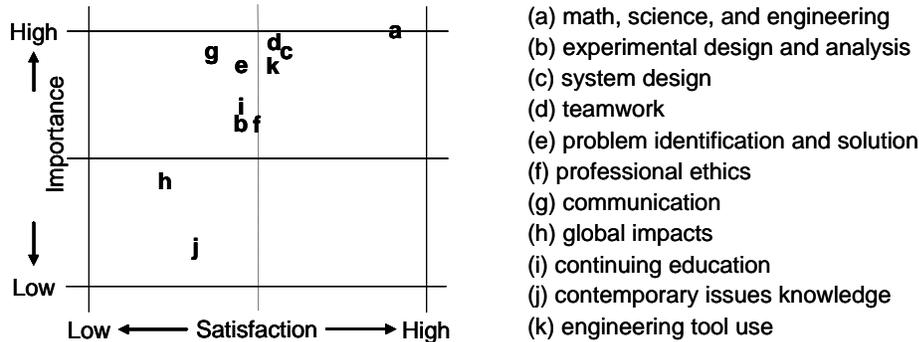
**Moderator:** So, if we asked that question, then lets go back down the list of continuing education and enter the results of each item with the number of panel members that agree.

<b>CONTINUING EDUCATION</b>	
• <b>Sanitary Design (buildings, equipment)</b>	<b>12</b>
• <b>Leadership and Business (whole list)</b>	<b>2</b>
• <b>Regulatory Training – New Codes</b>	<b>4</b>
• <b>Safety Improvements</b>	<b>1</b>
• <b>Communication</b>	<b>7</b>
• <b>Software Development</b>	<b>0</b>
• <b>Automization Training</b>	<b>2</b>
• <b>Emerging Technologies</b>	<b>10</b>
<b>Number indicates how many panel members feel education in content/service area belongs in University setting</b>	

**Moderator:** So, what we did then, is ask the question of continuing education and ranked them, high, medium or low. And then we asked the question would you go to the university versus someplace else. Anything else you want to say about that?

**Moderator:** So lets come back to the results on this chart of importance and satisfaction with ABET A – K. On the left side, high, medium and low says how important it is and across the top, high, medium and low says how satisfied you are. So, with A it is very important and you are very satisfied– highly satisfied. So in using this tool it makes more sense to try to focus on what really is important that you're dissatisfied with. So we got a clump right in here that we can start talking about. So lets start with "D" that's in this clump. So, what is "D"? "D" is Multi-Disciplinary Team. So the Multi-Disciplinary Team you said was very high and that you were medium satisfied with it. Lets talk about that, what does that mean and what would you like to see different.

Chart of the calculated results of the importance and satisfaction with ABET A – K



*Tape #2A (at 5.1 mark) Tape #3B (at 2.9 mark)*

**J. Wille:** This ties a little bit in with the ABET review document. There is a statement in this document or the overall document that says something about developing into a capstone type design project and you grasp the point where you are eventually put in a leadership role in terms of design. I see the students getting maybe one exposure to an overall team effort, but that's about it. We don't progress to that point, we suddenly hit that point before they graduate they have a capstone design project. And I think it would be advantageous in terms of what the students coming out to us that they have a four or five year program of learning to work as a team, even as freshmen. And I don't believe we're getting that team effort as such.

**Moderator:** How many people would echo that?

**P. Boor:** I agree with that if students are graded on an individual basis. There is always the tension of you know, the star performers being dragged down by the other ones on these team projects. And I don't know how to reconcile that.

**J. Wille:** That's their problem not mine.

**J. Marra:** That's a double edge sword through too. I'm of the generation where I was at the cutting edge of the Fortran programming. And where I went to school we did that as a team and you know what? I never learned Fortran programming as an undergraduate because I had a guy on my team that was really good at it. So I told him ok, this is the equation we need to solve and worked out all the basic math and he did all the basic coding. So this is kind of a double edge sword, if you push this back to a freshmen and there solving their calculus problems as a team, your running the risk of them not really leaning those basics of their needs.

**J. Wille:** I agree, that's why I say it's their problem.

**L. Pfeil:** One thing that would be helpful under that would be brainstorming techniques. In working as a group that's one thing most engineering professions probably don't do. We come up with a solution that works that isn't the most cost effective or isn't the best. Most often we're so busy that as soon as we get that one that's important we go forward onto the next one. There is some fundamental brainstorming techniques I think would be very valuable.

**Moderator:** Brainstorming, is it also innovation?

**L. Pfeil:** Yes, that's all part of it -- the value of cross functional teams.

**D. Steinman:** If we put a group of brand new engineers in a room and ask them to do brainstorming it's generally a disaster because this group wants to believe that every time they do a problem, one plus one equals two. They get into solving. There really is a challenge to get them to be innovative and creative, to get them to throw something against the wall and not be intimidated by the fact that it might not be the right solution.

**J. Kiedrowski:** My company is not a design firm. My engineers get working with legal personnel, marketing people, master brewers, distribution people and that's where my they stumble. It's multi-disciplinary, but not in engineering. It's trying to

get them to understand the rest of the organization. We are lean in engineering so probably ninety percent of our work is with other people in the organization, not engineering.

**Moderator:** I understand you have a discipline to work with and need to know how to do that.

**J. Kiedrowski:** I'm saying discipline here should not necessarily mean engineering discipline, but discipline within the entire business organization. (general agreement by the group)

**Moderator:** Yes. Anything else about teams?

**D. Petrick:** We could certainly achieve some of that in undergraduate programs in which we do some of the things in later years that we do in early years, where all first year engineering students would take calculus together. In the second year they are going in different ways. But putting those groups together again for common electives their last year may be a good thing to do. I don't remember having anything like that in our program.

**Moderator:** Thatcher, you said that the College of Engineering still has a freshmen design course.

**Thatcher Root:** The freshmen design course is recommended, but not required.

**Moderator:** Could you tell me what that is?

*Tape #2A (at 5.3 mark) Tape #3B (at 3.0 mark)*

**Thatcher Root:** Some disciplines have more than others. There is a freshmen course, which was supposed to be solving engineering problems with a little bit of exposure to the range of engineering majors. They work in groups and solve projects that are designs for people's houses, designs for handicap accessible buildings. We try to do something that's within the capability of freshmen and that they can do within the semester. And it's really good as far as organizing work as a team. Unfortunately while these kids will grow into engineers within their specializations, they are all basically high school graduates. So it's not like they all have different backgrounds they just have different interests.

**Moderator:** So, the faculty is multi-disciplinary?

**Thatcher Root:** The faculty is multi-disciplinary, the TA's are multi-disciplinary, so a lot of resources are available and the fact is students have inclinations but not skills leading them in different directions. You know, I think ABET intended us to have business, law, marketing and engineering students working together. But that has turned out to be tremendously difficult to do in the academic environment. If you want to do it as seniors nobody has room for it in their curricular, if you want to do as freshmen nobody has the expertise. So we have sort of reinterpreted this as working with people from other backgrounds whether it's an electrical and a bio-systems engineer or even whether it's several people in the same department, but different people specializing in heat transfer and the heats through purification and other components. And we're sort of trying to get the idea to trust people on your team who have different backgrounds. But we agree that this is a very difficult thing for us to address helping our students understand people with vast different areas of expertise and backgrounds.

**J. Wille:** One comment I'd make. When I say to design a project together I don't even care if it's designing a catheter, okay? And I don't care if it's with the business college, and I don't care if you have a peanut person involved. Just the process of different view points and different approaches and backgrounds, no matter what those backgrounds are. I think that's what's critical. And I understand your problem, don't get me wrong.

**Thatcher Root:** Certainly. Well we feel like it's a little bit of a copout in that we are trying to use people within a single major to obtain diversity. In another sense, thinking of diversity; if you have a group with some (inaudible) on it. If you have a group of people with different ethnic backgrounds, they are coming to the problem with different viewpoints even if they've been to the same classes and they have to work with people of a different work style and different motivations. So I think at least in our curriculum in Chemical Engineering we are now doing group projects in three or four different classes throughout the curriculum to try to give them repeated exposure. We don't give them a lot of training in group techniques. But there is a lot of trial and error in figuring out what works and what doesn't work and what works in different groups. So I think there is repeated exposure that is beneficial.

**Moderator:** The reason I called on Thatcher is because I knew of the freshman level engineering course.

**D. Bohnhoff:** To add to something because Jerry brought it up. In Bio-Medical Engineering, they actually have their students enroll in design courses every semester. We now also have a program in the College of Engineering – a program that was started at Purdue – that involves design projects that freshmen, sophomores, juniors and seniors can work on for credit. Seniors generally take the lead on these projects. As underclassmen get up there, they are expected to take the lead on these projects. These are typically community service projects, and they are used by departments to meet ABET design requirements.

**D. Steinman:** One thing, when you are looking at an ABET accreditation review, are things outside the core curriculum taken into consideration? For example. The people who come to us, that have the best skills and some of the multi-disciplinary team work, are people who have done a bunch of co-op programs and have been exposed to the business environment. So when somebody comes in and does this ABET evaluation or when you look at this, do you say, “We get that, but we get it through a co-op program rather than a core curriculum.”

**D. Bohnhoff:** I guess that’s one of the questions I’d like you guys to address and make a strong statement about and perhaps vote on. Do you think that (*a co-op program*) should be a requirement? Believe it or not, we did require, in our construction management program, that students have verifiable field work experience. Now in many cases they were grunts digging ditches all summer. Nevertheless, they were on a site, where they could observe what was going on. Experience was a requirement.

**Moderator:** So, the question is. How many feel that some type of field work should be a requirement? An internship, coop, work experience or something? (*Hands go up and moderator counts to eleven – eleven votes for requiring field experience. Marra votes against*).

**L. Pfeil:** Those are the only people we hire.

**J. Marra:** I may be the only dissenter. Let me tell you where I am coming from. I don’t underestimate or undervalue how important that can be. But I don’t want to mandate to my son, who I want to see graduate in four years, that he has to do a coop or internship in order to be employable when he’s through. I think all that does is exacerbate a problem that this university faces more than any that I know of (and I don’t know of many) and that is getting its engineering students through in four years.

**R. Schuler:** I guess to answer Dave’s [*Steinman*] question, they (ABET) do not count coop experience as design.

**J. Wille:** I disagree Ron, I think it’s taken in consideration.

**R. Schuler:** They do in terms of value. But if you look at engineering design, you know, we don’t give them many credits. Dave, how many credits do they get for co-op?

**D. Bohnhoff:** Actually I think that the hard count on design is now out of the ABET criteria.

**J. Wille:** That’s what I’m saying.

**D. Bohnhoff:** It used to be a big issue.

**Thatcher Root:** Let’s go back to the original question. When we talk to the accreditors, if we can show that every student is exposed to something through a requirement, that’s really strong. If we show that some fraction of our students are in professional societies and get co-ops, it’s nice, but it’s not really saying that everybody’s getting it. So, it’s hard to make a case for design experience in the program even though it is on average improving the quality of the students going through the program. But take it at the partial level, it’s sort of an iffy thing.

**D. MULTI – DISCIPLINARY TEAMS**

- **Brainstorming Techniques**
- **Innovation and Creativity**
- **Develop transkills vs individual learning**
- **Understanding non-engineering disciplines / functions**
- **Field Experience = Yes - 11 / No - 1**

**Moderator:** We should probably move on. So, lets talk about “G” then. “G” is an ability to communicate effectively, lets talk about that. Is there anything more to say about it, or is that it. Is there anything we should incorporate into the question?

**P. Boor:** Perhaps more student presentations could be incorporated into a fair number of classes.

**Moderator:** So there should be more student presentations and writing requirements, does that pretty much cover it?

**J. Wille:** One comment I might make on that. That is that I think some of our communication coursework at the university is directed toward overall communications, be it oral or written. In a very general sense, it would be nice to have a few courses available for our students in engineering, to take in terms of engineering communications.

**Moderator:** And you say specifically engineering?

**J. Wille:** That’s specifically engineering communications.

**Moderator:** Would you like to talk more about that? What do you mean by that?

**J. Wille:** I satisfied all my English course work, but never took any thing in terms of specifications writing. I didn’t know what a specification was until I got out. And I think if we had some, and I don’t want the engineering college to teach it, but if we can get our other colleges to teach that type of communication as opposed to just general speech. Visual aids that require drawings and power point in terms of material processing, loads and so forth, or communications in terms of what you do in the public hearing on a permit.

**Moderator:** Is that all part of specifications?

**J. Wille:** That’s oral communications. I think just strictly an application of communication tools to an engineering problem.

**G. Williams:** Engineers spend a lot of time of communicating via construction documents and drawings and such.

**J. Wille:** I think that would help.

**Moderator:** Anything else on that?

**G. COMMUNICATE EFFECTIVELY**

- **More student presentations**
- **Engineering communication**
- **Specification writing**
- **Presentation skills**

**Moderator:** Okay, lets move onto “E”. “E” is an ability to identify, formulate and solve engineering problems. So, you said that was really important and you are medium satisfied. Lets talk about that. What is it, the thinking skills, is it the math or the science skills, that they don’t have to solve the problems or is it the technical skills they don’t have to solve the problems?

**P. Boor:** I think it’s modeling.

**Moderator:** What do you mean?

**P. Boor:** People don't understand how to model structures. They'll build models that aren't realistic. You got to understand that you're trying to build a mathematical duplication of the real world. And unless you do a reasonable good job of it, the answers you get are not all that useful and I think that needs to be stressed a little more. Here is the system and here is how to model it. That probably goes for product engineering as well as structural engineering. But I imagine that follows for everyone who's doing design work.

**Moderator:** How many people agree that better understanding of modeling is needed? So, what else?

**G. Williams:** A lot of times when you are talking to a client, they will describe a problem they have and actually it turns out their problem was different than what they described. That's extremely common. They don't know enough about it. Not being an expert in the field, they are coming to you to answer their question.

**Moderator:** So what is the higher need? What do you need to get in order to get the right problem out on the discussion?

**G. Williams:** Oh, lots of experience.

**D. Steinman:** This is one of the classes we teach internally for root cause analysis.

**Moderator:** Root causes analysis?

**D. Steinman:** People don't dig down to what is the real problem. They only see the work up here. The real issue is an understanding of the system – the fact that something that happens five units operation and eight hundred feet back here is affecting the performance here.

**Moderator:** So you often have clients, I would guess from what I hear, that come to you asking for solutions only to find out the problem is something different.

**G. Williams:** It's very common, I don't know how you can quantify it, when they're just learning the basics. They've got to get beyond the basics before they can solve problems.

**J. Wille:** If we go back to what we did before. How many people would say that's part of what the university should be teaching or is that on the job training.

**G. Williams:** It could be continuing education.

**Moderator:** How many people would say you'd want that to be part of basic education. So really what your saying, either on the job or continuing education. Okay, what else? Would anything else push the letter "E" towards the high side?

**J. Marra:** I think Paul really hit the nail on the head with this modeling. I think this is like in math when you are in third grade, instead of learning  $2 + 2$  you learn what  $2 + 2$  is for a word problem. In other words no ones telling you here is the equation solve it. I have two apples and I go and buy two, how many more do I have, that's the kind of more real world. So that's what we need here: the analogous engineering problem to a word problem with learning simple arithmetic.

**Moderator:** So the application of the fundamental knowledge, that's what your saying.

**J. Marra:** And I agree with everything that everyone said, it's not something that's so easily taught. But I think that's what we're kind of getting after or what's missing. If I define the problem and hand it to one of my entry level engineers, he's likely to know how to solve it. In fact, what we're lacking there is always having the time to go out and define this thing for you. You got help me understanding what the problem is, pretty much what Gregg was referring to.

- E. IDENTIFY, FORMULATE and SOLVE ENGINEERING PROBLEMS**
- **Modeling (application / understanding)**
  - **Root cause analysis (on the job?) (continue education)**

**Moderator:** So, we've done this group here, so let's go on now to letter "H". "H" is the broad education necessary to understand the impact of engineering solutions in a global and societal context. Talk about that. Did we talk about that enough earlier?

**J. Marra:** Well we probably don't think that way enough so it's kind of hard to see how others can. *(laughter)*

**P. Boor:** I really think he's hit the nail on the head. We don't think it's a problem as a group, because we don't think it's a problem.

**D. Bohnhoff:** Neither does our federal government. *(laughter)*

**P. Boor:** You know the answer to energy is to use it to make more energy. That's an engineering solution, and by golly, that's probably a pretty good one. But is that the right solution from a global context? I don't know.

**Moderator:** You said that you were low on being satisfied, does that mean that you wish you could get more? Or did you say you are well satisfied. What would make you satisfied? Should we move on? Okay, we'll move on

#### H. GLOBAL and SOCIETAL CONTEXT

**Moderator:** I'm going to go back up here to "K". "K" is an ability to use the techniques, skills and modern engineering tools necessary for engineering practice. So anything stand out that you'd like to see different?

**J. Marra:** I would relate this. This is the only one I rated lower on importance than I did on satisfaction because I see these young graduates come out equipped with these tools. They think these tools are the engineering, and there're not. They are tools to the engineer. They think as long as I have this software on my computer, that solves these problems, and it doesn't.

**P. Boor:** This is very much related to the modeling issue. You pump some input into the software and it spits out an answer. The link between the idea that the input has to be good in order for the answer to be good, is sometimes lost.

**J. Marra:** My young engineers run circles around me when it comes to applying these tools. And I see that as pretty typical. They come and they know how to use all these things but they don't understand as well.

**Moderator:** So they understand the tools but they do not understand for the use or the application. That pretty much sums that up?

#### K. TECHNIQUES, SKILLS.... MODERN ENGINEERING

- Engineering knowledge (application) vs tools

**Moderator:** Lets look at "I", a recognition of the need for, and an ability to engage in life-long learning. No comments for letter "I".

#### I. LIFELONG LEARNING

**Moderator:** Lets look at "B", is an ability to design and conduct experiments, as well as to analyze and interpret data. Is there anything that would move "B" over towards the high side on the chart? Okay, nothing on that.

#### B. CONDUCT EXPERIMENTS

**Moderator:** And then "F" is an understanding of professional and ethical responsibility. Do you have anything to talk about that? No comments for "F".

#### F. PROFESSIONAL / ETHICS

**Moderator:** Then lets go to "J", "J" is a knowledge of contemporary issues. Is there anything to talk about that? No? Okay, then let's go back to our agenda.

#### J. CONTEMPORARY ISSUES

*Tape #3A (at 1.0 beginning)    Tape #3B (at about 4.0 ??)*

**Moderator:** OK. So then we done that, we done this (*flipping through charts*). Maybe, now we want to take a break?

**D. Bohnhoff:** Maybe they want to fill these sheets out and then take a break. Then we can look at them after the break.

**Moderator:** OK.

**Bohnhoff:** (*holds up two sheets*). What you have here are lists of position descriptions. This means you do not have to worry about the stuff taped on the board because it is contained on these two sheets of position descriptions. We contains design, planning, and construction positions, and the other one covers facilities operation, maintenance and management positions. (*holds up two other sheett of paper*) On these sheets you have the technical lists (that were presented somewhere this morning) listed down the left side. Across the top on these two sheets are the position descriptions. This is the matrix we talked about doing this morning. We are asking you to prioritize each technical competency for each position as described. We are asking you to put a priority, a high priority, a medium priority, and a low priority for that position. Is everybody clear on this matrix?

**P. Boor:** I would vote to have a certain number of each because what you see on that thing (*pointing to A-K importance/satisfaction plot*) is that we have a lot more highs than we actually have. You are going to see that we have very little separation which is one thing that our chemical engineer over there (*referring to Thatcher Root*) mentioned.

**Moderator:** You want some rules? (*mixed response*) So I guess, just spread them out.

*Worksheets are handed out and completed. Group takes brief break, then moderator summarizes what was done to this point in meeting.*

**Moderator:** OK, so there are two questions left. One is about the recommendation for industry involvement in recruitment and mentoring, cooperative education, classroom instruction, and continuing education programs. So your thoughts about ways in which you would be interested in being engaged with the university in those or other things that we do. Any thoughts about this? Does anybody do any of these things now?

**L. Pfeil:** We do with other schools.

**Moderator:** What do you do with other schools?

**L. Pfeil:** We recruit heavy on campus, put on programs and do partnerships with other universities, but not with the UW.

**Moderator:** Why not with the UW?

**L. Pfeil:** Never had any success in hiring UW engineering graduates. We do get students from Platteville, Stout, Iowa State, but not here.

**Moderator:** So that's where you do partnerships. Do you find those partnerships useful?

**L. Pfeil:** Yes, they are very useful.

**Moderator:** So what are you interested in if you don't do that now, what might you be interested in doing with this university?

**J. Marra:** I'll speak also as to why we don't. This is probably going to hit pretty hard. It speaks to diversity. We are using our internal co-op programs as our inroad into minority candidates and they're not prevalent here, so we're looking other places.

**Moderator:** So, the first reason that somebody gave is because we don't get your graduates. The second is because we use our internship programs as an inroad to diversity and you don't find a diverse pool here. ....

**D. Bohnhoff:** Could I ask you to clarify that Jerry? You are essentially using the internship programs to evaluate people as eventual full time hires.

**J. Marra:** It's so competitive to get university candidates, that we feel if we offer a student from the University of Puerto Rico, for example, an internship to come and work for Kraft for a period of about 6 months, that when that person goes back to school and graduates we will have an inside path to land them as a full time employee.

**Moderator:** So diversity is a competitive edge for hiring ...

**J. Marra:** Right.

**Moderator:** ... inroads for hiring. So that is why you don't go specifically to the UW. While we are on that topic, is there anyone else that doesn't?

**J. Kiedrowski:** We pull from Marquette, UW-Milwaukee, MSOE. We don't pull from UW-Madison because we want our co-ops, internships on an annual basis. We don't want them just for three months. We don't feel we get the value out of them. We spent too much time training. The company is too big. We would spend too much time getting them oriented that it would be of no value to us. So we try to get kids that we can take 10, 12 or 15 hours a week during the school year and full time in the summer.

**Moderator:** So local geographically because you can have a longer segment.

**J. Kiedrowski:** That has also come back to bite us though too in that we find -- not just from a diversity standpoint -- a way of thinking, amongst engineers, they think like Milwaukee and that's not ... *(laughter drowns out rest of comment)*

**D. Bohnhoff:** Could I ask the group this question, to take off of Jerry's comment. We are obviously under a tremendous amount of pressure to diversify and it's very difficult to recruit as well. It seems to me that if we can set up these partnerships with companies and they are interested in it, that's another recruitment tool for us. When we go out, we are saying, hey if you come here we'll guarantee you that we are going to have you placed in a job this summer, in a well paying job in your major. Is that something that other companies, in addition to Kraft, are looking for?

**Moderator:** How many of you use internships as an inroad to diversity? *(3 panel members raised hands – Kiedrowski, Marra and Steinman)*

**D. Steinman:** Ours are very location specific. We run a lot of our internships are co-ops through our facilities on our operations side. We don't have a facility that's located close.

**Moderator:** So geography is a factor?

**D. Steinman:** Yes. Now we do some through the R & D group, utilizing people through school, but we recruit for full time hires at this school. But I have to agree with Jerry. I guarantee you that everyone of our recruiters that goes out to do on-campus interviews will tell you which school in the U.S. graduates the highest percentage of women in the engineering. Hispanics in the engineering, African Americans in the engineering.

**Moderator:** We should also capture the idea of perhaps partnering for internships that are a recruiting tool for diversity as a concept to explore. Anything else? How about classroom instruction? Are there folks within your companies who might participate as instructors?

**J. Wille:** We do.

**Moderator:** You do that already? Here?

**J. Wille:** No not here, but ... *(laughter)*...

**G. Williams:** Its a little far to drive?

**J. Wille:** And that's why we do it. It's interactive. We benefit, they benefit. It an opportunity to make contact with new recruits and to see what new recruits are like.

**Moderator:** So classroom instruction is location specific. Is there anybody here who would be interested in classroom instruction at Madison?

**G. Williams:** I have done it before.

**Moderator:** Okay.

**D. Bohnhoff:** A comment. Des Doucette from McCain Foods who was originally on your list is not here today. He mentioned to me that he was involved in a mentoring program when he was up in Canada working, and that was pretty popular in the area where he was. This is where industry personnel serve as mentors. They would be tied one on one with an undergraduate, and if the undergraduate has some questions they can always talk with that mentor. Is that something that other companies are doing? Actively doing?

**J. Wille:** One of the things that we do is that, well take our interns. Anytime that they're involved in a design project -- supposedly a senior design project -- our office is always available to not only them, but all of their classmates that want to work on that design project. We become their base. It's like they go to the office. And it really seems to put them into a different mind set then a bunch of students just working on a job.

**D. Bohnhoff:** I'm involved in our student design course here, and I do make a lot of contacts for students, and they do work very closely just like you mentioned, with people on the outside. I'm not very strong in your industry. Perhaps what we need to do is we need to facilitate something like that with companies that would be willing to provide their name to students that are working on design projects. And you give us an expertise in a specific area. And if it's okay with you, the students could call during specific business office hours, not before or after, to ask questions.

**Moderator:** Are there any other questions?

**D. Bohnhoff:** I would like to find out if that's okay, if they think it is something that may work.

**Moderator:** How many of you would be willing to discuss the prospect of a mentor relationships with students? *(most raise their hands)*

**D. Bohnhoff:** I think then what we would do is probably start a data base, and that could be done through the profession itself. It could be shared then by all universities.

**Moderator:** I asked the question about classroom instruction, how about the same question for continuing education programs? Any, including yourself, within your companies that might participate as instructors for continuing education? *(Kurt Rosentrater, Paul Boor, John Kiedrowski, and Greg Williams raise their hands)* Anything else on that? Okay then, we have a bonus question, which is an interesting one. Van Kelly from South Dakota suggested asking this question. As you go through your pile of resumes, what are the one or couple of things that really stand out, that take somebody to the top of the pile?

**J. Wille:** Internships in related fields. Co-ops.

**Moderator:** Co-ops and internships.

**G. Williams:** In the structural engineering field I actually like them to have actually worked on a construction crew building something. I don't care about a formal internship but I like it if they spend a summer working on a carpentry crew. Or if you are running a process plant, you would want someone who has worked on the line for a couple of summers. Just a brief exposure to "hands-on" gives people a great feel for the business environment.

**Moderator:** So the hands-on experience is sort of what you are looking for. Is that true for everybody? For how many of you does an internship move a resume to the top of a pile? *(every one raises their hand)*

**P. Boor:** And work experience.

**G. Williams:** Yes, if they worked for two years and then went to school, they are usually a stand-out.

**Moderator:** Anything else that stands out?

**J. Marra:** Grade point high? Grade point low. *(laughter)*

**D. Bohnhoff:** I guess I would ask just the opposite question. What automatically puts them in the circular file?

**Moderator:** That's a good question.

**D. Steinman:** Misspelled words. Just plain, poor writing.

**J. Kiedrowski:** We look for leadership and stuff that would be for organizations, say they were in the eagle scouts, ROTC, anything that indicates involvement of leadership, self initiated leadership.

**D. Steinman:** Things like volunteer activities, big brothers and big sisters.

**D. Petrick:** We look to see what classes they have taken outside of their majors, what they minored in, and what elective courses they've taken. You know, how rounded a background they have.

**Moderator:** Anything else that puts them in the circular file?

**J. Willie:** I guess one word of caution that I would have. While I would want them to have leadership and initiative, if they come right out and tell me that they are a leader and that they want to take my job, that goes real quickly in the circular file.  
(laughter)

**Moderator:** Anything else on that? Okay, I'm going to do a quick summary on what we did today. We identified position titles in essentially two major categories. We asked "What do those positions do in terms of responsibility?" We went through all those basic categories in that way. We then said in terms of educational needs, "What are they?" We identified five major categories. Of the design one in particular, we had a lot of things that we had some minor edits to, and we identified some key things that we want to do more or better. And then for basic and technical, we have taken those and did some prioritization of those through one of your handouts. And then we identified leadership, business and social in terms of what those particular skills were. We took ABET and we asked about satisfaction and importance and then much more about what you mean, what you are actually looking for in ways and terms of satisfaction and importance. Then we took all of the positions by the educational needs and gave them a high, medium, or low which you filled out and handed them in and you will get the summary of that. We talked about continuing educational needs and ranked those. We talked about partnering opportunities and resume highlights. Did I miss anything? Dave do you have anything?

**D. Bohnhoff:** No, unless they have some broad comments that they would like to make, or something they would like to share. Something that they thought they would get an opportunity to say today and they didn't, I guess.

**J. Willie:** From your standpoint Dave, I guess one thing that comes to mind, I don't know if we ever said it, but in terms of the technical training of students, I don't think anybody's really expressed any feelings of dissatisfaction.

**D. Bohnhoff:** Correct. When we decided over the noon hour to do the A through K ranking exercise, I said criteria A (An ability to apply knowledge of mathematics, science and engineering) is going to get a high-high ranking in terms of importance and satisfaction, and I wouldn't expect to see any other category get a high-high ranking. Sure enough. When I came back into the room after you completed your rankings, I see A is the only one picked in the high-high category. This always seems to be the case. Employers state that technical expertise is very important, and they always feel that the engineers come out of here with it.

**Moderator:** That's really an excellent point. A nice point to end on.

**G. Williams:** Dave, do you want to give like a summary of where you are headed in terms of your structures and environment program? How you might want to change it a little bit, now that we have gone through this whole exercise?

**D. Bohnhoff:** Well, (and I kind of mentioned it in some of the material I sent out) as a profession, ASAE has traditionally slanted their technical programming more towards on-farm production and on-farm facilities, at somewhat the expense of post-harvest processing and storage. And the thing is, our on-farm facilities are getting quite large and regulations keep growing, and what we're now seeing is similar problems in both areas. By refocusing -- by actually focusing more on agri-industrial facilities and their needs (and I'm talking about air quality issues, recycling, energy utilization, bio securities, etc.) - - we are going to develop some technical expertise that is common across both post-harvest technology and on-farm processing to the betterment of everybody. I think that this will also unite the profession -- the technical divisions and

institutes with in ASAE. Right now our food processors don't work that closely with the people in structures and environment area. We've seen here, and many of you are living examples, that these two areas are married so close together. Why are they so separate with in our profession? So, my idea is to really get this technical programming together. To look at the continuing educational needs and bring this stuff together. We'll bring in the machinery systems people as well. I'm saying, unite and grow ASAE and you'll strengthen it, and I think that we will feel much better about ourselves. I feel very good about what I do and I think most of you do as well. I love my profession and I think it's the greatest profession out there. I have no problem selling this major and what I do to any student out there. It's a great job and you're examples that there is so much to do out there, and it's exciting stuff. Lets get together and just let the world know about it. Lets get students involved and you know, I want to just bring this together. We can do this.

**J. Wille:** How many people in here hire people from the Ag and Bio-Systems area?

**D. Bohnhoff:** These companies do hire our food engineers. They don't hire our structures students, but our structures group isn't that large. Our machinery systems people they are typically going with Deere, Cat, J-Star and Case IH, we don't crank out that many as well. Our people in the natural resources area are really looking at government jobs. There is a need to bring those people into this sector as well. They can deal with a number of topics that we have talked about. Topics that you seemed to vacillate on a bit with respect to sanitary engineering, water resources, health issues, etc.

**Moderator:** We got a question here.

**J. Wille:** My question is in terms of this group. We were talking at lunch and I was kind of surprised to hear, "Well we don't hire from UW."

**Moderator:** How many people hire from the UW-Madison? Okay, rather from the Bio Systems Engineering / Ag Engineering.

**D. Steinman:** Our R & D group does okay, because we balance some of that Food Science use.

**J. Wille:** But I think it's interesting to hear what you said. Why don't you?

**Moderator:** Why don't you?

**D. Steinman:** Should we talk a little about that. (*Group laughter followed*). Now if you turn off the cameras....

**D. Steinman:** No, we really do. We focus on specific majors in specific universities, because we as a company play the percentages. Where do we have the best luck for people who are going to give us long term performance, commitment, growth? We find that if I took a major (not to pick on anyone, but say chemical engineering) we find that (and I realize this is a little bit of generalization) but by and large people that go into chemical engineering, go into that major to challenge themselves against the best and the brightest in their school. Those are the people that we want in our organization. We find that they are people that are graduating with not a hundred and twenty-four credits, but with a hundred and forty-four credits because they wanted to do more. They got minors that go along with that. So we play the percentages. That is where we have had the best luck in getting good, long-term employees. That is a generalization.

**D. Bohnhoff:** That is an excellent point and it goes right back to recruitment. If you can recruit a student into a chemical engineering program out of high school, you tell me, just think of your own kid. How many of your own kids would be attracted to chemical engineering? That's a tough sell. It really is. And it's going to be a tough sell to recruit people even into a program to specialize in industrial building design and management. It's not clamorous. Architecture is clamorous. Structural engineering is somewhat appealing. But bringing them into chemical engineering is a tough sell. So I think you are right, those kids are committed to a future in that industry.

**D. Steinman:** And David, it sounds so specific. I mean, if you are going to recruit somebody into a specific program, Chemical Engineering and Mechanical Engineering tend to have a little bit more of a broad base appeal to employers. I would hire a Chemical Engineering who would compare to anything. I don't know that companies necessarily look at an Agricultural Engineer or an Ag Engineer as having that same attribute.

**Moderator:** Is it the name of it or is it the education that they receive, or is it anything that agri engineering programs could do to hold move more toward that desirability?

**D. Steinman:** I don't really know.

**J. Marra:** I think that might be part of it. But I think maybe there's a part of it that's bigger. We talked about this last night at length, what I call critical mass. You haven't reached that here yet. You want a good example of critical mass? I used this illustration with this group before. The most engineers out of any school that Kraft hires (you will be shocked to hear this) is Michigan State University because they provide us like ninety-eight percent of the packaging engineers that we hire. We have reached that critical mass where we're now like in our second or third generation of Michigan State packaging grads. They go out and hire Michigan State packaging grads. It's a system that just feeds itself. I think David and I were talking about the pipeline that exists from East Lansing to Glenview, Illinois.

**D. Steinman:** I'll give you another one – the food engineering major at Purdue. You know we never miss an opportunity to go and talk to their food engineers. I lived in Indiana fifteen years ago and that wasn't the case. They were just getting that started up. They were just working internships and co-ops. But they were actively, actively talking to industry. In the one I was in at the time -- the Dairy industry -- holding forums like this, making contacts, getting your foot in the door, being able to start co-ops and internships with anybody and everybody that would listen. And you know I think those are the first steps. They are baby steps, but that's the way that they start to get that critical mass.

**J. Marra:** I would echo that, because that's what I'm seeing now at Kraft. More and more as I'm introduced to young, kind of hot shots – I can tell these guys that are on their way up -- where did they go to school? Food Engineering from Purdue. It's just a system now that's feeding itself. The best promotion that the University of Wisconsin could do to build its Food Engineering Department, is to get aspiring, excellent food engineers out into the industry. I know it's kind of a little catch 22, because in order to do that, you scratch and you claw and you start to build this thing so it reaches that critical mass and then it kind of feeds on itself. But they are not there yet.

**D. Steinman:** Have you had any contact in the industry with recent graduates? Have you talked to the companies that hired them? What's working and what's not working or where are they lacking or where are they are strong. Those are the people that are going to give you the best feedback, I would think.

**D. Bohnhoff:** That's part of the self assessment process. We do survey our students that have been out three years and students that have been out five years. I believe our department has been doing this every three years.

**R. Schuler:** I know that Jerry Marra was involved with our Food Engineering focus group which was somewhat like this with just a different arrangement. One-third of the group were senior engineers and hiring people, another third was recent graduates and then we had our undergraduates and graduate students there. We focused more on the curriculum than you have. It was more narrowly focused than what Dave has done here. So we did get some feedback from our younger people - some that have been working with Kraft.

**Moderator:** Any other advice for us? Thank you very much for all your helpful guidance.

**D. Bohnhoff:** Lets see, it only took us until about ten to three to get Dave to really open up. *(laughter from group)*

**J. Wille:** We should have fed him earlier. *(laughter from group)*

**D. Steinman:** Well, you didn't ask me to lead the thing.

**D. Bohnhoff:** I want to thank everybody for coming and I know it's kind of hard to put together for the first time, but I also know it will be very valuable.

**A – K - Important / Satisfied****- Discuss**

- Continuing Education needs
- Partnership opportunities
- Prioritize basic technicals
- Resume highlights

**PARTNERING OPPORTUNITIES****Not Presently Partnering:**

- Diversity - competitive edge for hiring
- Don't "get" (hire) UW Graduates
- Geographic Proximity (Milwaukee)
- Partnering for internships = recruitment tool for minority students

**CLASSROOM INSTRUCTION**

- Greg Williams

-

**MENTORING**

- 4 / 12 willing to participate

**CONTUNUING EDUCATION****RESUMES**

- Internships / Co-ops, Leadership, Eagle Scouts, BBB's
- Structural Engineers: Construction "hands on" exposure
- GPA
- Minors, electives
- Poor presentation
- Spelling
- Too long

## APPENDIX A: Positions and Descriptions as Defined by Focus Group

### Positions and Descriptions: Facility Planning, Design and Construction

1. **Design Engineer – Structural:** Determine loads, supervise CAD personnel, apply model building codes, minor specification writing, product searches, shop drawing review, coordinate with other engineering disciplines, arriving at design criteria, permitting coordination, information gathering, code compliance, structural analysis
2. **Design Engineer - Electrical Controls:** Determine electrical loads, software development/upgrading/maintenance, troubleshooting, equipment recommendations/selection, maintain flow networks (Ethernet), supervise CAD personnel, minor specification writing, product searches, shop drawing review, coordinate with other engineering disciplines, arriving at design criteria, permitting coordination, information gathering, code compliance
3. **Design Engineer – Process:** Determine flows, develop process flow diagrams, process development work, process parameters, piping and instrument diagrams (PNID's), test and specify process equipment, process design, test controls, minor specification writing, product searches, shop drawing review, coordinate with other engineering disciplines, arriving at design criteria, permitting coordination, information gathering, code compliance, wastewater management
4. **Design Engineer – Mechanical:** Determine loads, plumbing, HVAC, refrigeration, piping, PNID's, compressed air, boiler systems, chemical processes (ammonia), minor specification writing, product searches, shop drawing review, coordinate with other engineering disciplines, arriving at design criteria, permitting coordination, information gathering, code compliance, energy recovery, wastewater management, energy utilization
5. **Design Engineer - Civil:** Site evaluation and design
6. **Design Engineer - Packaging:** Equipment selection, packaging materials, package design, equipment design, vendor coordination
7. **Planner/Designer/Estimators:** Capital budgeting, detailed estimating, conceptual design work, purchasing, contract negotiations, technical approval, interface with project managers and design team
8. **Construction Project Manager:** Scheduling, coordination of trades, cost control, manage subcontracts, manage work place health and safety, coordination of information flow for project, liaison to client, coordinate with labor unions, supervise project superintendents, expediting, start-up and commissioning, work with regulatory agencies (inspectors), building permits, scope development

### Positions and Descriptions: Facility Operation, Maintenance and Management

1. Facility Manager/Engineer /Maintenance Engineer: **Directs maintenance activities, maintenance planning**
2. Plant Engineer, Plant Project Engineer: **Project engineering, engineering maintenance, execute plant level capital projects (under 100,000, 200,000), responsible for infrastructure of building, vacation relieve of production supervision**
3. **Manufacturing/Industrial Engineer:** Improve line efficiencies, reduce waste, supply chain management, identify cost reduction opportunities, measure productivity
4. **Product Development Engineer:** New product design, prototype the process
5. **Quality Engineers:** Sanitary design, assure consistent quality, food safety requirements, oversee specifications and regulatory engineers
6. **Production Planner:** Schedule and plan production, coordinate inventory
7. **Environmental Safety and Health Engineer:** Maintain permits, manage regulatory programs, regulatory compliance, safety programs, develop environment initiatives, training
8. **Production Supervisor:** Supervise hourly workers on production line, performance tracking for their area, maintenance, employee safety, GMP's, process control

## APPENDIX B: Focus Group's Educational Needs Ranking By Position (as Previously Defined)

Ranking: 1 = High, 0 = Medium, -1 = Low

POSITION		STATISTICS	EDUCATIONAL NEED											
			Structural Design & Analysis	Loads	Building Life Safety and Fire Codes	Building Systems and Design	Sanitary Facility Design	Regulations	Mechanical Systems	Electrical Systems	Food Process Engr. Systems	Construction Mgmt.	Business Operations & Planning	
FACILITY PLANNING, DESIGN AND CONSTRUCTION POSITIONS	Design Engineer - Structural	Avg	1.00	1.00	1.00	0.40	0.30	0.91	0.09	-0.20	-0.32	0.09	-0.27	
		SD	0.00	0.00	0.00	0.70	0.95	0.30	0.54	0.42	0.64	0.54	0.65	
	Design Engineer - Electrical	Avg	-0.60	0.40	0.45	0.22	0.09	0.82	0.18	1.00	0.00	0.00	-0.18	
		SD	0.84	0.84	0.82	0.67	0.94	0.40	0.40	0.00	0.77	0.63	0.75	
	Design Engineer - Process	Avg	-0.50	0.00	0.27	0.30	1.00	0.64	0.55	-0.09	1.00	0.09	0.09	
		SD	0.85	0.94	0.90	0.82	0.00	0.67	0.69	0.83	0.00	0.54	0.54	
	Design Engineer - Mechanical	Avg	-0.56	0.00	0.20	0.44	0.50	0.70	1.00	0.10	0.30	-0.20	-0.10	
		SD	0.88	1.00	0.79	0.73	0.53	0.48	0.00	0.57	0.67	0.79	0.74	
	Design Engineer - Civil	Avg	0.33	0.56	0.44	0.00	0.00	0.78	-0.33	-0.44	-0.56	-0.11	-0.22	
		SD	0.71	0.53	0.53	0.50	0.87	0.44	0.71	0.53	0.73	0.78	0.83	
	Design Engineer - Packaging	Avg	-0.89	-0.78	-0.20	-0.56	0.75	0.20	-0.50	-0.20	0.60	-0.50	0.00	
		SD	0.33	0.67	0.79	0.73	0.42	0.92	0.71	0.63	0.52	0.71	0.67	
	Planner/Designer/Estimator	Avg	-0.50	-0.50	0.11	0.13	0.33	0.00	0.11	0.11	0.11	0.33	0.00	
		SD	0.53	0.53	0.78	0.64	0.71	1.00	0.33	0.33	0.60	0.71	0.71	
	Construction Project Management	Avg	-0.36	-0.27	0.67	0.55	0.67	0.58	0.08	0.08	0.08	1.00	0.75	
		SD	0.50	0.47	0.49	0.52	0.49	0.51	0.51	0.51	0.79	0.00	0.45	
	FACILITY OPERATION, MAINTANANCE AND MANAGEMENT POSITIONS	Facility Maintenance Engineer	Avg	-0.70	-0.70	0.20	-0.11	0.80	0.40	0.70	0.50	0.00	-0.70	-0.10
			SD	0.67	0.48	0.92	0.60	0.42	0.52	0.48	0.53	0.67	0.48	0.57
Plant Manager		Avg	-0.55	-0.18	0.45	0.20	0.82	0.64	0.64	0.73	0.45	-0.09	0.45	
		SD	0.82	0.87	0.52	0.63	0.40	0.50	0.50	0.47	0.82	0.70	0.52	
Manufacturing/Industrial Engineer		Avg	-0.80	-0.60	-0.30	-0.33	0.50	0.20	-0.30	-0.20	0.60	-0.60	0.20	
		SD	0.42	0.70	0.95	0.71	0.53	0.92	0.82	0.79	0.52	0.70	0.42	
Product Development Engineer		Avg	-0.80	-0.70	-0.70	-0.56	0.70	0.00	-0.60	-0.70	0.90	-0.80	0.30	
		SD	0.63	0.67	0.67	0.73	0.48	0.94	0.70	0.67	0.32	0.63	0.67	
Quality Engineer		Avg	-0.80	-1.00	-0.70	-0.56	0.70	0.30	-0.70	-0.70	0.80	-1.00	-0.10	
		SD	0.63	0.00	0.48	0.53	0.67	0.95	0.48	0.48	0.42	0.00	0.57	
Production Planner		Avg	-1.00	-0.80	-0.80	-0.44	-0.10	-0.30	-0.70	-0.80	0.40	-1.00	0.70	
		SD	0.00	0.63	0.42	0.73	0.74	0.67	0.48	0.42	0.84	0.00	0.67	
Environmental Safety & Health Engr.		Avg	-0.73	-0.73	0.36	-0.20	0.18	1.00	-0.55	-0.55	-0.09	-0.73	-0.27	
		SD	0.65	0.47	0.92	0.63	0.75	0.00	0.52	0.69	0.70	0.65	0.47	
Production Supervisor		Avg	-0.91	-0.82	-0.36	-0.80	0.45	0.27	-0.55	-0.64	0.73	-1.00	0.82	
		SD	0.30	0.60	0.81	0.42	0.52	0.65	0.52	0.50	0.47	0.00	0.40	