Good Morning. I am pleased to have the opportunity to be with you today. As a trustee of the AT&T Foundation, I participated in AT&T's decision to join with the National Science Foundation to launch three WEPAN centers at universities that have solid track records of attracting and retaining women in engineering. I am pleased that AT&T is the corporate partner in this effort and by participating in this meeting, I will have the opportunity to see our investment in action.

I must confess that I struggled to come up with a topic worthy of your consideration and time. I am not an engineer by training. However, the business I manage is highly technical and full of engineers. And although their numbers are few, we do have some very talented women engineers. To ensure that this message would be current, practical, and accurate, I asked those who work with me to talk with me about their experiences. Through a focus group session, they have informed and enlightened me. Much of what I will share with you today comes directly from them. In fact, based on these discussions, I might have titled this talk, "What they didn't teach you in Engineering School", at least from the point of view of women striving to succeed in today's global business economy.

Clearly, there is much that these women WERE taught in engineering school that they consider fundamental to their present success. You should know that our discussion began with enthusiastic acknowledgement of what is valuable about being an engineer and having an engineering education. They believe that coming out of school, it was easier for them, than for other women, to find jobs as women in business. The engineering curriculum is considered tough, and to have earned the degree provides a legitimacy, establishes a basis for respect. They also acknowledge that the engineering curriculum teaches how to focus on identifying and solving problems. The ability to do this, especially today, with so much emphasis on Quality improvement and the principles of scientific experimentation, is highly valued as a critical skill set.

Our consideration of critical skills for success prompted a discussion of what is needed that wasn't provided by the basic engineering curriculum. The consensus is that they weren't prepared to apply the learning to real problems. The women I talked with believe they have used just a fraction of the requirements of a technical degree in the everyday application of their education to their jobs. They told me that, with the possible exception of individuals who go into pure research and development, most students of engineering
will find themselves in business settings where the traditional engineer's toolbox does not include essential, fundamental business skills. I will share with you later some of their specific suggestions for enhanced preparation. What I found most insightful about the discussion, however, was a tangential dialogue about how these women use their essential qualities as women, to enhance their technical skills. They weren't taught or encouraged to include these behaviors in the toolbox. It came naturally.

Let me explain. We talked about what the women experienced in school and how that compares to their professional experiences. No surprise to me, and I am sure to you, is the fact that women interact differently than men do. They interact differently in the classroom, and they interact differently at work. For example, it was generally agreed that the engineering classroom is often dominated by students who are trying to impress others with what they know. This behavior is rewarded in school. It is sometimes rewarded in business. But more and more, it is ineffective in the workplace. Our women engineers have found that it is far more valuable for an engineer to be able to communicate or explain ideas than to impress others with what you think you know. The women believe they are better able to establish a rapport with non-technical teammates because as women, they feel less of a need to impress and more of a need to participate. They believe that they are more willing to admit what they don't know, and they ask more questions. This generally produces more information with which to make decisions and solve problems. Ultimately, it can actually make them more effective than their male counterparts in situations that require teamwork for problem solving. But as in school, the ability to admit what you DON'T know is not automatically valued by traditional managers. And so the question, "is the global corporate world ready for women engineers?"

In the course of my research to understand the issues we face in trying to increase the number of women who enter and stay in the field of engineering, I was offered an article from the May/June issue of "Technology Review." It offers particular insight into the world these women are trying to penetrate. In fact, it suggests that the behaviors the women engineers still observe in the classroom and in the workplace have been around for a very long time. The article is titled, "A World without Women", by David E. Noble, and it traces the history of the exclusivity of the scientific community. As a history major myself, I found this article to be a fascinating thought piece on why things are the way they are. Mr. Noble writes that for centuries men have been trying to retain science as their exclusive province and in the process, they have disqualified the knowledge women bring as emotional, irrational, or merely intuitive. There is ample evidence that some men still deal with women in this way, even now that they are permitted to become qualified engineers.

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Two current examples from the women engineers I spoke with highlight this truth. One comes from the experience of a woman who deals with a global supplier of components to our business. The individuals who serve her as engineering representatives from the supplier's firm are American men based in the U.S. Her experience with these men is that they don't treat her as a professional equal. She considers their behavior toward her to be condescending and distinctly different from how they treat the men. She attributes it strictly to the fact that she is a woman, and they are used to dealing with men. Another woman cited an equally frustrating experience with a Far East manufacturer of drills. In this case, the representative was an engineer from Japan. Despite the fact that the woman engineer was the decision maker and the person in charge, this representative could not bring himself to deal with the woman. Instead, he addressed all of his comments to one of her subordinates, a less senior male engineer. The purpose of the visit was to answer some questions about the performance of the drills in order to close a multi-million dollar sale. He lost the sale. Again, one has to wonder if the global corporate world is really ready to value women in engineering. Somehow, based on this example at least, I think it is time to consider seriously if it can be avoided much longer.

It is important to realize that the introduction of women into this traditionally male domain presents a real dilemma for both the men and the women. The prior examples suggest that there are men who still haven't learned to deal with their female counterparts. The women on the other hand express a real concern about losing their feminine qualities if they try too hard to fit in. One suggested that it is important for women engineers to think of themselves as women who happen to be engineers. This may sound like a strange concern, but I relate to it well. These women are pioneers in their field to the extent that they do not have plentiful role models, and to the extent that their numbers are still so few. As I was coming through the ranks in other parts of our business, I faced the same thing. Having survived the experience, I try to help others recognize what is considered acceptable behavior for ambitious women. The truth is, there is a very narrow path they must walk. One must not be too feminine or give credence to the old stereotype suggested by Mr. Noble's article. On the other hand, one must retain a certain amount of femininity or be accused of trying to be a man. This is difficult advice to internalize and carry out. Consider the complications of trying to fit into the global scene where multi-national cultures cross, cultures which are often far less generous to women than our own. Women can and do feel isolated, and the need for a support system is real. As early as when they first enter engineering school, the presence of other women for support and the reinforcement that offers can make the difference between successful completion or dropout.
It seems to me that there is new opportunity to encourage women to join the engineering ranks because things ARE changing. The domestic corporate community is just beginning to acknowledge that competitive success will be won by companies that learn to harness the collective knowledge and effort of the entire workforce, not just the technical elite. Our Far East competitors have understood this for a long while, and global corporations have been forced to confront the need for change earlier than some that are purely domestic. In my business, we are introducing self managed work teams as part of a culture change designed to move us from being a hierarchical organization to one that is more participative. The engineers who will be most valuable as we make this transition will be those who can listen, learn, communicate, and be sensitive to others. For this to work, the qualities some people consider typically female are exactly the qualities we will need to cultivate in all of our engineers.

As for subject matter to add to the formal engineering curriculum, most of the suggestions relate to the need to be able to sell ideas or solutions in a business context. Increased study in business case analysis, engineering economics, or a related developmental course in decision analysis would be of benefit. There was strong endorsement for required focus on a systems engineering approach to problem definition and resolution in addition to learning this as a by product of other coursework. And skills that are clearly needed and generally undeveloped are the ability to lead, plan and implement a project, the skills are taught in business school but are equally relevant for students of engineering.

Corporations are finding that they must school engineers in the APPLICATION of quantitative methods such as Statistics, Design of Experiments and Statistical Process Control, all of which are essential skills for any engineer. While these subjects are offered in school, students do not get the opportunity to apply the learning to practical problems. Once they are in the competitive world, where time is critical to success, the business need is that engineers will be able to immediately apply these skills. Similarly, computer literacy is a must, and the ability to apply computer skills to analytical problems will enhance the value of the engineer to any organization.

As I listened to the women discuss their hunger for these tools, it occurred to me that they were revealing what they would want to know to feel more confident in their jobs. One way that we can do something to grow the confidence of women engineers in particular, might be to join forces in a partnership between education and industry that would tie the undergraduate schooling to the business world. One idea along these lines is to offer a credit seminar class for plant or site visits where students would interact with representatives of business or government to gain an appreciation of how the engineering skills are applied real time. Another way might be
to offer co-op programs or senior projects with outside companies. I know I could certainly assign a bright young talent to some very challenging problems. Absent a practical way to make this kind of thing happen, it is clear that the use of case studies would help to demonstrate how the engineering knowledge is applied to practical business problems.

In summary, I think the global corporate world may not be entirely ready for women engineers, but I also know that they are sorely needed. We must be conscious of the risk that we will weed them out of the classroom because they don't fit our stereotype of the typical engineer. Our job as partners in this effort to increase their numbers is to show them that there are exciting ways to contribute as women who happen to be engineers. We must ensure that they feel prepared and ready to succeed. And we must value what they offer; the added qualities they bring first to the classroom and then to the office.