

## EXPERIENCES FROM AN IBM EXITE CAMP AT PURDUE UNIVERSITY

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**Abstract** - Purdue University's Women in Engineering Program hosted an IBM EXITE Camp for junior high school girls during the summer of 2000. The goal of the camp was to allow the girls to see all the exciting options available in engineering. Highlights of the camp included: team projects to reassemble a computer and design and program a robot; self-development talks; tours of engineering laboratories and a Frito Lay production plant; and daily computer laboratories where participants designed a personalized web page and Power Point presentations to be given to their parents describing their experience at camp. The week culminated in an Awards Banquet for the girls and their families. In conclusion, the girls all said they had a good time during the week. The parents appreciated seeing their daughters so excited. They were also grateful that the program presented career options that otherwise they might not have known to encourage their girls to pursue.

**Index Terms** – Pre-college programs, Summer camps, Team activities

### INTRODUCTION

The Latin phrase, “Cognito Nullo Cupido”, translates to, “You will not love that which you know nothing about.” This is the catch phrase for the Pre-College Program in the Purdue University Women in Engineering Program. The more technical experiences a girl is introduced to, the more likely she is to be comfortable choosing a technical career. This also seems to be particularly important for young women. In a study following high school seniors’ career choices through college, it was found that “when female students in the sample planned to be an engineering major while in high school, and had high positive expectations for the results of obtaining a degree in engineering, their gender no longer affected their chances to become an engineering major”. [1] In fact, the female student was more likely to act on her high school intentions than was her male counterpart. This finding emphasized why it is imperative to give girls an early exposure to engineering before they make career decisions. It is important that these interventions help give girls a vision of engineering as an exciting career with a great breadth of career opportunities.

Purdue University’s Women in Engineering Program hosted an IBM EXITE Camp for junior high school girls during the summer of 2000. The goal of the camp was to

permit the girls an opportunity to better understand what engineers do. Allowing the girls to see all the exciting options available, it was hoped that they would be more likely to harbor the dream of becoming an engineer. This age level was chosen to inspire the professional ambition before they are put on a track in high school that might not allow them to enter freshman engineering.

The budget for the camp was approximately \$12,000 which covered the salaries to plan and execute the camp for Dr. Stwalley and Ms. Willis, lunches, six Lego Mindstorm™ Robotic Kits, application flyer postage, transportation, photos and books given at the award presentation, and the banquet for the campers and their families. IBM covered approximately \$10,500, as well as printing the flyers and the expenses of a visiting engineer for the week of the camp. A fee of \$50 per camper was assessed which covered the balance of the account. It is assumed that this camp would be cheaper to run in future years, because less time would be expended planning the camp and the robotic kits, which were a significant expenditure, could be used again.

This paper will discuss planning efforts for the camp, activities that the girls participated, feedback obtained from the participants and their parents, and suggestions for future camps. This information is geared for other Women in Engineering Programs who are designing a summer camp for junior high school girls.

### RECRUITMENT OF PARTICIPANTS

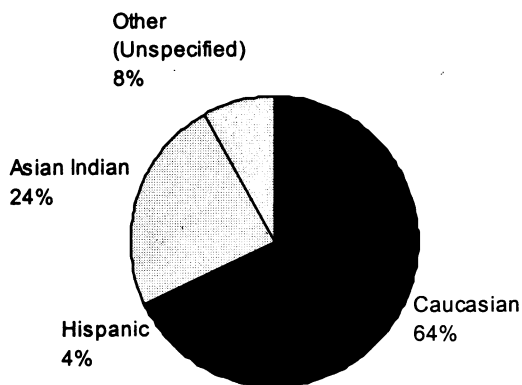
EXITE 2000 was a nonresidential camp, so the recruitment efforts were focused locally and included: brochures sent to 27 local middle schools’ math and science teachers to pass out in class, a mailing through the Sycamore Council Girl Scouts Office to send to 150 girls in local counties, a press release generated by the University News Service, flyers attached to posters at local community centers, and a description created of the camp to be e-mailed to Purdue employees. There were 27 applications received, and of those, 25 girls attended the camp.

Even though recruitment was focused locally, a diverse group of hometowns resulted. There was one girl from the Chicago, Illinois region, two girls from Evansville, Indiana, one girl from Tennessee, one girl who lived in Holland, and the remaining 20 girls from the Lafayette area. The ethnicity of the group as determined by the applications were as follows: 16 Caucasians, one Hispanic, six Other (Asian

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Indian), and two Other (unspecified). The ethnicity data are shown in Figure 1.



**FIGURE 1**  
ETHNICITY DATA OF EXITE 2000 CAMPERS.

### CAMP PERSONNEL

The preliminary planning of the EXITE program at Purdue University was conducted by Dr. Jane Daniels, Director – Women in Engineering Program. She was assisted by Ms. Betsy Willis, a doctoral graduate student in the Agricultural and Biological Engineering Department. They reviewed the results from the 1999 IBM Endicott Technology Camp, enlisted volunteers throughout the engineering departments, and coordinated application mailings to the various local middle and junior high schools.

Dr. Carol Stwalley, P.E. joined the staff of the Women in Engineering Program as Assistant Director on May 1. She was hired to supervise pre-collegiate outreach programs, and her initial project was to finish planning and direct the EXITE camp. Dr. Stwalley's duties included planning the team project, scheduling speakers for the after lunch talks, recruiting IBM employees to be e-mail mentors, and organizing the computer lessons. Ms. Willis continued to assist in pre-camp activities by arranging the lunches and coordinating the various departmental and plant tours.

Dr. Stwalley was present with the girls during the entire camp. Ms. Willis arranged to be in attendance throughout the week, except for Monday afternoon and Tuesday when she had another commitment. Ms. Niki Spencer (B.S.-MSE '99), who works for IBM in Burlington, Vermont was able to be present for the entire week and was a big help in working with the girls. She was able to relate a little more like a big sister, but gave them pertinent information about working in industry as an engineer.

### PROGRAM CONTENT

The program schedule is presented on the following page as Table I. The goal for the schedule was to include some work on a team project, a session about self-development

strategies, and a tour of an engineering department each day. As suggested by IBM, the camp had a computer and robotic focus. In that light, along with the Lego robotic team project, 1-1/2 hours was scheduled to reconstruct a computer that had been disassembled into its components. The computer reassembly was the most enthusiastically received project by the girls during the week. They all (100%) felt that this activity should be incorporated into future camps, and several felt it was their favorite activity during the week. Improvements in conducting this activity are included in the Recommendations and Conclusions section.

### Team building activities

The team project followed the Lego RoboLab™ *Can-Do Team Challenge*. Four soft drink cans were placed inside a circle with an 18 in radius. The girls were to design a robot that could move the cans outside the circle. Two girls on each team were to specialize in building the robot, and two girls were to program the robot using Lego RoboLab™ v1.5. The point system to rate the teams' performance was:

- 10 points per can removed from the circle
- 5 points per can bonus for those remaining upright
- 20 – 3 points Speed (Fastest – 20 to Slowest – 3)
- 15 points Originality
- 10 points Beauty
- 10 points Finish Routine (What the robot does when it finishes the task)

An activity was performed on Monday to introduce the girls to building technique and show them what varying gear ratios do to the performance of the robot. The RoboLab™ programming took place on the computers that the girls had put together the first day. This effectively demonstrated that the computers could be used after they had been reconstructed. Because of the tight schedule, on Tuesday and Wednesday, time was taken from the team project to keep the other activities on schedule. Consequently, most of the robots were manufactured on Thursday or Friday. The most significant problem that arose during the Lego project was the camp leaders were not sufficiently versed in RoboLab™ to help direct the girls when they had programming difficulties. The major problems the girls had included: not following the suggested procedure (program a few steps at a time, building the robot along with the programmers, etc.), totally dismantling the robots when they were not happy with the results, and the builders blaming the programmers if the robots did not work as planned and visa versa. Even with these problems, most of the girls (82%) said that this project should be used in future camps. Suggestions for next year will be summarized later in the Recommendations and Conclusions section of the report.

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**TABLE I**  
EXITE 2000 PROGRAM SCHEDULE.

	<b>Monday, 7/24</b>	<b>Tuesday, 7/25</b>	<b>Wednesday, 7/26</b>	<b>Thursday, 7/27</b>	<b>Friday, 7/28</b>
<b>8:30</b>	Welcome / Orientation	Welcome / Project	Travel to Frankfort	Welcome / Project	Welcome / Project
<b>9:00</b>	Project Intro	Project	Frito Lay Tour	Project	Project:
<b>9:30</b>	Lego - Gears	↓	↓	↓	Final Preparations
<b>10:00</b>	Play around fountain/pictures	Boiler Challenge:	↓	↓	↓
<b>10:30</b>	Computer Construction	Team Building	Return to Campus	Volleyball	↓
<b>11:00</b>	↓	↓	Project	↓	↓
<b>11:30</b>	↓	↓	↓	Lunch	Lunch
<b>12:00</b>	Lunch	Lunch	Lunch	↓	↓
<b>12:30</b>	↓	↓	↓	↓	↓
<b>1:00</b>	I Love Me, I Love Me Not: Feeling Good About Me (Dr. J. Myers-Walls)	"The Right Stuff" of Leaders (Dr. J. Sinclair)	School Secrets Your Teachers Never Taught You (Dr. B. Stwalley)	Making Your Point: Effective Presentation Skills (P. Johnson)	Robot Challenge
<b>1:30</b>				Chemical Engineering Tour	↓
<b>2:00</b>	Quiet Highway Tour	Food Process Engr: Chip Making	BioMed Tour	Chemical Engineering Tour / Materials Engineering Tour	Chemical Engineering Tour / Materials Engineering Tour
<b>2:30</b>			↓	Girls split between locations	Girls split between locations
<b>3:00</b>	Computer Mentoring	Computer Mentoring	Computer Mentoring	Computer Mentoring	Computer Mentoring
<b>3:30</b>	Web page creation	Web page creation	Power Point: Introduction	Power Point: Presentation Preparation	Power Point: Presentation Preparation
<b>4:00</b>	↓	↓			
				<b>4:30</b>	Boilermaker Special Trips
				<b>5:00</b>	Parents meet at Harrison Hall
				<b>5:30</b>	Presentations
				<b>6:00</b>	Dinner
				<b>6:30</b>	↓
				<b>7:00</b>	IBM Representative Talk
				<b>7:30</b>	Recognition

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On Tuesday, the girls participated in a team building activity called the Boiler Challenge organized out of Purdue's Recreational Sports Center. Everyone participated in name learning and team building activities, with some tasks including the entire group and some broken into smaller teams. Everyone had fun with at least one of the activities, and they learned to work together better as a team. Their efforts were certainly more coordinated by the end of the Challenge, than at the beginning. The respondents overwhelmingly (90%) thought that the Boiler Challenge should be used in future camps.

### Self-development talks

Talks were scheduled each day to introduce topics intended to raise the self-confidence of the participants. A self-esteem building session started off the week, which was given by a professor in the Child Development and Family Studies Department. Dr. Myers-Walls began by asking the girls to think about the reactions that they encountered when they told their friends about coming to an engineering camp. A discussion ensued about how to react when friends don't agree or understand your lifestyle choices. She also included activities for the girls to illustrate the difference between being a braggart and having good self-confidence. Overall, the reaction to the session was, "What does this have to do with engineering?" The completion of the various projects during the week might actually make this type of topic unnecessary, since the girls left the camp feeling proud of their accomplishments.

Tuesday's topic focused on traits shared by leaders. Dr. Jennifer Sinclair, a professor in the Chemical Engineering Department, gave this address. The girls were given a list of leadership traits and groups brainstormed who they felt best embodied these traits. The activity included a worksheet that each girl filled out to determine if she were a task- or relationship-oriented leader. The girls were to think of the most difficult person they had worked with on a project, and rate this person using the various personality qualities listed.

A study and test taking skills lecture was presented on Wednesday by Dr. Bob Stwalley, a local consulting engineer, educator, and spouse of the camp director. This fast-paced address covered a lot of ground on how the girls should approach coursework. This class concluded with a game of *Who Wants to be a Millionaire*. Many of the tips were included on a handout, which could be digested later at home. Half of the girls thought that this talk was definitely helpful, and another 30% indicated that they gained something from the topics covered.

The final session in this series covered good presentation skills, given by Ms. Priscilla Johnson, a doctoral graduate student in the Civil Engineering Department. This discussion was intended to help the girls as they planned their presentations to be given to their parents. Ms. Johnson went through the basics of presentation skills and then had several girls convey their feelings on whether they should

keep their parents informed of the music they listened to. This session received the highest rating by the girls for relevance (78%).

These after lunch talks were the least well received of all of the activities that were scheduled. Still, one-third to two-thirds of the girls said they got something out of them, and several parents mentioned at the banquet and in the questionnaires that they felt the materials covered were very pertinent. The fact that they were right after lunch could have contributed to their low enthusiasm rate. For the most part, the older the girl, the less likely they were to say they were helped by the talks. More time needs to be spent considering ways to make these self-development talks more engaging for the girls.

### Engineering tours

The university personnel who performed the engineering tours were a good mix of professors, graduate students, men, and women. The Women in Engineering Program has several programs throughout the year, which involve recruiting professors to discuss their area with potential students. The list of volunteers was used to help plan the tours. The professors were given the option of presenting the material themselves or letting their graduate students give the demonstrations. The presenters welcomed this open agenda when surveyed about how the tours went a couple of weeks after the program.

The campers were all very enthusiastic during the engineering department tours. Many of the tour guides were surprised at the willingness of the girls to try different activities during the tours. Most of the girls volunteered to try everything, whether it was feeling pig intestines in the biomedical tour or testing active hearing protection in the quiet highway tour. On Monday, the Mechanical Engineering Department gave a tour of their Quiet Highway Center. The girls got to see and hear the "quiet room", the "noisy room", various active hearing protectors, and current testing of how noise propagates from the road into a car. A group of soon-to-be sophomore engineering students were performing this test, so the EXITE students were able to get some interesting comments by students that were new to engineering.

On Tuesday, the campers went to the Food Engineering Laboratories and were able try chip making in preparation for the Frito Lay tour the next day. Four stations were arranged to let them understand the processes of steeping the grain, grinding the corn, forming the chips, and frying the final product. Since it is difficult to hear within the Frito Lay plant, this activity allowed the girls to understand better what they would see the next day in the plant.

The majority of the girls (95%) were very impressed with the tour of Frito Lay on Wednesday. The EXITE students, broken into two groups, were each able to tour the potato chip, Tostito™, and Cheeto™ manufacturing lines. A special treat for the day was being able to taste a test market

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chip that had only been in production for an hour. Each girl also got to take home sample bags of Frito Lay products.

Wednesday, on campus, the EXITE group toured the Biomedical Engineering facility. They were able to see many different varieties of pace makers, and how they had been miniaturized through the years. Many of the girls volunteered to be tested with a machine used to determine if a person's nerves were functioning properly. In the labs, they were able to view cells growing and see many uses for Purdue-developed SIS (pig intestines), which promotes cell growth in injured areas. This tour was a particular favorite, and on the post-program questionnaire, nine girls indicated that they would like to be biomedical engineers.

Thursday and Friday, the campers were split into two groups, so that they could better be accommodated by the Chemical Engineering Department and Materials Engineering Department tours. The CHE tour guides showed them a micro-pelletized material used in gasoline production, how various light sources have different spectrums, and several uses for liquid nitrogen. The MSE tour guide introduced the girls to crystallinity, processing, and properties of various materials. The participants then went into a lab where they saw extrusion and injection molding of plastics. Each girl took home a key chain from this tour as an example of injection molding.

### Computer lab

The final activity each day was a computer laboratory. The girls were asked to complete a Computer Use Survey prior to the camp and return it with their acceptance package. The majority of campers were very comfortable with using word processor programs and e-mail. The girls started each computer session by e-mailing various Purdue alumni that are currently working for IBM. The Purdue staff opened a free Yahoo e-mail account for each camper. These accounts all started with 'exite' and ended with the girl's first and last initials (example – exiteab@yahoo.com). This was chosen so that the Purdue Women in Engineering Program could continue to reach these girls easily by e-mail, if the parents chose to keep this account open. It took a couple of days for all of the mentors and mentees to make first contact. It appealed to the girls that there was an adult engineer interested in what they were doing during camp.

In addition to the e-mail mentoring, there was an hour each day spent on learning new computer skills. The girls were engaged for two days in learning HTML, and each girl created a personalized web page from a template given them. This activity was designed and taught by Ms. Megan Evans, a computer science undergraduate at Purdue. The participants spent three days learning Power Point and preparing a presentation for their parents at the awards banquet. Dr. Karen Haberstroh, a new professor in the BioMedical Engineering Department, taught the classes. Each design team for the Lego project was allowed to choose a topic covering some aspect of the camp for their

presentation. The sophistication of the presentations was extraordinary for the amount of time available.

### Awards banquet

The awards banquet was held in the dining room of one of the Purdue residence halls. The girls were taken to the banquet in the Boilermaker Special, a train that is the school mascot. Ninety-three parents, camp participants, and camp personnel were in attendance for the event. The dinner consisted of grilled chicken, rice, broccoli, salad, rolls, and cheesecake. An EXITE program, certificate, and camp photo commemorating the evening were presented. Each girl also received the book, *Cool Careers for Girls in Engineering*, and a poster, *Women of NASA*. The book is designed for 11-14 year olds, and it is a compilation of interviews with women in various disciplines of engineering. Ms. Allison Pollster (BS-IE'99), an IBM employee in Research Triangle, N.C., gave a fitting inspirational talk for the banquet.

## CONCLUSIONS AND RECOMMENDATIONS

The EXITE camp was a big success for the Purdue University Women in Engineering Program (WIEP). This was the first WIEP activity held on campus for junior high school age girls. Many parents, particularly mothers, were very vocal at the banquet expressing their gratitude for showing their daughters new career opportunities.

Several methods were used to obtain feedback about the camp. All the girls kept a daily journal to help them articulate their experiences and to document what they liked about the camp. On Friday, the journals were collected and copied, and then returned to the girls. Additionally, an evaluation was sent to the parents after the completion of the camp.

From the pre-program questionnaire it was learned that 15 of the 25 participants had relatives that were engineers or scientists. The relatives included: fathers (9), mothers (3), sisters (2), brothers (2), uncles (2), grandfathers (2), an aunt, a cousin, and a brother-in-law. Even the girls with fathers that were engineers had little knowledge at the beginning of the camp of what engineers really do. The three most used replies for what engineering is before the camp were: something to do with science, invention, and a well paying career. The replies by the end of the camp continued to list design and invention, but also included how diverse and interesting engineering was. There were seven instances of girls wanting to be engineers at the beginning of the camp, with most of these replies (4) listing an engineer, without defining a major. By week's end, there were 25 instances of listing engineer as a career choice, but most significant is the fact that they were able to convey what kind of engineer they wanted to be. At this age, most of the girls found little difference between why men and women become engineers.

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By the end of the week, these girls did not know of reasons why they shouldn't become engineers, if they wanted to.

There were twelve Parents Questionnaires returned, and all of the parents replied that their daughters had fun, learned new things, and talked about the camp to friends who didn't come. The parents all said that they would recommend the camp to other parents. Some excerpts from the parents are:

- I was very pleased with the EXITE program. My daughter's eyes were really opened to the wide range of things engineers do. She really enjoyed all the hands-on projects.
- It sounded wonderful! I would have liked to have done some of the activities myself!
- This was the high point of my daughter's summer. Everything was excellent
- The camp was awesome! . . . I can't express thoroughly the appreciation I feel for your program and its efforts to plant ambitious seeds in girls. . . The program also educated me so I can encourage my children in areas I hadn't really thought of before.

### Program Content

From a camp leader's viewpoint, improvements in scheduling might prevent the feeling of constantly running behind. Adding some flexible time activities at various points in the daily schedule would help. Increasing the schedule of the camp so that it begins as 8:15 am and ends at 5:00 p.m. would go a long way in helping to alleviate scheduling problems. This would allow the same level of projects, tours, and talks, yet provide built-in travel times between remote campus activities.

The major changes in this proposed schedule are: increasing the amount of time spent on the project, exchanging the times of the tours and the project activities, and adding some individual activities. Increasing the time spent on the design process is recommended because few teams felt prepared for the Lego Challenge. The tours would be changed to the morning, since most of the summer students that wanted to help with the camp were only free during the afternoons. This scheduling conflict would continue to be a problem in future years, since it is function of how Purdue schedules summer course hours. Changing the design activity times would allow a larger pool of prospective student helpers.

More time would be included in the proposed schedule for the computer reassembly activity. The 1-1/2 hour used this year did not give enough time to effectively cover each component of the computer. Since this activity was so well received by the girls, it is recommended that the reassembly be covered in a more thorough manner. More time can then be spent teaching them about why different cables are used for the various components, what are the different kinds of RAM available, and how is clock speed and memory related to each other, among other things. It might also be

beneficial to let the girls disassemble the computers, so that they know how it is supposed to look before they begin. This could also be accomplished if all of the computers were the same model, and there was one that was never disassembled. Also, no more than three girls should work together on a computer.

It is recommended that in future years individual projects be included to allow the girls more items to take home that they made at the camp. Proposed projects include the production of alarms that the girls could put on their bedroom doors and perfume made by the distillation process. The Women in Engineering Program would like for the girls to have several reminders from the camp to keep them thinking about engineering.

A virtual scavenger hunt is also recommended for inclusion in future camps. This activity had been scheduled for the computer session on Friday; however, the girls requested more time to complete their Power Point presentations. The scavenger hunt was to help the girls hone their web surfing skills and show them a number of enlightening web sites that would teach them more about engineering. The search was designed to have a varying degree of difficulty in finding the answers, and some of the harder sites were dispersed throughout the list. This was a tie-in to the School Secrets talk in how to take a test. It was emphasized that a test does not need to be completed in numerical order, and easy questions should be done first. Prizes had been envisioned to be given at the awards banquet for the fastest and most complete scavenger list.

Overall, the Purdue Women in Engineering Program was very happy to host an IBM EXITE Camp and feels very positive about the outcome. The program is featured on our website at <http://fairway.ecn.purdue.edu/~wiep>. This camp allowed us to promote engineering and Purdue to a much younger audience than previously sponsored programs. We are extremely pleased with IBM for allowing us to offer this program at such a reasonable enrollment fee. This initial offering gave us several long-term assets including a general plan of what interests and motivates girls this age and the Lego sets purchased for the Robot Challenge. We will be able to effectively utilize these resources in future efforts.

### REFERENCES

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