IBM EX.I.T.E. Camp: Growing the Pipeline of Women Who Enter Science, Technology, and Engineering Fields

Janel Barfield, Audrey Romonosky
IBM Austin EX.I.T.E. Camp

Abstract - As women working in technical fields, we have a unique opportunity to inspire the interest and success of young women in science and technology. As powerful and influential women, we partner with professionals, educators and parents in our community to have an impact on growing the pipeline of young women who become scientists and engineers. The IBM EX.I.T.E. (EXploring Interests in Technology and Engineering) camp program held in Austin, Texas is one of 48 camps worldwide, and is a shining example of this kind of partnership. Held in Austin for the past six years, this program has directly touched over 150 girls in the Austin and surrounding communities by providing a week-long engineering and technology camp and a year-long mentoring program.

During the week of Austin EX.I.T.E. camp held each summer, 25 to 30 girls from local schools are exposed to hands-on projects from diverse fields including engineering, forensics, robotics, and more. Working on small teams with a dedicated counselor, they complete challenging and fun, individual and team, projects. Professionals from the community volunteer to lead projects and speak about technology and science, as well as self-confidence, self-esteem and presentation skills. The goal of the camp is to provide the girls with a renewed excitement for science and technology, and to grant acknowledgement of their power and importance in their communities.

After EX.I.T.E. camp, the mentoring program ensures that the girls continue to be supported by professional women in their community. Face-to-face activities compliment an email exchange to provide a strong stand for the participants' success in any endeavor. We incorporate Central Texas eWeek with visits during the school year, and participate in IBM grant programs to provide technology for participating schools. In these ways, we expand our influence to the schools and communities. In addition to the participation of professionals and corporations, each year we have the support of principals, teachers, and parents, building bridges in the community that will stand long after the girls leave the camp.

In this paper and presentation, we discuss the operation of IBM EX.I.T.E. camp in Austin, Texas, and the benefits of the program.

Background

IBM is recognized for initiating programs that value diversity in the workplace, including those that advance women in technology (Bogue, 2000; Hoeberechts, 2005; Muller, 2005; Shellenbarger, 2006). EXploring Interests in Technology and Engineering (EX.I.T.E.) camp is one program included in IBM's Women in Technology initiative, and it serves a core objective of that initiative to support and encourage girls to pursue college and science, technology,

engineering and math (STEM) careers. For the middle school girls who participate, it provides fun and diverse hands-on activities, positive female role models, and one-on-one attention during camp, followed by a year-long mentoring program. The participants see how science and technology are used every day in real life by showing them people with jobs they are passionate about, using these skills. In addition to fostering interests in STEM careers, IBM EX.I.T.E. camp encourages analytical thinking, leadership and team building, provides new skills in programming, electronics, web design and other technology, and fosters self-esteem.

Overview

In 2000, Austin hosted one of only two IBM EX.I.T.E. camps. The Austin camp involved one school and 25 participants. In 2005 there were 48 IBM EX.I.T.E. camps worldwide including more than 1400 participants from over 250 schools. For the past several years, 20-35 7th and 8th grade girls from at least four local school districts have participated in the Austin camp.

The Austin camp lasts one week in the summer, and incorporates hands-on STEM activities including a large team project, guest speakers, lab tours, presentation skill development, self-esteem development, and problem solving activities. All camp activities are led and executed by volunteers who are professionals in the community, most of them female IBM employees. Girls are placed in groups with dedicated camp counselors that work with them all week.
The girls are inspired by the women they meet and work with, and they really get a sense that they can be just as successful.

Interaction extends into the following school year via a mentoring program. The girls communicate with their mentors primarily through email using a secure tool, and face-to-face activities are planned throughout the year. Interaction throughout the school year reinforces what the girls gain during camp – both their interest in college and STEM careers, and confidence in their ability to succeed.

How it Works

Getting Started
One essential requirement for hosting an IBM EX.I.T.E. camp is support and commitment of the company's leadership. Camp coordinators depend on their support for funding and their encouragement for employee participation.

Selecting Schools
One of the first considerations after gaining the support of leadership is selecting the schools that will participate. It is important to engage school administrators who are accountable and passionate about the program and its objectives. Camp coordinators select participating schools and school districts with the help of our Corporate Community Relations team. The schools select the girls who participate, typically by teacher and/or parent nomination. These girls are not necessarily the straight 'A' students, nor do they always express an interest in college or STEM careers, but they are identified by their teachers and parents as having potential to benefit from the program.

Selecting a Location
The Austin IBM EX.I.T.E. camp is held at the IBM site in Austin, TX as is the case in other IBM EX.I.T.E. camps worldwide. Below are some suggestions for selecting a location for a camp with about 25-30 participants.

The facility should include:
- one large room that seats about 50, and used for arrival, starting sessions, design challenges and guest speakers
- a room with computers and Internet access
- one large room with seating for 100, used for the orientation kickoff and end of camp celebrations
- 3–6 smaller rooms for each team to work on its project
- a cafeteria or vending service (unless the students are bringing their own lunches)

It helps to have access to outdoor areas where the girls can take breaks, and it is important to have easy access to restrooms.

Volunteers
Volunteer participation is crucial to the success of the program. From the beginning, volunteers are needed to help with planning all aspects of camp, including selecting schools, forming relationships with them, planning activities, speakers, projects, tours, coordinating the mentor program, and much more. A volunteer coordinator can be responsible for recruiting and assigning volunteers. Volunteer recruitment should start early, four to six months before camp. A list of suggested volunteer roles for a week-long camp hosting 25-30 participants is included in Appendix A.

Many volunteers are solicited via mailing lists for diversity network groups established within the company. The volunteer coordinator(s) attend new hire and intern orientations to request help, and also ask for the support of managers. Volunteers outside of IBM are also sought, including local professionals, past camp participants, university students, and retired employees.

In 2005, more than 100 IBM employees volunteered to help with the Austin EX.I.T.E. camp, most of them women. These women had diverse backgrounds and careers, but shared a passion for technology. The girls in camp were really touched and inspired by these women who spoke to them, taught them, or helped them work together on a team to complete the camp project.

It is important to note that while more than 100 volunteers were used for the 2005 Austin IBM EX.I.T.E. camp, this number is not necessary. Five schools were served in five different school districts in 2005 in Austin. A successful program can reach a smaller group of girls with a fraction of the volunteer roles described in Appendix A. In addition, because IBM is a large company from which to draw volunteers from, many of the volunteers only contributed one to two hours of their time. It is possible to hold a successful camp with much fewer volunteers.

Activities and Projects
At the heart of the camp itself are the hands-on activities. A lot of time and energy goes into careful planning of activities, including a large team project, various STEM projects that will

challenge but not frustrate the participants, and activities aimed at increasing confidence and improving presentation skills. A description of some of these activities is included in Appendix B.

One main feature of the camp is the week-long or major team project. Students from different schools are placed on the same team to encourage networking. The students must work together as a team to complete this project, as it is too complicated for one person to complete it successfully on their own in the amount of time provided. The project reinforces the principles that have been taught to the students throughout the week, and reinforces the fact that engineers work in teams to develop solutions. Participants balance their skills and talents to successfully complete their projects on time and within a budget. Some week-long projects done in Austin include designing a robot using Lego's Mindstorms® to traverse an obstacle course, building a computer (which was then donated to the school), and dropping an egg from the top of the building without breaking it. The girls love the competition and often surprise the volunteers with their creativity and ability to solve the problem. Parents, siblings, relatives, teachers and principals are all invited to attend the final presentation where the students proudly present their final projects along with other accomplishments from the camp.

Ementoring Program and e Week
An important follow-up to the week of camp is the year-long e-mentoring program. Before camp the students are each assigned an IBM mentor. During camp the mentor has an extended lunch with the student to establish a relationship that will last throughout the school year. The mentor often also attends some camp activities and the closing ceremony. When school starts in August, each mentor and protégée are given email ids through MentorPlace, an IBM web application used to provide a monitored environment. The pair exchange emails weekly throughout the year, allowing the mentor to serve as a role model.

One mentor from each school takes on the additional responsibility of being the school liaison. They coordinate activities with the school throughout the year, ensure that regular emails are being exchanged and monitored for appropriateness. The school also provides a liaison responsible for giving the girls both the opportunity and the encouragement to email weekly, as well as act as the point of contact for the IBM liaison.

In addition to weekly emails, there are five main face-to-face activities held throughout the school year. The first is at the beginning of the school year and includes training the girls to use the MentorPlace tool. The second activity occurs a couple of months later and encourages everyone to get to know each other better with lunch and fun games. The third event coincides with winter holidays, when the mentors and protégées volunteer together to do a service project within the community. The fourth event is eWeek. This is an opportunity for the mentors to spend time in the protégées' classrooms. Mentors have the opportunity to reach beyond a single student to affect a much greater audience. Typically, the volunteer liaison for the school works with a math or science teacher to coordinate a visit for the entire grade level. The visit educates the students on what engineers do and what it takes to become one. It also encourages the students to decide on a high school curriculum which will prepare them to study math, science or engineering, in college (Flatow, 2006).

During the eWeek visit, all of the mentors for that school, along with additional energetic and enthusiastic volunteers, spend time in the girl's classrooms. The highlight of the visit is the experiment or design challenge. With hands on experience, this project teaches the students a facet of engineering and often shows them that engineers typically work in teams to solve problems. Each student is given a brochure to share with their family and a small prize. Information on some of the experiments/projects used in the classroom is provided in Appendix B.

The final face to face activity is an end of the year celebration. Typically a bowling party is planned, with pizza for lunch, and prizes given out for high score and low score. By the end of the program, the mentors have shared their passion for technology with the students, guided them on high school course selections, opened their eyes to career opportunities and shown them that women can have successful careers in male dominant fields.

After the school year is over, there is still an additional opportunity for the mentor volunteers to make an impact on the school with an IBM community grant. This can be either a monetary grant for a pre-approved project or computer equipment, which IBM awards to the school after volunteers have logged their volunteer hours through IBM's On Demand Community website. Note that many companies offer this kind of resource (Great Source Education Group, 2006).

Why it Works

There are five essential elements that have been described in this paper that makes IBM EX.I.T.E. camp a successful program. If any of these elements are missing, it would be difficult to make the program work. These are:

1. supportive leadership
2. open communication with accountable school administrators who have a passion for the program
3. an enthusiastic, diverse, and extensive volunteer base
4. scheduling that includes a wide variety of age-appropriate, hands-on activities
5. one-on-one attention, both during camp and in a follow-up mentoring program.

As mentioned, at IBM the program clearly has the support and backing of corporate leadership. Without funding, it isn't possible to buy the needed supplies, and without management support for employee participation, it isn't possible to get the needed volunteer base.

When schools are selected, the commitment and passion held by the school administration and liaison are strongly considered. There is a lot of interaction with the school and students throughout the year, so a commitment on both sides and open communication are crucial.

Volunteers are the backbone of the program. It is important that enthusiastic volunteers work directly with the girls because their enthusiasm is contagious. It is also important that the volunteers have diverse careers, backgrounds, and personalities, so there is more opportunity to touch all of the participants.

Camp coordinators spend a lot of time planning the activities and content of camp. Many different kinds of hands-on activities are selected. The girls will be inspired and interested in different things, so it is important to expose them to a wide variety of activities that engage them. A generic camp schedule is included in Appendix C and a description of some activities and projects used during Austin EX.I.T.E. camp is included in Appendix B.

It is also important to back up the participants' interests in new career choices with confidence in their ability to succeed. This is accomplished by providing a lot of one-on-one time with successful, professional women who encourage them during camp, and afterwards during the mentoring program.

Results

IBM EX.I.T.E. camp has a direct impact on the girls who participate. They communicate new interests in pursuing college and STEM careers, and visibly gain self confidence during the program. While we don't have documented results from every year of Austin EX.I.T.E camp, we do have encouraging results from last year. For example, of the students attending camp in 2005, 91% of them said that they were considering a STEM career after camp, while only 58% considered such a career according to the pre-camp survey. The pre and post-camp surveys used in 2005, along with the results, are given in Appendix D. Additionally, we strive to provide EX.I.T.E. camp to a diverse student population in the Austin area. A summary of the camp attendee ethnicity is included in Appendix E.

The primary objective of IBM EX.I.T.E. camp is to grow the pipeline of young women entering college and STEM careers. The students are surveyed to find out the inhibitors that stop girls from pursuing STEM careers, as well as to determine the camp's effectiveness in eliminating those inhibitors. We are not surprised to hear things like, "Some people think it is a boy thing. They don't want to do it because they are embarrassed." This was quoted by a camper in 2003. At the end of camp, when one camper was asked why she had changed her mind about her career interests, she replied, "Now I want to build stuff. It is really fun to do this." Many such positive remarks have been collected from campers and indicate we're making a difference. Camp volunteers are often inspired and encouraged by the participants' enthusiasm, as when one student in the 2004 camp shared in the post camp survey, "This camp ROCKS. I have an idea now of what I want to do when I grow up."

EX.I.T.E. camp also has a direct impact on the schools attended by the participants. In Austin in 2005, five schools in five school districts participated, while only one school participated for the first three years of camp. The program has successfully grown to serve more schools, and is able to contribute more to the schools that participate each year.

For example, in the past several years, Central Texas eWeek visits to 7th and 8th graders at all participating schools have been incorporated into the program, taking advantage of the opportunity to reach more students. Additionally, tracking volunteer hours at IBM has resulted in money and equipment grants that are issued by IBM to the participating schools and that are used to update technology.

Finally, the volunteer base for Austin EX.I.T.E. camp has grown significantly over the years. We had 180 volunteers in 2005, 80% more than the previous year, and 530% more than seen in 2000. In order to ensure the success of the program, we must be able to retain and grow our volunteer base.

Conclusion

Austin IBM EX.I.T.E. camp has clearly supported the objective to grow the pipeline of women entering college and STEM careers. By providing a week of interesting and diverse speakers and activities from STEM fields for the participating 7th and 8th grade female students, Austin EX.I.T.E. camp encourages new interest in college and STEM careers. By providing one-on-one attention during camp and the follow up mentoring program, it inspires self confidence and creates a network that will support the participants no matter what their choices in life.

Each year the program is changed in response to feedback from previous years and lessons learned, and coordinators work to make the camp more effective. One thing coordinators would like to include soon is a study over time that tracks the participants through high school and beyond. This is accomplished in part with those participants that return as cadet counselors, but there is no formal process in place to track all participants. Among other things, coordinators plan to incorporate more leadership participation opportunities for prior participants, and allow them to contribute more to the program.

Austin IBM EX.I.T.E. camp is successful for five main reasons. It has the support of IBM's executive leadership, its camp coordinators and volunteers maintain open communication with accountable school administrators for all participating schools, it has a large and diverse volunteer base, it incorporates a lot of fun and interesting hands-on activities, and it incorporates a lot of one-on-one time with professional women with successful STEM careers. This paper has described how and why Austin IBM EX.I.T.E. camp works, as well as the results seen so far. Additionally, some detailed practical information was shared in hopes that it will assist others in creating engineering camps of their own.

References

Bogue, Sheer (2000). *WEPAN awards recognize outstanding contributions to the advancement of women in engineering*. Retrieved May 3, 2006 from http://www.wepan.org/displaycommon.cfm?an=1&subarticlenbr=53.

Flatow (2006). Report: U.S. slipping in science and technology. *NPR Talk of the Nation*. Retrieved May 3, 2006 from http://www.npr.org/templates/story/story.php?storyId=5231579.

Great Source Education Group (2006). *Private funding – technology*. Retrieved May 3, 2006 from http://www.greatsource.com/grants/tech.html.

Hoeberechts (2005). Helping girls become computer scientists. *Western News*. Retrieved May 3, 2006 from http://communications.uwo.ca/western_news/opinion.html?listing_id=20059.

Muller (2005). *IBM provides $150,000, three-year grant to MentorNet to advance women in engineering and science*. Retrieved May 3, 2006 from http://www.mentornet.net/Documents/About/Media/PressReleases/pr_feb2005.aspx

Shellenbarger (2006). In search of skilled workers, employers go to summer camp . *The Wall Street Journal Online*.
   Retrieved May 3, 2006 from http://www.careerjournal.com/columnists/workfamily/20060224-workfamily.html .

Author Contact Information
Janel Barfield, jgbarfie@us.ibm.com
Audrey Romo nosky, romonosk@us.ibm.com

Appendix A
Volunteer roles for IBM EX.I.T.E. camp

Volunteer Role	No.	Time Estimate*	Responsibilities
Camp Lead	1	120 hours	Select and direct other team members. Collaborate with other program leaders. Collect and report results. Attend full week of camp. Meet with school principals.
Camp Counselors	5-10	40+ hours	Be with the girls the entire week of camp, typically half days. We assign two counselors for each group of girls. Groups of 4-6 girls are ideal.
School Liaison	1-4	15-30 hours	One liaison for each participating school. Introduce camp to the selected schools. Act as interface between the organization, school and parents during camp and ementoring. Ensure student applications and releases are returned. Ensure an adequate number of girls are selected for camp. Ensure participation in ementor program.
Project Lead	2	20-30 hours	Adapt and create team projects for allocated time. Ensure documentation is appropriate. Train project volunteers. Ensure necessary supplies and equipment are identified and available.
Project volunteers	8	10–15 hours	Learn the big camp project and how to best help the campers learn the concepts. Provide assistance to project leads.
Activity Lead	4-8	10-15 hours	One lead for each activity. Adapt activity for allocated time. Ensure instructions are appropriate. Train activity volunteers. Ensure necessary supplies and equipment are identified and available.
Activity Volunteers (2-3 for each activity)	8-16	2-4 hours	Learn the activity and how to best help the campers learn the concepts. Provide assistance to activity leads.
Logistics Team Lead	1	10	Plan and arrange for camp site facilities, transportation, field trips, meals, etc.
Logistics Volunteers	3	10	Assist at pick-up, drop-off points, field trips, meal arrangements, giveaways, etc.
Games Lead	1	10-15 hours	Find games and teach the campers to play them.
Games Volunteers	3	5	Learn games and teach campers to play them.

Camp Journal Lead	1	20-40 hours	Develop a journal to document the week's activities.
Journal Volunteers	3	20-40 hours	Work on the journal.
Speakers	5	5 hours	Speakers can open each day or speak in a panel; prepare 5-minute talks. Demos and audience participation encouraged.
Volunteer Coordinator	1	20-40 hours before and during camp	Recruit volunteers and place them into various jobs depending on their interest and expertise.
Mentor Program Coordinator	1	50 hours throughout school year	Ensure that a Mentor Program is in place. Recruit volunteers to e-mentor campers. Work with teacher to select projects/activities for protégées during the school year. Train mentors, students, and teacher to use the tools.
Mentor Program volunteers	20-30	½ hour per week throughout school year	Meet protégée during camp. Provide one-on-one e-mentoring to campers throughout school year (30 mins. per week). Participate in face-to-face events.
Media Coordinator	1	5 hours	Work with communications to publicize the camp internally and externally to the news media.
Kickoff and Closing Ceremonies Coordinator(s)	1 or 2	5 hours	Create an agenda for each ceremony to give the EX.I.T.E. camp a good start and a great finish.

*Estimated time commitments are based on the experience of camp coordinators in Austin.

Appendix B
Example activities used during IBM EX.I.T.E. camp and eWeek

Balloon Race/Payload - The students are given the assignment to use balloons and payload baskets to transport marbles across a nylon thread. www.centexeweek.org/html/balloon_race_payload.html
Marble Roller Coaster - The students are given supplies and to design a roller coaster for marbles which fits in a small space attached to a wall. www.centexeweek.org/html/marble_roller_coaster.html
Build a Bridge - The students are split up into groups and are given a specification, budget and schedule. They are able to purchase supplies to build a bridge which spans 12" and supports a 16 ounce bottle of water. www.centexeweek.org/html/build_a_bridge_3.html
Paper Structure - The students are taught some basic concepts used in structures. They are split into groups of 4-6 and given the assignment to build a structure using paper and water bottle rings, which support the weight of textbooks. www.centexeweek.org/html/paper_structure.html
Transistors - Bottle caps, tennis balls and marbles are used to teach the students how transistors work and how they are utilized. www.centexeweek.org/html/transistor_experiment.html
Software Protocol - The students are split up into groups of 5, containing an "arbiter" and 4 "nodes". They are given some basic rules to teach them the concept of a basic network protocol. www.centexeweek.org/html/software_protocol.html
Accessibility Awareness Program – a look at assistive technologies and their importance, ie. web pages which can "speak" to aid the blind.
PowerPoint – a tutorial on the use of PowerPoint, which the students use to prepare their final presentation.
Problem solving and the use of the scientific method – presentation and a hands-on problem to solve.
Meteorology – A female meteorologist speaks to the students on the use of science in weather prediction.
Design a shoe – The students design and build a shoe with an extraordinary feature. Brainstorming techniques are taught and used in this project.
Liquid Nitrogen - Dr. Kool (an IBM engineer) demonstrates the principles of liquid nitrogen and how extreme temperatures react with generic household items.
Graphics/Animation Design - A graphics designer from industry demonstrates the capability of their software tools.
Future Dorm Room – The students take a look at innovative ways that technology will be used to enhance their lives in the future.
Burglar Alarm – The students are taught basic electronics and boolean concepts to breadboard a burglar alarm that beeps when compromised.
Patents – A female IBM Master Inventor speaks to the students on the value of ideas.
Netlogo – programming concepts are introduced to the students with this hands-on application. http://ccl.northwestern.edu/netlogo/
Webpage design – The students create a webpage as a method to introduce themselves and to share their interests with their fellow campers.
Presentation skills – the students are taught the basics on creating effective presentations.
Karel the robot – teach the students simple programming concepts. They program Karel to move in a certain pattern around the computer screen. http://www.mtsu.edu/~untch/karel/
Self defense – students participate in a self defense workshop that includes safety tips and basic defense moves.

Appendix C

	Monday	Tuesday	Wednesday	Thursday	Friday
	Sample EX.I.T.E. Schedule				
8:30	Welcome – Guest Speaker 1	Welcome – Guest Speaker 2	Welcome – Guest Speaker 3	Welcome – Guest Speaker 4	Welcome – Guest Speaker 5
9:00	Meet Team / Ice Breakers / Team Rules	Presentation Or Activity	Presentation Or Activity	Presentation Or Activity	Presentation Or Activity
9:45	Break*	Break	Break	Break	Break
10:00	continued	Major Project Brainstorm	Major Project Prep Time	Major Project Prep Time	Major Project Prep Time
11:00	Presentation Or Activity	Presentation Or Activity	continued	continued	continued
12:00	Team Pictures/Lunch	Lunch with mentors	Lunch	Lunch	Lunch
1:00	Major Project Introduction	Tour	PowerPoint	Presentation Or Activity	Major Project Prep Time
2:00	Presentation Or Activity	continued	continued	continued	continued
2:45	Break	Break	Break	Break	Break
3:00	Presentation Skills	Major Project Prep Time	Presentation Or Activity	Presentation Or Activity	Major Project Prep Time
4:00	Thank You Notes	Thank You Notes	Thank You Notes	Thank You Notes	Thank You Notes
	Pick Up	Pick Up	Pick Up	Pick Up	
5:00					Evaluations / Post Survey
					Break
6:00					
7:00					Presentations

* Both bathroom and snack breaks are scheduled.

Appendix D

Pre-Camp and Post-Camp Surveys for Austin EX.I.T.E Camp 2005

Pre Camp Survey

Question	Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7
1) Women and men have an equal chance of becoming a scientist, engineer, or a technologist.	0	0	0	5	0	2	19
2) At my school there are as many girls interested in science, engineering, and technology as boys.	4	2	3	4	9	1	3
3) In general, most people that I know think that boys are better at science, engineering, and technology.	11	4	2	3	2	3	1
4) I am considering a career in science, engineering, and technology.	6	3	2	4	3	6	2

Post Camp Survey

Question	Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7
1) The EXITE camp was what I expected it to be.	0	0	0	2	4	0	16
2) I am considering a career in science, engineering, and/or technology.	0	2	0	4	6	6	4
3) I am more likely to consider a career in science, engineering, and technology after participating in the EXITE camp.	0	0	0	2	5	8	7

Appendix E

Year	Hispanic	Asian	African American	White	Native American	Total
2000	8	3	8	6	0	**25**
2001	11	2	5	9	1	**28**
2002	9	1	3	10	0	**23**
2003	21	0	4	10	0	**35**
2004	13	1	9	4	0	**27**
2005	9	0	5	8	0	**22**