The GirlTECH Workshop:
Guidelines for a successful technology training program for K-12 teachers

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Abstract

A third-party evaluation of the CRPC's GirlTECH workshop established the effectiveness of the workshop in helping K-12 teachers to incorporate the educational resources of the World Wide Web into their curriculums. During the two-week workshop, participants significantly increased their Internet searching and programming skills, their awareness of the field of computational science, and their understanding of how issues of gender and ethnicity effect computational science. In the school year that followed the workshop, substantial increases were seen in the number of participants using computers in various educational contexts, their use of computers as an instructional tool, and the diversity and sophistication of their general computer use. Teachers who participated in the workshop became members of an ongoing, supportive community of fellow teachers and computational scientists at Rice University who were dedicated to incorporating computer- and Internet-based educational materials into the K-12 curriculum, and about a quarter of the participants contacted went on to become technology resources or advocates in their schools. Quantitative and qualitative analyses of survey and interview data were used to identify the essential elements that were critical in bringing about the success of the workshop. This report provides guidelines to administrators at other institutions who are interested in creating similarly successful technology training programs for the K-12 teachers in their area.

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1. Introduction

As we move into the 21st century, many visionaries see computers and the Internet playing an increasingly central role in the instruction of students at every level (National Information Infrastructure Advisory Council, 1996). But in order for that vision to become a reality, the current generation of teachers, particularly those at the K-12 level, will need to become much more adept at using computer technology themselves and much better informed about how to incorporate Web-based materials into their curriculum (Mendels, 1997). In Means and Olson's (1995) study of restructuring schools with technology, teachers cited assistance with integrating technology into their curriculum as one of the most valued and most needed supports in the process of technology implementation. Other studies have found that the effective use of computer technology in the K-12 classroom hinges upon the provision of teacher training and ongoing technical support (Means, et al., 1993; Office of Technology Assessment, 1995; Padilla & Young, 1996; Ruskus & Luczac, 1995). Since teachers generally have little time to learn new computer applications on their own during the school year, the best time to train teachers is often during the summer, when they can devote several weeks at a time to intensive training in how to develop and use computer applications for instruction. Studies of multi-week summer programs for K-12 teacher professional development in technology—including the Apple Classrooms of Tomorrow (ACOT) Teacher Development Centers, and the Resources for Science Education (RSE) program—have found that these programs produced substantial gains in teachers' technological knowledge and skill and encouraged many of participants to not only use computers in instruction but to provide computer training and technical assistance for other teachers at their schools (David, 1996; Padilla & Young, 1996; Sandholtz & Ringstaff, 1996). The teachers who participate in such programs are often the first in their schools to actively employ computers in instruction, and as such become both a technology resource and a fulcrum for pedagogical change.

Of course, teacher professional development programs can vary considerably in their effectiveness and in the ultimate impact that the training has on the instructional methods of the teachers who participate in them. According to a national evaluation of federally funded teacher enhancement programs (Ruskus & Luczac, 1995), the key elements in an effective program appear to be: (1) emphasis on "hands-on" collaborative activities; (2) immersion in the subject matter; (3) taking a systems approach that makes explicit links between the curriculum, instructional activities, and the district/school context; (4) providing follow-up technical support; and (5) providing ongoing professional development for participants. In other evaluations, these same elements were found to be essential to the success of both the Apple Classrooms of Tomorrow (ACOT) Teacher Development Centers (David, 1996), and the NSF's Resources for Science Education program (Padilla & Young, 1996). Researchers at the National Center for Improving Science Education have further suggested that enhancement programs will be more likely to succeed if they provide a forum for teachers to share what they are doing with colleagues and receive feedback and guidance in return (Raizen et al., 1995). However, while the elements listed above increase the likelihood that a teacher enhancement program will be effective, they are not sufficient to guarantee its effectiveness.

One summer program that has all of these elements is the GirlTECH workshop sponsored by the Center for Research on Parallel Computing (CRPC) at Rice University and the Education, Outreach, and Training (EOT) branch of the National Partnership for Advanced Computational

Infrastructure (NPACI). The stated goal of this workshop is to "seed the nation with more technically-capable K-12 science, mathematics, and technology teachers in order to prepare them to teach and counsel their students with greater efficacy." Over a two-week period during the summer, the 19 K-12 teachers who have been selected to participate in the workshop:

- receive intensive computer technology training from master teachers, especially in the use of the Internet;
- learn to utilize online resources as a research, teaching, and collaboration tool;
- create their own Web page to link to the GirlTECH Webpage at CRPC;
- design and publish Web-based math and science lessons;
- gain an awareness of the latest research in the computational sciences;
- hear business and industry leaders' expectations for students of the 21st century;
- discuss diversity issues and teacher practices that impact the computational sciences.

Enrollment in the workshop is competitive, with preference given to K-12 teachers who teach math, science, or technology; who have a commitment from their schools to provide Internet access for the year following the program; who teach students from a variety of backgrounds, including under-represented minorities; and who have some degree of computer experience already, although this is not required. Participants in the workshop are expected to:

- become members of an ongoing teachers' technology support group that communicates via a list serve and electronic mail throughout the year;
- establish a student technology project at their school to ensure a transfer of knowledge from teacher to students;
- make a one-year commitment to advanced training and to an integration of technology into their teaching practices;
- consider enrolling in one of several brief follow-up workshops offered at Rice during the course of the school year which focus on topics of the participants' choosing.

The current version of the GirlTECH workshop incorporates another CRPC outreach program: the Mathematical and Computational Sciences Awareness (MCSA) workshop established in 1989. In previous years these workshops were both one week in duration. The goals of the MCSA workshop, directed by Richard Tapia, were to make teachers in the Houston area more aware of future opportunities for their students in the computational sciences and to gain an understanding of the challenges that under-represented minority students face in pursuing such a career. The goals of the original GirlTECH workshop, established in 1995 and directed by Cynthia Lanius, were to prepare teachers to use technology as a teaching tool and serve as a resource for others at their school; to make them aware of the opportunities for their students in science, math and engineering; and to make them sensitive to challenges faced by girls who seek to enter these fields. The MCSA workshop focused on awareness without providing technical training, while the GirlTECH workshop was much more technical and emphasized using and creating materials for the Internet. In 1997 the two workshops were combined into a single workshop lasting two weeks so that teacher participants could receive the benefits of both types of training and have more time to develop working relationships and ties with their colleagues.

In the summer of 1997, the EOT leadership of NPACI proposed that the CRPC's GirlTECH workshop be evaluated to determine whether it was worthwhile and feasible to expand the program and disseminate guidelines for how to create similar programs throughout the nation. As

part of NPACI's 5-year commitment to supporting, evaluating, and disseminating its most successful education and outreach programs, researchers from the Learning through Evaluation, Adaptation, and Dissemination (LEAD) Center were engaged to evaluate both the GirlTECH workshop and the CRPC's well-known minority recruitment and retention program, Spend a Summer with a Scientist (see Alexander, Foertsch, & Daffinrud, 1998). This report provides the results of the LEAD Center's evaluation, an assessment of the impact of the workshop, an analysis of the key elements in its successful outcomes, and guidelines for those who want to establish similar technology training workshops for K-12 teachers.

2. Methodology of the evaluation

Participants: LEAD's evaluation of the GirlTECH workshop focused on participants from the first year of the combined workshop (1997) but also included participants from the 1995 & 1996 GirlTECH workshops. Nineteen teachers participated in the workshop each of these three summers, so a total of 57 teachers formed the population of subjects under study. Attempts were made to survey the entire population and interview a representative sample, but compliance was lower than anticipated. From the total population of 57, 4 participated in a focus group of master teachers, 8 agreed to be interviewed individually by phone, and 21 completed surveys (3 of whom had also been interviewed). Hence, this report was informed by the experiences of 26 different workshop participants from three different years, or 46% of all participants. All but one (4%) of these participants were female, whereas the total population included 8 (14%) male teachers. All but 5 (19%) of the studied participants were white, whereas the total population included 15 teachers (40%) who were African American, Hispanic, or Asian American. The studied participants, like the total population of workshop participants, taught a variety of grade levels and subject matters. About 48% of the studied participants taught at the High School level, 19% at the Junior High level, and 33% at the Elementary level. About half of the studied participants taught computer literacy or computer science courses (with about a quarter of those also teaching math or science), while the other half taught just math (32% of the total) or just science (18% of the total). Thirty-three percent of the studied participants taught primarily white students, 43% taught primarily minority students, and 23% taught an even mix of white and minority students. In these three respects, the studied participants were very similar to and hence representative of the total population of GirlTECH participants.

Data collection methods: The three main methods for collecting data about participants' experiences and the impact of the GirlTECH workshop were interviews, surveys, and analyses of GirlTECH list serve communications. A fourth method, having current participants fill out bi-monthly logs on their experiences integrating technology into their classroom in the year following the workshop, was eventually abandoned due to lack of compliance.

In all, 3 program administrators and 12 workshop participants were interviewed. Four of the 12 participants were interviewed as part of a focus group conducted at Rice University and 8 as individual interviews conducted by phone. The 2-hour focus group involved 4 1995 participants who were serving as master teachers for the 1997 workshop. This focus group and the administrator interviews served as an initial means of gathering information about the program and its potential impact on teachers who were "model" participants. The individual interviews involved only participants in the 1997 workshop and were conducted in the spring following their

participation in the workshop. These interviewees had a wide range of technical expertise coming into the program, from those who had already begun experimenting on the Internet to one who had never used a computer at all. The interviews, lasting from 40 minutes to an hour, were conducted by LEAD researchers trained in inductive, open-ended interviewing techniques who referred to a written protocol as a guide. The interview protocol is provided in Appendix A.

Toward the end of the 1998 school year, participants from all 3 years of the workshop (N = 57) were sent a 25-question survey about their experiences in the workshop and their experiences at their schools since attending the workshop. A copy of this survey is provided in Appendix B. These surveys were sent both by electronic mail and U.S. mail. Twenty-one were completed and returned by the time of LEAD's analysis, for a response rate of 37%. Seven of these respondents were from the 1995 workshop, 8 from the 1996 workshop, and 6 from the 1997 workshop.

From April through June of 1998, e-mail messages sent via GirlTECH's list serve were collected by LEAD researchers. The GirlTECH list serve is the primary means of communication between participants in the workshop and GirlTECH administrators and technical support staff. Messages and postings are sent almost daily and are received by all past and current participants in the workshop. Many contain "hotlinks" to Websites that have additional information about the educational resource or conference being discussed. The GirlTECH workshop also has its own Webpage which contains links to the participants' personal Webpages, lesson plans, and electronic resources that they are integrating into their curriculum. The GirlTECH Website may be viewed at http://www.crpc.rice.edu/CRPC/Women/GirlTECH/index.html.

3. Outcomes of the GirlTECH workshop

Interviews and surveys alike showed that the GirlTECH workshop considerably increased the Internet expertise and computational science awareness of almost all participants. For the majority, what they learned during the workshop also had a significant impact on their teaching and their commitment to the use of technology in the year(s) that followed. While a number of teachers faced obstacles in their later attempts to integrate technological enhancements into their curriculum, most felt they were making good progress in doing so, and all of them felt that the skills and knowledge they had gained in the workshop would eventually be put to good use. In this section, we use the survey and interview data to illustrate the impact of the program, communicate the participants' perspective on what worked and what didn't, and offer recommendations for how to improve.

3.1 Participants' knowledge and technology usage before the workshop

For all the participants surveyed and interviewed, the primary motivation for enrolling in the GirlTECH workshop was to learn more about technology and how it could be used as an instructional tool in their classrooms. A majority were primarily interested in learning how to create their own Web pages for their classes, while others were looking for information on educational programs already available over the Web. A few who came into the workshop with a very low level of technical skill simply sought to become more computer literate. Many participants were also interested in the "awareness" aspect of the program and sought to become

more familiar with careers in technology that their students could pursue, and to learn more about the special issues faced by women and ethnic minorities who seek to enter computational fields.

Survey respondents were asked to report how they had used computers in an educational setting prior to enrolling in the program. As the responses in the "Before" column of Table 1 show, there was a great deal of diversity in participants' initial experience levels with computers. The vast majority of participants had already used computers for writing or as an instructional tool (keep in mind that 12 of 21 taught computer science or computer literacy), and about one-third were already using computers to communicate with colleagues or prepare their lesson plans. But less than half were using computers to help them find instructional materials and ideas on the Internet, or to find information about teacher enhancement programs and grants that would allow them to use technology more effectively. Three respondents had not been using computers in an educational setting at all, and one had no computer experience in any setting. Interviewees showed a similar degree of diversity in their pre-existing technological knowledge and computer usage.

Table 1: Changes in how participants used computers in an educational setting

Uses of computers in an educational setting (N = 21)	Before	After	Change
Used for writing/word processing	18	21	+3
Used as an instructional tool	18	20	+2
Communicated with colleagues	14	21	+7
Prepared lesson plans	13	17	+4
Used for bookkeeping	10	13	+3
Found lesson plans/ideas on the Internet	9	17	+8
Found info about teacher enhancement programs/grants	5	17	+12
Other	5	9	+4
Never used/minimally used a computer	1	0	-1

3.2 Impact of the workshop on participants' knowledge and technical skills

The first and most obvious impact of the GirlTECH workshop is that, regardless of the participant's pre-existing technological skill, all of the participants came away with increased aptitude in finding, using, and creating Web-based instructional materials and a better understanding of the field of computer science and the opportunities and challenges it provides for their students. For example, a comparison of pre-tests and post-tests on Internet knowledge taken by participants in the 1997 workshop showed that all of the participants significantly increased their scores over the 2 weeks, rising from a pre-workshop average of 54.9 to a post-workshop average of 74.2, with some participants' scores rising by as much as 47 points. However, the workshop seemed best suited and most useful for those whose initial technological expertise was in the middle ranges—those who had explored the Internet in the past or perhaps had some experience in programming but had little or no knowledge of how to design Webpages or create Web-based instructional materials. As interviews with the 1997 participants illustrated, participants who came in with little or no experience with computers had a lot of "catching up" to do before they could even access the Internet, much less create Webpages for it. Hence, some were not really ready to absorb or make use of the training in html programming. On the other

end of the scale, a few participants came in with such advanced technical knowledge that they became somewhat frustrated with the slower pace of training needed to bring the non-experts up to speed. But for the most part, both those interviewed and surveyed made the most of their time at the workshop and focused on whatever aspect of the training they felt was most important or at the right level for their needs.

Discussions with interviewees made it clear that the technical support staff at the workshop worked hard to provide individual assistance at whatever level was needed and that participants felt the support staff to be very capable and flexible in the assistance they provided. Participants also learned to rely on one another's expertise. The collaborative, hands-on nature of the training and the long stretches of time in which to work on the computer alongside one's colleagues provided an ideal opportunity for teachers to both learn from one another and to practice the teaching skills that they would later use on their students. When surveyed about their degree of satisfaction with the network training they received, 18 of 21 respondents said they were "Extremely satisfied" (the highest of 4 ratings) and 3 said they were "Satisfied" (the second highest rating).

Interviews also illustrated that participants took different things from the technological training they received depending on their needs and what they intended to use technology for in their classrooms. Those participants who were teaching computer science and computer literacy courses seemed the most interested in—and seemed to get the most from—their training in how to use html to create Webpages. The science and math teachers, on the other hand, seemed to be less interested in learning to use html than in learning how to access and use instructional materials already on the Web. As one science teacher explained:

> I didn't really care that much about learning how to write the program and do the Webpages as far as html is concerned…For the computer teachers that were going through and writing the programs and stuff, that probably was real important for them, but as a Chemistry teacher, if they had used a [web-authoring] program, that would've made it simpler or easier, and that would've been sufficient for me.

Several other interviewees felt that spending less time on the programming would have allowed somewhat more time for learning how to integrate the technology into their curriculums. As one teacher said, "One thing that I did find very interesting, and maybe that we need a little more emphasis on, was integrating the technology into the classroom subjects. We did some because we all wrote lessons using the Internet, but I'd like to see more, not just using the Internet, but using technology, period, in the classroom." However, even those teachers who got less out of the training in html seemed to feel that they had gained a lot from attending the workshop in terms of their technological aptitude and knowledge.

3.3 Impact of the workshop on participants' use of technology in instruction

While the immediate goal of the GirlTECH workshop is to improve the technological aptitude and awareness of K-12 teachers, the ultimate goal is to have teachers take these skills back into the classroom and use them to enhance their curriculum, improve the technological know-how of their students, encourage more students to pursue careers that utilize technology, and provide training and encouragement to other teachers interested in using technology. These ultimate goals are much harder to reach due to constraints in the school and classroom contexts beyond the

summer workshop. Lack of preparation time; lack of computer access; lack of support from administrators, colleagues, and parents; and technical and logistical complications all create challenges and potential obstacles for teachers trying to incorporate instructional technology into their curriculum. But in spite of these challenges, interviews and surveys showed that a number of teachers who participated in the GirlTECH workshop made good progress in reaching the workshop's ultimate goals.

Table 1 (p. 5) shows how surveyed participants responded when asked about their use of computers in educational settings. In separate questions participants were asked to mark which activities they were performing in the school year *before* enrolling in the summer workshop and which activities they were performing in the year *after* the summer workshop. As mentioned in Section 3.1, the activities near the top of the list were those being performed by the majority of surveyed participants even before taking the workshop. All computer activities showed an increase in the year after the workshop, as can be seen by looking at the column labeled "Change." Some activities showed less of an increase than others, though in a number of cases this was due to a "ceiling effect." For example, since a large number of teachers were already using computers for word processing and as an instructional tool, there was little room for improvement, so that measure reached the "ceiling" or maximum of 21 participants in the year after the workshop. Notable in this table are the large increases seen for using computers to communicate with colleagues (+7, to the ceiling), finding lesson plans on the Internet (+8), and finding information about teacher enhancement programs and grants (+12). All of these activities could be carried out by participating in the GirlTECH list serve, which carried e-mail discussions between workshop participants and provided hotlinks to Websites containing educational resources and information about grants and training programs.

Because of ceiling effects, it is difficult to see the impact of the workshop on the use of computers as an instructional tool for many of the workshop participants. While it is useful to see that 2 of the 3 teachers who had not already been using computers in instruction chose to do so in the year after the workshop, a list of what activities were performed does not fully reflect the impact of the workshop on the other 18 teachers who were already using computers in instruction. To measure that impact, one must look to a second set of questions asking about the frequency with which teachers used computers as instructional tools for their classes—one question for before the workshop, and one for after the workshop. Table 2 shows the responses to these questions. Note that the 4 teachers who had been using computers in instruction very infrequently prior to the workshop (once per month or less than once per month), and the 3 teachers who had been using computers in instruction only moderately (once every week or two), moved into the category of frequent users (2 or more times per week) after the workshop. Before the workshop, 12 of 20 survey respondents (60%) were using computer-based instruction twice a week or more; after the workshop, that number had increased to 19 of 20 (95%).

Table 2: Changes in frequency of use of computers as instructional tools.

How frequently computers are used as instructional tools	Before	After	Change
Less than once per month	3	0	-3
Once per month	2	1	-1

Once every two weeks	2	0	-2
Once a week	1	0	-1
2-3 times a week	2	3	+1
Almost daily	10	16	+6

When survey respondents were asked more specifically *how* they were using computers to instruct their students since attending the workshop, 12 said they "use a single computer in front of the classroom" very frequently or fairly frequently, 10 said they "have students work independently in small groups on computers" very frequently or fairly frequently, and 6 said they "let students work on a computer if they finish early" very frequently or fairly frequently. Other instructional uses (see Q15 on the survey) were much less frequent. All but 5 of the survey respondents and one of the interviewees had access to a sufficient number of computers for students to work on them in small groups, but in many cases, only one of these computers (the teacher's computer) had Internet access. Similarly, when interviewees were asked to describe their use of computers in instruction since attending the workshop, about half said what they learned at the workshop added to the repertoire of computer-based instructional activities that they had already been using, somewhat less than half said their workshop experiences encouraged them to use educational materials off the Web for the first time, and one remarked that, although she had wanted to make greater use of the instructional resources on the Web in her classes, a lack of access had kept her from doing so. This teacher was the only participant surveyed or interviewed who still did not have Internet access at her school in the year following participation in the program. Other interviewees mentioned problems getting on to the Web during class time because of an insufficient number of phone lines at their schools, but most of the interviewees were able to make do with the degree of Internet access that they had. The participants in the GirlTECH workshop, almost all of whom taught in Texas, seemed to fare somewhat better in terms of post-program Internet access than have participants of other K-12 Internet training programs (Padilla & Young, 1996; Padilla & Olson, 1997). In many school districts, particularly rural school districts, insufficient Internet access remains one of the major barriers to incorporating Internet-based instructional materials into the curriculum (Means & Olson, 1995). A 1996 national assessment of school districts' Internet connectivity (Mayer, 1997) found that only 15% of the rural school districts in Texas had dial-up Internet access, compared to 100% of its urban school districts. And only 5% of rural Texas schools and 15% of urban Texas schools had the faster and more useful form of Internet access that is provided through lines that are dedicated solely to the Internet access. Similar patterns were found for urban and rural school districts nationwide.

Of course, lack of Internet access is not the only obstacle that participants faced in integrating Internet technology into their curriculums. Question 13 of the survey asked respondents to rate the constraints that they faced in applying their newly-gained technological skills. Table 3 shows the degree to which each of 9 issues were seen as a constraint by the teachers for whom this issue was applicable. The issues are listed in order from the greatest constraint overall to the smallest constraint overall. Constraints were also addressed in question 17, where participants were asked to what degree they were able to achieve 8 different technology-related goals, and what major barriers still remained (see Table 4). As the responses to these two questions illustrate, the most consistent barriers to integrating instructional technology into the curriculum (a major constraint for 25% or more of respondents) were:
(1) a lack of time to prepare activities,

(2) a lack of support from other teachers,
(3) too few or inadequate computers,
(4) technical problems logging onto the network when needed, and
(5) a lack of support from school administrators.

The participants we interviewed faced similar problems. For a few interviewees, overcoming the resistance of parents, administrators, and colleagues to computer- and Internet-based instruction was especially difficult. As one interviewee described it: "The biggest barrier was administrative. Dragging by the administration, lack of knowledge by the parents, not enough parents supporting it. I'd say you need a third to 50% of your parents that are really into this and don't see it as a threat. That's one of the things I ran into problems with." How schools and school districts responded to workshop participants' attempts to incorporate technology into instruction will be discussed in more detail in Section 3.4.

Table 3: Constraints that participants faced in applying the skills learned at the workshop.

Constraints to be overcome	% not a constraint	% minor constraint	% major constraint
Lack of preparation time	11	47	42
Lack of support from other teachers	29	35	35
Too few or inadequate computers	29	41	29
Technical problems logging onto network when needed	47	24	29
Lack of support from school administrators	44	31	25
Lack of support from parents	56	25	19
Inadequate/outdated software	38	50	13
Lack of technical support	53	41	6
Glitches or difficulties in getting an application to work	56	39	6

In spite of these constraints, most participants seemed to be making good progress in reaching their instructional technology goals. Evidence for this is seen in the responses to survey question 17, where respondents rated their success at achieving various objectives on a 4-point scale, where 1=achieved the objective, 2=made good progress, 3=made some progress, and 4=still a major barrier. (Participants also had the option of responding "not applicable," in which case they provided no rating). The second column of Table 4 shows the percentage of survey respondents who "achieved" or "made good progress" on each objective. The third column shows the percentage of respondents who felt they faced major barriers in achieving a given objective. The last column gives the mean of the responses, with lower means representing greater progress in achieving an objective. As this table illustrates, there were far more "successes" than "failures" in terms of achieving the objectives of technological instruction.

Table 4: Degree to which participants achieved the objectives of technological instruction

Objectives to be achieved	% achieved or good progress	% major barrier	Mean rating*
Motivating students during activities/instruction	100	0	1.33
Keeping students on task and engaged in assigned activity	100	0	1.39

Ensuring equitable computer access between students	89	6	1.56
Giving students a sense of competence and achievement	95	0	1.63
Integrating network activities into the curriculum	61	6	2.00
Finding age-appropriate instructional materials	68	0	2.11
Having sufficient time to complete activities during classes	58	17	2.44
Finding enough time to prepare activities	33	33	2.80

*Scale: 1=achieved the objective, 2=made good progress, 3=made some progress, and 4=still a major barrier

Finally, when asked about the value of computers as an instructional tool for their classrooms, interviewees and survey respondents were almost unanimous in attesting to the value of computer-based instruction. When given a 4-point scale ranging from "extremely valuable" to "not valuable at all," 19 of 21 survey respondents (90%) said that computers were "extremely valuable" as an instructional tool, and the remaining 2 said they were "valuable" and "somewhat valuable." Interviewees also felt that computer-based instruction, when intelligently integrated into the curriculum, enriched their students' classroom experiences and advanced their understanding of how to use an increasingly ubiquitous information resource. When asked to describe the impact of using computers and the Internet to instruct students, interviewees mentioned the following:

- Students become less reliant on their teacher for information and more willing and able to search for answers on their own.
- Students learn up-to-date information that is far more current than what is in their textbooks.
- Students get information from a wider variety of sources, including experts in the field who they communicate with on-line.
- Students become proficient Internet users, an important skill to have in today's workforce.
- Students are more motivated to learn because they enjoy working on computers.
- Computer-based activities often prompt more collaborative work among students, which teaches them how to work on teams and learn from each other.
- Different types of students excel in this learning environment than is often the case with more traditional modes of instruction.

These perceived benefits for students have been substantiated by recent research studies on the effects of computer- and Internet-based instruction cited by Sivin-Kachala and Bialo (1996).

3.4 Impact of the workshop on participants' schools

One of the ultimate goals of the GirlTECH workshop was to have participants return to their schools with the skills and the desire to serve as technology advocates and resources for other teachers in their home school or district. According to the participants interviewed and surveyed, there were mixed results in the degree to which this goal was achieved. In all, about a quarter of the participants reported having a tangible impact on the technological acceptance and knowledge of teachers in their school or their school's commitment to technology. These effects included a couple of teachers who gave in-service workshops on how to use the Internet to other teachers in their school, one teacher who was hired as the technical specialist for her school, several teachers who presented on their experiences integrating the Internet into their curriculum at district or state-wide conferences, several teachers who were helping their school districts write grants to get more computers and better access to the Internet, and several teachers who had been tutoring

or offering technical support to their colleagues in their spare time. The positive effects of the GirlTECH workshop on participants' school districts were clearly illustrated in those teachers' comments. As one survey respondent remarked, "The training has encouraged more than just me; it has set an entire school district in motion!" When such changes began to occur, the teachers who helped set them in motion often gained both personal satisfaction and professional recognition for their efforts, as reflected in this interviewee's story:

> Something happened to me just this year as a result [of my workshop participation]. I feel GirlTECH really opened some doors for me where, gosh, there's just no way they would have been opened otherwise. I presented at the school board and with the new superintendent—that was scary—and with my principal there. I was nominated for three awards…At the state level, I won the Presidential Award. I won the Texas Medical Association award. And just July 7, I won a National Chemical Council Award. And in every one of the applications, every one of them, I let them know that I attended GirlTECH and to please visit my home page for the lessons that are on line. And I put it bold print…in the text itself telling them about GirlTECH. I feel that had a great deal to do with what was going on.

On the other hand, there were also a few teachers who felt frustrated by the lack of support shown them by administrators, other teachers, and parents when they attempted to work Internet-based lessons into their curriculum or advocate for more of their colleagues to do so. As one participant from the 1997 workshop commented on her survey:

> The workshop has been the one positive force to keep me motivated to continue teaching. I wish my school district and administrative staff would be as supportive. Please write school districts and principals that are not supportive and let them know they need to consider supporting teachers who are willing to learn and give of their own time to make education better for children.

With time and persistence, however, such resistance may still be overcome, as illustrated by this vignette shared by one of the 1995 participants who had come back to the workshop as a master teacher:

> [My school is] just that one little school, and I'm the person they use to get the school board to move on things when it comes to technology. In fact, we have done two presentations where the kids showed how they access the Internet and how they used it, not only for research topics but to talk to specialists in fields. And the school board and parents were so afraid that these kids were going to get into X-rated movie stuff and everything that they were just extremely paranoid. So when the kids got up there and did their thing, they were floored. They were just awe-struck.

3.5 Participants' evaluations of workshop elements and activities

Interviewees and survey respondents alike were largely pleased with their experiences at the GirlTECH workshop, the training they received there, and the support and follow-up training they received in the year(s) following the workshop. For example, when asked to rate their satisfaction with the program overall on a 4-point scale ranging from "extremely satisfied" to "not satisfied at all," 16 of 19 survey respondents (84%) gave it the highest rating, and the remaining 3 gave it the second-highest rating. In their written commentary, a number of respondents mentioned how the workshop had reinvigorated their interest in teaching, helped them overcome their fear and resistance to technology, and prompted them to become technology advocates within their school districts.

Questions 18-22 of the survey asked participants to evaluate the various aspects of the workshop, using a 4-point rating scale of "extremely satisfied," "satisfied," "somewhat satisfied," and "not satisfied at all." As mentioned earlier, 18 of the 21 survey respondents (86%) gave the highest rating of satisfaction to the Internet training they had received at the workshop, with the 3 others (14%) giving it the second-highest rating. The comments of those who gave the network training the second highest rating of "satisfied" reflected one participant's frustration with using PCs that were very different from the Macintosh she had at school, and another's disappointment that the workshop focused so heavily on learning to create Webpages.

Ratings of other elements of the program were somewhat lower. The talks given by industry people about the demand for computational skills in industry were given the highest rating of satisfaction by 11 of 21 respondents (52%), and the second highest rating by the remaining 10 respondents (48%). The presentations of computational science projects given by minority graduate students at Rice were given the highest rating of satisfaction by 7 of 20 respondents (35%), the second highest rating by 12 respondents (60%), and the third-highest rating of "somewhat satisfied" by one respondent. The accompanying comments reflected that while some participants felt the talks were useful in providing a broader context or in showing what was possible for students entering the computational sciences, others found some of the talks to be "boring" or "over their heads."

Questions 21 and 22 asked about participants' satisfaction with the amount of emphasis the workshop gave to issues of race and ethnicity and issues of gender, respectively. The question about issues of race and ethnicity was only asked of the participants in the 1997 workshop, since this was the first year in which the race and ethnicity issues of the former MCSA workshop were incorporated into the GirlTECH workshop. Of the 6 1997 participants who responded, 5 said they were "extremely satisfied" with the amount of emphasis given to race and ethnicity, and one said she was "satisfied." For the question regarding gender, 6 of 18 respondents (33%) said they were "extremely satisfied" with the amount of emphasis given to issues of gender, 4 (22%) said "satisfied," 6 (33%) said "somewhat satisfied," and 2 (11%) said "not satisfied at all." Participants' commentary on the role these issues played in the workshop was also mixed, both for survey respondents and for the 8 1997 participants we interviewed. On the one hand, some participants were very thankful to have their attention drawn to these issues, and a handful found the panel discussions on gender or the discussions on race led by Richard Tapia to be the highlight of the workshop. On the other hand, some participants felt that these things were not an issue in their own classrooms or were concerned that the amount of emphasis given to these issues would slight students who were not female or not ethnic minorities. As one teacher wrote on her survey, "I do feel gender equity is very important, if handled in a manner that does not offend the male students. Do not be so in-your-face with the gender issues. I want all my students to appreciate each other and therefore gender is not an issue." Another teacher, regarding the race emphasis, commented, "I don't like to see race as an issue in school—I have 80% minority students and don't treat them any differently." Such comments represent the general opinion of the participants who were less than completely satisfied with these aspects of the workshop.

For question 23 of the survey, participants were asked to rate how valuable each of the workshop elements had been to them as teachers in the past year. For issues that were applicable, they were asked to use a 4-point rating scale, where 1=extremely valuable, 2=valuable, 3=somewhat valuable, and 4=not valuable. Table 5 shows these elements in order from the one rated most

valuable to the one rated least valuable, with the average rating given in the second column. According to this table, the Internet training, the email account at Rice University, and the email discussion group with other participants were the most valuable aspects of the workshop.

Table 5: Participants' value ratings of various aspects of the workshop

Aspects of the workshop	Mean rating of value*
Internet/network training	1.11
Receiving an email address at Rice University	1.17
Email discussion group with other participants	1.39
The leverage provided by the connection with Rice	1.41
Web production training	1.44
Working/meeting other teachers	1.50
Technical assistance by Rice staff	1.56
Talks by Dr. Tapia about gender/ethnicity issues	2.47
Talks by industry people	2.78
Talks by graduate students	3.00

*Value scale: 1= extremely valuable, 2=valuable, 3=somewhat valuable, 4=not valuable

3.6 Recommendations for improvement

Although the CRPC's GirlTECH workshop was highly rated by the vast majority of participants, many still saw room for improvement. The most frequent recommendations for how to improve the workshop were the following:

- Make the workshop longer, perhaps 3 weeks: Several participants from various ability levels felt that the workshop needed to be longer, although they recognized fewer teachers might be able to make a greater time commitment. A lot of technical knowledge is covered in two weeks, and some of the less-skilled applicants felt rushed, while more-skilled applicants wanted time to take their training further.
- Put somewhat less emphasis on Internet programming and somewhat more on finding and integrating the educational materials already available on the Web: A few teachers, especially those teaching math or science instead of computer science, were disappointed that the workshop didn't provide participants with more time to explore and evaluate the educational materials already available on the Web or provide more assistance and advice on integrating these materials into their curriculum.
- Have less of a range in participants' incoming skill level: A few teachers mentioned the difficulties caused by having participants with such a wide-range of technical skills attending the same workshop. On the one hand, all the participants felt that the workshop staff did a good job at trying to provide extra assistance to those who needed it and that a lot of effort was put forth to make everyone feel comfortable with whatever skills they had. But on the other hand, some teachers felt more could have been accomplished in 2 weeks' time if participants were required to come in with some degree of PC and Internet experience.
- Make sure that teachers get some time to work on computer skills every day. Don't have days that only involve talks: A couple of teachers recommended having the workshop activities restructured so that participants would have at least a few hours every day to work

on their computer skills. These teachers mentioned that the days in which they attended talks and presentations involved no computer training, and this made it more difficult for them to remember what they had learned when they returned to the computers a few days later.

- Give more attention to how teachers can deal with issues of race and gender without making other students feel excluded: The teachers who were less than satisfied with the workshop's diversity and awareness training were generally concerned about how to apply these lessons to their classroom activities without drawing too much attention to race and gender and making some students feel uncomfortable or excluded as a result. For these teachers, how to prevent "reverse discrimination" or "affirmative-action backlash" was of concern.

4. The GirlTECH workshop's guidelines for success

In sum, the LEAD Center evaluation found the CRPC's GirlTECH workshop to be successful at reaching most of its goals. During the workshop, participants increased their Internet searching and programming skills, their awareness of the field of computational science, and their understanding of how issues of gender and ethnicity come into play in computer-based instruction. In the year(s) after the workshop, increases were seen in the number of teachers that were using computers in various educational contexts, their use of computers as an instructional tool was much more frequent, and their general computer use much more sophisticated and diverse. About a quarter of the participants contacted went on to become technology resources or advocates at their schools.

What is it about the workshop that led to these largely successful outcomes? From an integrated analysis of the interviews, focus groups, surveys, and list serve observations carried out by the LEAD researchers, seven essential elements of the program emerged. These elements, stated below as guidelines for success, are strikingly similar to those found in studies of other successful K-12 teacher enhancement programs (Padilla & Young, 1996; Ruskus & Luczac, 1995; Raizen et al., 1995).

The seven guidelines for success for those seeking to administer a successful K-12 teacher enhancement program on Internet-based instruction and computational science awareness are:

- Technological skills are best learned through "hands-on" collaborative activities.
- Immersion in the subject matter over several weeks is needed in order to make significant advances in one's technological skills.
- Attention must be given to how the technological skills and resources will be integrated into each teacher's curriculum.
- Follow-up technical support must be readily accessible, timely, and proficient.
- Teachers must be given opportunities during the school year to refresh their training and enhance their skills.
- Providing a forum for ongoing discussions allows teachers to rely on the support and knowledge of their peers.
- For teachers working with underrepresented populations, hearing the success stories of individuals from similar backgrounds provides inspiration and deeper understanding.

Each of these guidelines will be discussed in more detail in the seven sections that follow.

4.1 Technological skills are best learned through "hands-on" collaborative activities.

Interviews and the focus group with workshop participants made it clear that the collaborative, hands-on nature of the Internet training was a critical element in its success. The teachers felt that both for their students and for themselves, learning means doing, and they valued the long stretches of time in the computer lab doing workshop assignments, receiving assistance or suggestions from fellow participants and workshop support staff as needed. As one teacher described it in talking about the difference between GirlTECH and other technology workshops in which she had participated:

> The difference with GirlTECH, I think, is that they let you come and spend all day playing with the computers, doing it till you've figured it out. And everyone's graciously helping each other. There were people from all three years at the session I attended today, and really no structured program…just you and a couple other teachers just working together…just helping each other. Whatever you need. And then we had some student helpers that were out of sight.

The collaborative nature of such training made teachers who were initially fearful of technology feel much more comfortable learning the material. As one teacher said in describing the effect of the hands-on, collaborative training:

> I was scared to death, because I didn't think that I could do this. It scared me. And then they said, "Yeah, yeah. We know you're feeling that. We're going to help you through it." Well the more they would show us, it was like a piece of candy: the more I wanted to know and do. And I just couldn't get enough information…It changed me that much. I went through scared little mouse to very, very aggressive at finding more knowledge of this…And that transferred into my classroom. The computer wasn't a thing that sat in the corner and was used for word processing anymore. It became our window to the world.

4.2 Immersion in the subject matter over several weeks is needed in order to make significant advances in one's technological skills.

Equally important in making the Internet training effective was that participants were deeply immersed in the subject matter for two weeks, which gave them enough time without outside distractions to progress to a functional level of proficiency. As one interviewee put it, "This workshop was better than whenever you go to a two-hour workshop and then maybe a month later you might get to go to another workshop. Having it all in two weeks, I mean, you really *knew* the material by the time you left…It was an intense two weeks." If anything, several participants expressed that they wanted the workshop to be longer, perhaps three weeks, because there was so much information to digest and they wanted more time to practice using it.

4.3 Attention must be given to how the technological skills and resources will be integrated into each teacher's curriculum.

One strength of the GirlTECH workshop that administrators and participants alike noted was that the workshop activities—particularly the participants' primary assignment of designing a Webpage for their courses that contained lesson plans and hotlinks to educational resources—pushes participants towards integrating the Internet into their curriculum. As studies of computer-based teacher enhancement programs have shown, it is not enough to merely show

teachers how to use a given technology: They must also be given incentive to use it in their regular classroom curriculum and guidance in how to do so. Newly learned skills are much less likely to be employed in teaching if teachers cannot see how to develop a curriculum that links the information acquired through those skills with the required content of their courses (Ruskus & Luczac, 1995; Sivin-Kachala & Bialo, 1996). The Webpage assignment and the guidance of other teachers gave participants in the GirlTECH workshop a head-start in trying to figure out how to bring the Internet and its world of information into their standard curriculums. A few participants wanted even more guidance in how to do this. Some got the extra help they needed through conversations with fellow participants both during and after the workshop.

4.4 Follow-up technical support must be readily accessible, timely, and proficient.

Countless studies have shown that providing ongoing technical support to teachers attempting to integrate technology into their curriculum is critical if these reforms are to succeed (David, 1996; Means, et al., 1993; Office of Technology Assessment, 1995; Padilla & Young, 1996; Raizen et al, 1995; Ruskus & Luczac, 1995; Sandholtz and Ringstaff, 1996). All of the workshop participants interviewed and most of those surveyed were impressed with the technical support they received both during and after the program. The ongoing technical support that workshop staff and other teachers provided through the list serve or direct e-mail was especially critical to ensuring that teachers could continue to use the technology day-to-day. Participants received answers to most of their questions within a day and sometimes even immediately if they called by phone, a time frame that was essential. As one teacher said in describing the importance of the ongoing technical support after the workshop:

> I can't emphasize how much that really helps, the help from the CRPC. If you get stuck—and there's so many places to get stuck—that's what teachers need. I mean, we've got the drive, we've got even the equipment. But just one little glitch can stop you to a dead halt, and you can always call them, that support group…If you're going to replicate this, you've got to have a big support staff that can help within a day. You don't want to say, "Oh, I'll help you in a couple of weeks." No. Teachers will get frustrated and blow it off.

4.5 Teachers must be given opportunities during the school year to refresh their training and enhance their skills.

Another critical feature of the GirlTECH workshop is that participants are given the opportunity to continue their technological training with one-day follow-up workshops at Rice during the course of the school year. The support staff at Rice keeps in regular contact with the workshop participants and solicits from them ideas about the topics on which they want to receive additional training. The staff at Rice then sets up weekend workshops on the selected topics. There are usually 2-3 follow-up workshops given during any given year, with topics like animated graphics, Java script, and acceptable use policies, and somewhere between 12 and 20 participants from the various years attend. Participants who attend these follow-up workshops also get updates on new software and individual help on new things they want to try with their Web pages. The participants who had attended such workshops felt they were critical in keeping their technological skills up-to-date and giving them an opportunity to share their experiences with their fellow teachers face-to-face. Workshops not associated with GirlTECH and other opportunities to receive additional training are also regularly posted on the GirlTECH list serve.

4.6 Providing a forum for ongoing discussions allows teachers to rely on the support and knowledge of their peers.

For many participants, one of the most rewarding aspects of the GirlTECH workshop was the opportunity to join an ongoing community of fellow K-12 teachers interested in technology and educational reform. The time spent working and learning together during the summer workshop and the ongoing contact through list serve interactions and follow-up workshops ensures that this community remains a vital source of guidance, encouragement, and support for teachers who are committed to integrating technology into their curriculums. The teacher-to-teacher and school-district-to-university "networking" that this workshop makes possible was mentioned by many participants as being a key component in the workshop's impact on them and their teaching. As one participant explained:

> Within the GirlTECH program, there is a great network of other participants, where we have great access to their Webpages. And then through email we get lots of up-to-date information on conferences, what software is really good for creating this certain part of a web page or whatever. I mean, the networking between participants is really, really great.

Participants from smaller towns outside of Houston were especially thankful for this network of support. As one such participant said:

> Because of the workshop…I have more contacts, more people that I can ask questions…It had broadened my vision of what I can do …I'm always finding out about what is out there that we don't know about back here…I guess just being around people that are in the same area as you, you just learn things every day.

4.7 For teachers working with underrepresented populations, hearing the success stories of individuals from women and minorities in computer science provides inspiration and deeper understanding.

For the workshop participants interviewed and surveyed, the most enriching part of the diversity training they received was hearing the stories of women and underrepresented ethnic minorities who had succeeded in computational science fields. The panel discussions and presentations by workers in industry and minority graduate students in the computational sciences gave workshop participants a sense of what was possible for their own students. A number of teachers, particularly those teaching ethnic minority students, were encouraged and inspired by the life stories of Dr. Tapia and some of his minority graduate students. They said that these stories and the discussions about race with Dr. Tapia gave them a deeper understanding of some of their students' backgrounds and the particular struggles that they faced. This gave them more patience and greater hope when they returned to their classrooms. It also made some of them more conscious about the role that they as teachers could play in their students' lives. As one teacher explained:

> Dr. Tapia was so straight-forward and honest about what he thought. He kind of pushed the teachers to be more responsible for how they are with their students in class. I mean, just watching him with the graduate students that talked that day, I could see some of him in them—their confidence and the way they talk. He just has really strong convictions that make you think…It really had an impact on how I am with my own students.

5. Conclusion

The goal in evaluating the CRPC's GirlTECH workshop was to assess the impact of the workshop on the technical skills and teaching practices of the participating K-12 teachers and to determine whether it was worthwhile to disseminate guidelines for creating similar workshops nationwide. The LEAD Center's evaluation found the workshop to be largely effective at reaching its goals. In the short term, participants significantly increased their Internet searching and programming skills, their awareness of computational science, and their understanding of how issues of gender and ethnicity effect the teaching of computational science. In the long term, substantial increases were seen in the number of teachers using computers in various educational contexts, their use of computers as an instructional tool, and the diversity and sophistication of their general computer use. Teachers who participated in the workshop became members of an ongoing, supportive community of fellow teachers and computational scientists at Rice University who were dedicated to incorporating computer- and Internet-based educational materials into the K-12 curriculum. This network, which they kept in contact with through e-mail, list serve postings, and follow-up workshops at Rice, was an important source of guidance, encouragement, information, and technical support.

Thanks to the hands-on, cooperative nature of the Internet training, the intensive immersion in the material over a 2-week period, the prompt and proficient technical support provided both during and after the workshop, and the continuing contact that workshop participants had with the staff at Rice and each other, the workshop has had a significant and lasting impact on most participants. About a quarter of the participants contacted have gone on to become technology resources or advocates in their schools, and almost all of the participants have substantially increased their use of computers and the Internet in their teaching. The structures and activities of the workshop that have made these outcomes possible are detailed in this report. The guidelines listed in Section 4 should be helpful to administrators at other institutions who are interested in creating similarly successful technology training programs for the K-12 teachers in their area. Programs such as these, which develop the "human infrastructure" needed to incorporate Internet technology into the K-12 curriculum, are as critical as programs that provide schools with Internet access in realizing the full potential of the World Wide Web as a powerful and dynamic educational resource.

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Appendix A: MCSA And GirlTECH Interview Protocol

Background

1. How long have you been teaching?

2. What grade and subject(s) do you teach?

3. Before attending the GirlTECH workshop, what had been your approach to teaching that subject? What were your typical class periods like?
   a. Had you ever used group work?
   b. Had you ever had your students work on projects?
   c. How much class time was typically spent lecturing or doing chalkboard demonstrations?
   d. …doing hands-on demonstrations?
   e. …doing problems sets and exercises?
   f. …doing group work?

4. Before you took the MCSA/GirlTECH workshop, how much computer access did you have at your school? Where were computers located? Were they connected to the Internet?

5. How often did you use computers in your teaching? If you did use them, what types of activities did you do?

6. How often did you use the computer on your own and for what purposes? How adept did you feel at using the computer?

7. Describe the students in your typical class in terms of gender, class, ethnicity.

8. Before the MCSA/GirlTECH workshop, how often did you discuss career opportunities with your students? In what contexts?

MCSA/GirlTECH 1997

I. What motivated you to attend the MCSA/GirlTECH workshop? What were you hoping to get out of it? (What were your expectations?)

II. What support or encouragement did you have from your school to attend this workshop? Did you attend the workshop with other teachers from your school, your district?

III. Please describe your experiences in the workshop. What did you think of the workshop?

   A. Describe the computer/Internet training. What did you think of that? Was it at the right level and pace for your level of expertise? Was there sufficient technical support?

   B. Describe the talks by industry people. What did you think of them? What did you see the purpose of those as being?

C. Describe the talks by college students in the Summer with a Scientist program? What did you think of them? What did you see the purpose of those as being?

D. Describe the discussions with Dr. Tapia. What did you think of them? Do you think it is important to have someone like Dr. Tapia interact with the participants in this program? Why?

IV. What did you like about the workshop?

V. Is there anything about the workshop that you would like to change or did not particularly like? Were there any other topics/activities that you wish had been included in the program?

VI. Were your expectations for the workshop fulfilled? In what way? Was there anything in the program that prevented your expectations from being fulfilled?

VII. To what degree did you interact with other teachers in the workshop? What did you get out of those interactions? Do you still interact with them?

VIII. Do you use the email list? Why or why not? How often do you use it?

IX. Have you received technical or other support from the CRPC at Rice University following the workshop?

Workshop impacts

I. [If not covered] One goal of the workshop was to make teachers aware of the opportunities that exist in the computational sciences, with particular emphasis on what it takes to succeed in these fields for minorities. In your mind, was the goal achieved? What elements contributed to that?

II. Has the workshop affected you or what you do? How would you characterize the impact of the workshop?

III. Have you done anything differently in your classroom or in your interactions with students as a result of the workshop? Can you give me an example?

IV. If you have tried new things in the classroom, how have they gone?
a) Did things go as you expected?
b) Have you had problems or constraints that have limited what you had intended to do with your GirlTECH training? Were you or will you be able to overcome those problems?

V. Have you done anything differently in your interactions with other teachers and/or school administrators? Have you taken on any new roles, official or unofficial, since you've been in the program?

VI. [If not covered] What role did the CRPC play in what you've been able to accomplish following the program? [Does the reputation of the CRPC give you leverage of some sort?]

Appendix B: GirlTECH survey

1. First Name _____

2. School _____

3. Subject Taught _____

4. Grade Taught _____

5. Please describe the ethnic make-up of the students in your classroom:

_____

_____

_____

_____

6.A. What year did you participate in the GirlTECH or GirlTECH/MCSAProgram?

6.B. Have you participated in any Rice University programs prior to this one?
Yes No

7. What factors influenced your decision to participate in the GirlTECH or GirlTECH/MCSA program? (check all that apply)

____a. I wanted to earn continuing education credits
____b. A former participant in a Rice University outreach program encouraged me to participate
____c. Dr. Richard Tapia encouraged me to participate
____d. I had participated in other programs at Rice University and found them useful/interesting
____e. I wanted to learn how to use technology in the classroom
____f. I wanted to learn about the possible careers in technology that my students could pursue
____g. I wanted to learn about/explore issues of race and ethnicity
____h. I wanted to learn about/explore issues surrounding gender and technology
____i. I thought a program at a prestigious university like Rice could provide leverage for making change at my school
____j. Other (please explain) _____

8. Please check the statement that best applies to your computer access within the school setting.

____I have no access to a computer in my school
____I have a computer in my classroom
____I have multiple computers in my classroom, but not enough for small groups
____I have multiple computers in my classroom, enough for small groups
____There is a computer lab, but not large enough for the students to work in small groups
____There is a computer lab, large enough for students to work in small groups
____Other (please explain) _____

9. BEFORE you participated in the program, how had you used a computer in an educational setting? (check all that apply)

____a. Never used/minimally used a computer
____b. Used for bookkeeping
____c. Used for writing/word processing
____d. Prepared lesson plans
____e. Found lesson plans/ideas on the internet
____f. Found information about teacher enhancement programs/grants
____g. Communicated with colleagues
____h. Used as an instructional tool
____i. Other (please explain) _____

10. If you have used a computer as an instructional tool BEFORE participating in the program, about how frequently did you do this?

____Less than once a month
____Once a month
____Once every two weeks
____Once a week
____2-3 times a week
____Almost daily

11. AFTER you participated in the program, how have you used a computer in an educational setting? (check all that apply)

____a. Never used/minimally used a computer
____b. Used for bookkeeping
____c. Used for writing/word processing
____d. Prepared lesson plans
____e. Found lesson plans/ideas on the internet
____f. Found information about teacher enhancement programs/grants
____g. Communicated with colleagues
____h. Used as an instructional tool
____i. Other (please explain) _____

12. If you have used a computer as an instructional tool AFTER you participated in the program, how frequently have you done this?

____Less than once a month
____Once a month
____Once every two weeks
____Once a week
____2-3 times a week
____Almost daily

13. What are the constraints in applying the technological skills and information that you learned in the GirlTECH or MCSA/GirlTECH program in your classroom? (Rate each issue on the following scale: 1 = not a constraint; 2 = minor constraint; 3 = major constraint; 9 = not applicable)

____a. Too few or inadequate computers
____b. Technical problems with logging on to the network server when needed
____c. Glitches or puzzling difficulties in getting a program/application to work
____d. Inadequate/outdated software
____e. Lack of technical support
____f. Lack of preparation time
____g. Lack of support from school administrators
____h. Lack of support from parents
____i. Lack of support from other teachers
____j. Other (please explain)_____

14. How valuable do you see computers as an instructional tool for your classroom?

____Extremely valuable
____Valuable
____Somewhat valuable
____Not valuable at all

Please explain: _____
_____

15.When you have used the computer for instructional purposes, how frequently have you used it in the following ways? (Rate each issue on the following scale: 1 = very frequently; 2 = fairly frequently; 3 = occasionally; 4 = once or twice; 5 = never)

____a. I use a single computer in front of the classroom
____b. I have students work independently in small groups on computers
____c. I let students work on a computer if they finish early
____d. I have students who are lagging behind use computers as a catch-up tool
____e. I have students who use the computer as a make-up tool
____f. Other (please explain)_____

16. a. Do you have access to the internet that allows you to use it as a teaching tool? Yes No
b. Have you used the internet for instructional purposes? Yes No

17. When you used a computer for instructional purposes, to what degree were you able to achieve the following? (Rate each issue on the following scale: 1= achieved the objective; 2 = made good progress; 3 = made some progress; 4 = still a major barrier; 9 = didn't attempt this)

____a. Integrating network activities into the curriculum
____b. Finding enough time to prepare activities
____c. Finding age-appropriate instructional materials
____d. Having sufficient time to complete activities during classes/labs
____e. Motivating students during activities/instruction
____f. Keeping students on task and engaged in assigned activity
____g. Giving students a sense of computer competence and achievement
____h. Ensuring equitable computer access for students of different backgrounds and ability levels
____i. Other (specify) _____

18. Please rate your satisfaction with the network training you received in the GirlTECH or MCSA/GirlTECH program.

____Extremely satisfied
____Satisfied
____Somewhat satisfied
____Not satisfied at all

Please explain: _____
_____
_____

19. Please rate your satisfaction with the talks by industry people in the GirlTECH or MCSA/GirlTECH program.

____Extremely satisfied
____Satisfied
____Somewhat satisfied
____Not satisfied at all

Please explain: _____
_____
_____

20. Please rate your satisfaction with the talks by graduate students in the GirlTECH or MCSA/GirlTECH program.

____Extremely satisfied
____Satisfied
____Somewhat satisfied
____Not satisfied at all

Please explain: _____
_____
_____

21. (MCSA/GirlTECH 1997 participants only) Please rate your satisfaction with the amount of emphasis given to issues of race and ethnicity.
____Extremely satisfied
____Satisfied
____Somewhat satisfied
____Not satisfied at all

Please explain: _____
_____

22. Please rate your satisfaction with the amount of emphasis given to issues of gender.
____Extremely satisfied
____Satisfied
____Somewhat satisfied
____Not satisfied at all

Please explain: _____
_____

23. Please rank the elements of the program by how valuable they were to you as a teacher this past year. (1 = extremely valuable; 2 = valuable; 3 = somewhat valuable; 4 = not valuable; 9 = not applicable)
____a. Internet/network training
____b. Web production training
____c. Working/meeting other teachers
____d. Receiving an email address at Rice University
____e. Email discussion group with other participants
____f. Technical assistance by Rice staff
____g. Talks by industry people
____h. Talks by graduate students
____i. Talks by Dr. Tapia about gender/ethnicity issues
____j. The leverage provided by the connection with Rice University
____k. Other (please explain) _____

24. Please rate your satisfaction with the program overall.
____Extremely satisfied
____Satisfied
____Somewhat satisfied
____Not satisfied at all

Please explain: _____
_____

25. If you have any additional comments which are not covered in the above questions, please state them here.