2006-573: ASSESSING THE LONG TERM IMPACTS OF SCIENTIFIC WORK EXPERIENCE PROGRAMS FOR TEACHERS

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Assessing the Long Term Impacts of Scientific Work Experience Programs for Teachers

Since 1991, the *Georgia Intern-Fellowships for Teachers* (GIFT) program at the Georgia Institute of Technology has placed middle and high school math, science and technology teachers into internships throughout the state of Georgia, providing them with opportunities to conduct research in cutting edge scientific and engineering fields and to extend their skills in data analysis, curriculum development, real-world inquiry and problem solving. The GIFT program is a part of a network of similar *Scientific Work Experience Programs for Teachers* (SWEPT) across the country, and works with faculty on the Georgia Tech campus to fund many research positions through the National Science Foundation's *Research Experiences for Teachers* (RET) program. The overall goals of most of the SWEPT and RET programs are to increase teachers' understanding of cutting-edge content, expose them to real world applications of science, mathematics and technology, and encourage the teachers to implement inquiry-based learning strategies in order to increase student achievement and interest in science, technology, engineering and mathematics (STEM) fields.

An important challenge to all of the SWEPT and RET programs is how to evaluate the success of the program, and how to determine whether bringing teachers into research laboratories has a positive measurable effect on K-12 education. In this era of increased accountability, issues of program assessment are of critical importance to both public and private funders. This paper will therefore provide background information on a variety of SWEPT and RET programs around the country, including a discussion of their evaluation plans, introduce literature and research that supports the effectiveness of SWEPT and RET programs as a teacher professional development model, and discuss the issues surrounding the development of evaluation tools to assess teacher and student impacts of these programs. The GIFT program and its current evaluation plan will then be discussed as a case study. This case study evaluation includes 1) the results of a multi-site SWEPT study in which GIFT participated, 2) a recent alumni survey sent to all current and former program participants, and 3) Pre & Post Summer, School Year Follow and Mentor Surveys administered during the 2004-05 academic year.

Overview of Scientific Work Experience Programs for Teachers

There are two common terms, SWEPT and RET, that describe professional development opportunities for teachers that place them in 4 – 8 week summer internships or fellowships in research laboratories and/or in corporate settings. According to the *Triangle Coalition for Science and Technology Education*, Scientific Work Experience Programs for Teachers (SWEPTs) are summer programs in which elementary and secondary science and math teachers work with scientists or engineers to do supervised, paid work in areas that are relevant to subjects that they teach. The Triangle Coalition asserts that "SWEPTs provide industry, labor, government, higher education, alliances, and other community groups with cost-effective methods of contributing to systemic reform that promotes better science, mathematics, and technology education[1]." The Research Experiences for Teachers (RET) program[2] is a specific variety of SWEPT that places teachers into university laboratories to conduct research projects and that is sponsored by individual scientific and engineering directorates at the National Science Foundation (NSF). Annual requests for RET Supplements, of up to $10,000 per teacher, may be

included in proposals for new or renewal NSF grants from various directorates, including Engineering, or as supplements to ongoing NSF funded projects. RET Site grants are independent, not supplementary, proposals to implement research participation projects for groups of K-12 teachers per year. RET Supplements will cover the cost for a teacher stipend, material and supply costs for the research laboratory, and funds for the teacher to purchase materials and supplies for the classroom. SWEPTs in general are funded from a variety of sources including corporate or university sponsors, grants from Foundations and government agencies (such as NSF), or by allocations from state or school district funds. Many SWEPTs are classified as nonprofit organizations. According to the Triangle Coalition website (www.triangle-coalition.org/swept/swept.htm) there are 29 SWEPT programs from 12 states and 2 multi-site programs. These RET programs vary yearly in the number of teacher participants as well as in the scope of the experiences.

An RET Network website (www.retnetwork.org) was initiated to provide SWEPT and RET programs with resources and evaluation instruments, and to disseminate information about NSF-sponsored RET conferences held from 2002-2004. SWEPT directors also present information at various NSF directorates and professional scientific and educational organizations such as the American Society for Engineering Education (ASEE), the American Geophysical Union (AGU), the American Chemical Society (ACS) and the National Science Teachers Association (NSTA). The 2002 RET Network conference focused on "Bringing Research into Science Classrooms", the 2003 one on "Assessing, Determining, and Measuring the Impacts of the Research Experience" and the 2004 conference, held in conjunction with the American Chemical Society Conference, addressed "Science Partnerships: Impact of Research Experiences for Teacher Programs on Scientists, K-12 Teachers, and Their Students". During 2005, over 100 scientists, teachers, program coordinators and grantees from 30 programs met at the University of Rhode Island[3] in May and again in conjunction with the American Geophysical Union in December to discuss "Teacher Professional Development Programs Promoting Authentic Scientific Research in the Classroom"[4] Although the RET Network website provides some website resources, evaluation tools, and previous opportunities for discussions to share ideas and resources, it doesn't appear to be utilized to a great degree as in previous years. Programs currently tend to struggle with the same issues of program implementation and evaluation and it would be nice to see increased dialogue between programs and to ensure that information and resources are readily available to those working with similar programs. Plans are now underway for an RET Listserve of current RET programs[5] and a potential conference emphasizing the issues surrounding program evaluation.

SWEPT programs, in their current form, have been in existence at least since the early 1990's and have been wrestling with the issues surrounding program evaluation from the start. Following a SWEPT conference in 1994, The Industry Initiatives for Science and Math Educations (IISME) commissioned a white paper that included a survey of SWEPT program managers to determine commonalities in program objectives and focus on the issues of program evaluation[6]. In 1995, a survey was sent to 75 SWEPTs as a follow-up to a discussion at a 1994 NSF meeting regarding the impact of SWEPTs. Survey questions included information about program evaluation and how the data collected was used. It was determined there were 6 broad areas for evaluation:

- Institutional and program support

- Program implementation
- Teacher effects
- Classroom effects
- Student outcomes
- School and community impact.

The results of the paper included detailed information about the type of data collected by current SWEPT's and led to a 4 year NSF-funded Multi-Site SWEPT study of eight programs across the country. These programs varied somewhat in size and structure at the time, but Table 1 contains an overview of the characteristics of the programs in 2002. The programs included 1) Arkansas STRIVE, 2) Industry Initiatives in Science and Math Education in California, 3) The Georgia Industrial Fellowships for Teachers program in Georgia, 4) Idaho National Engineering and Environmental Laboratory (INEEL) in Idaho, 5) Summer Research Program for Teachers at Columbia University in New York, 6) Business Education Compact in Oregon, 7) Texas STARS program and 8) Science Education Partnership in Washington.

Table 1—Programs Included in Multi-year SWEPT Study (as of 2002)

Program	AR	CA	GA	ID	NY	OR	TX	WA
Year Founded	1990	1984	1991	1988	1990	1985	1991	1991
Total # teachers served to date	397	910	450	374	135	987	104	244
# of teachers served (2002)	32	130	80	70	23	25	10	27
# of teachers who are first time SWEPT participants (2002)	26	75	40	14	10	25	8	27
Length of Summer Program	8 weeks	8 weeks	4-8 weeks	8 weeks	8 weeks	3-10 weeks	8 weeks	13 days
Stipend	$4,400	$6,400	$2,500-$5,000	$4,000-$6,000	$6,000	$500 per wk	$4,000	$500
Classroom Supplemental Funds	0	$600	$600	0	$1,000	0	$500	$100-300
Post-Program Activities	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes

The current state of these eight programs varies by program, and is reviewed below. GIFT is described in detail later as a case study.

- Arkansas STRIVE places middle, junior high, and senior high school science, math, and computer teachers into summer research positions in industries, businesses, government agencies, universities, research facilities, and nonprofit organizations. The program is eight-weeks long and teachers receive a stipend of $4,400 and travel monies if they must commute long distances to their research site. Teachers also can receive 60 hours of professional development credit or 6 hours of graduate credit. Teachers develop inquiry-based and problem-based lessons from their summer research experiences that they can use in their classes. (http://www.ualr.edu/%7Estrive/)

- The IISME Summer Fellowship Program in California places Bay Area K-14 teachers of all subjects into high-performance work sites for the summer. Teachers complete a project for their sponsors and are paid $7,400 for their work. Teachers also spend time focusing on ways to transfer their Summer Fellowship experience back to their students and colleagues. In the past 21 years, IISME has offered 1,996 Summer Fellowships to 1,157 individual teachers. (www.iisme.org)

- The INEEL SWEPT program in Idaho ended four years ago, but a new and similar program modeled after the previous program has emerged and is called Teaming Teachers with INL (Idaho National Laboratory) (http://www.inl.gov/k-12/tti.shtml). Teachers work with technical and scientific experts for eight weeks in the summer and are paid a stipend.

- The Business Education Compact in Oregon (http://www.becpdx.org/) is a nonprofit organization that works with local businesses to offer summer internships for K-14 educators. Through these internships educators have the opportunity to "upgrade their knowledge and skills and discover ways of making their instruction more relevant for students". The length of the internship and summer stipend varies per teacher.

- The website link to the Texas STARS program was not accessible and no current information was determined.

- According to their website, the Science Education Partnership in Washington State (http://www.fhcrc.org/science/education/educators/sep/) is a year-long program that "includes a 13-day summer workshop in which teachers work closely with each other, with lead teachers and with SEP staff to gain skills and expertise in molecular biology. A component of our summer program includes a week working closely with a scientist mentor in a research laboratory. During the school year, teachers have access to our kit loan program so that students have the opportunity to work with cutting edge biomedical research tools in their school classroom. Participants receive a $500 stipend for their training" and may receive 5 hours of graduate level credit. Mentors are from the Frank Hutchinson Cancer Center, the Department of Genome Sciences at University of Washington, Seattle Biomedical Research Institution, Pacific Northwest Research Institution, Amgen Corporation, and ZymoGenetics, Inc.

- The Summer Research Program for Teachers (http://www.scienceteacherprogram.org) at Columbia University places middle and high school science teachers in two consecutive summers in research laboratories working with a Columbia faculty mentor. Teachers are paid a stipend of $6,000 for each of the summers and given funds to purchase materials for their classrooms. Each teacher completes a transfer plan to share their experiences with their students.

Evaluation of SWEPT/RET Programs

Challenges of Evaluating SWEPT Programs

In many SWEPT and RET programs, the impact on teacher professional growth is captured both quantitatively and qualitatively through the use of teacher impact surveys, teacher journals, classroom observations and by evaluating the quality and success of transfer plans developed for classrooms and students. There is a belief among teachers, mentors, school leaders and program managers that these types of experiences are valuable for teachers who participate in them. There are many challenges, however, in establishing definitively that these impacts on teachers have a corresponding impact on student achievement. Designing and executing a scientifically valid study that measures the impact of summer research internships for teachers on the students in their classes is a major evaluation challenge. In order for programs to develop a student achievement study they must a) design a scientifically valid study that includes an appropriate control group of teachers to compare to the treatment group, b) have appropriate measures of student achievement for students across grade levels, course topic, and achievement level, and c) obtain access to this achievement data for students in classes of both the teacher participants and the control teachers. The population of teachers in one summer SWEPT program can teach a variety of subjects (physics, biology, geometry, earth science, etc.), may be at various school levels (elementary, middle, and high school), and may be in school situation that range from stable, affluent suburban schools, to low income inner city schools, to schools that are transitioning from one demographic to another. Particularly in this latter scenario, student achievement changes that might be a result of the SWEPT can be overwhelmed by changes in school demographics. Another major problem is obtaining funding for collecting this type of longitudinal evaluation data.

Regardless of the difficulties, all SWEPT and RET programs are under pressure to effectively evaluate their programs. Several notable studies regarding SWEPT/RET programs are reviewed below.

- *Multi-Site SWEPT Study*[7]. This major study, funded by the NSF, included Pre- and Post-Summer Teacher Surveys, Mentor Surveys, Pre-Teaching Surveys for Comparison and Study teachers, Student Pre- and Post-Attitudinal Surveys, and Student Cognitive Tests in the areas Algebra, Geometry, Biology, or Chemistry developed in conjunction with the Educational Testing Service (ETS). Most of the instruments can be found at http://www.sweptstudy.org/instruments.html . The final results of the student cognitive test show an increase in science achievement scores the second year after the SWEPT experience. There were no statistical differences in cognitive gains on the mathematics tests. The final report can be found at www.sweptstudy.org.
- *The Summer Research Program at Columbia University*[8] has collected student data of its program participants utilizing the New York Regents Exams for the past several years. Following a similar methodology to the SWEPT study, evaluators have seen an increase in the achievement scores of students of teacher participants following their summer experience.
- IISME conducted a *Teacher Retention Study*[9] of program participants in an effort to determine if teachers opted to leave the field of education after experiencing an IISME

internship. It was determined that IISME teachers leave the teaching profession at a rate of 4% compared to the state average of 8%, thus showing a positive impact of the program in retaining teachers in the profession. It was also determined that 43% of the teachers serve in various leadership capacities at their schools as department chairs or administrators. Participants were also asked how IISME influenced their decision to stay in the field of education and over 50% reported it offered a professional challenge, gave them new perspectives on their role as a teacher, increased their enthusiasm for teaching and added income so that they could stay in teaching.

- The RET Network has a series of evaluation instruments available to RET programs and programs may send their surveys to be included in data collected among programs. (www.retnetwork.org)

Best Practices Emphasized in SWEPT/RET Programs

SWEPT/RET programs typically emphasize the "best educational practices" found in the National Science Standards[10], National Council of Teachers of Mathematics (NCTM) Standards[11], and Benchmarks for Science Literacy[12]. These national standards, based on input from the broad community of professional scientists, mathematicians and engineers, as well as educational experts, promote the use of inquiry pedagogy in science classrooms. The National Science Education Standards encourage experiences where teachers are involved in scientific research as part of their professional development and state that learning experiences should include situations where the teacher is "actively investigating phenomena that can be studied scientifically, interpreting results, and making sense of findings consistent with currently accepted scientific understandings".[13] The professional development standards also emphasize that teachers have strong content knowledge, understand the nature of scientific inquiry, and be able to make "conceptual connections" across science disciplines and other subjects.

Student involvement in inquiry is also an essential component of the National Science Education Standards. There are five essential features of inquiry described in Inquiry and the National Science Education Standards[14]:

- Learners are engaged by scientifically oriented questions
- Learners give priority to evidence, which allows them to develop and evaluate explanations that address scientifically oriented questions
- Learners formulate explanations from evidence to address scientifically oriented questions
- Learners evaluate their explanations in light of alternative explanations, particularly reflecting scientific understanding
- Learners communicate and justify their proposed explanations.

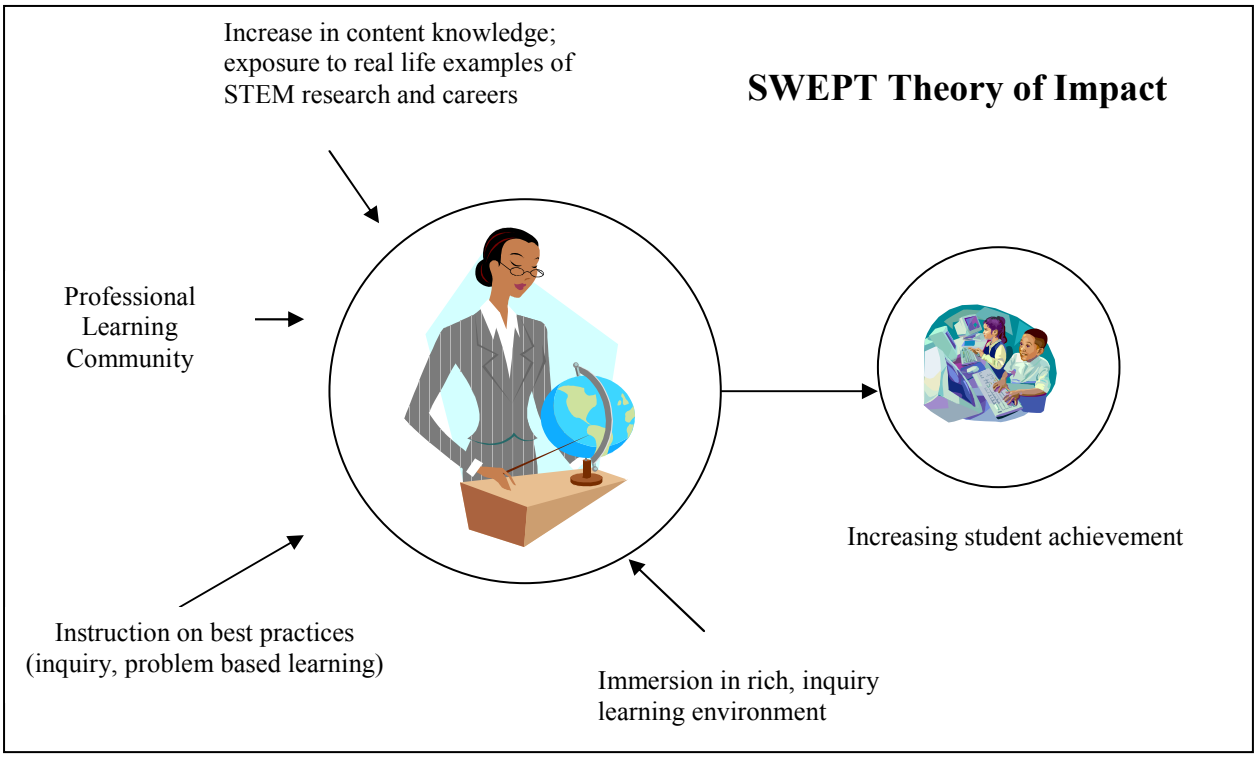
Research also suggests that the quality of the teaching workforce is the single most important factor in predicting student achievement.[15] Robert Marzano has conducted an extensive review of the research studies involving factors that impact student achievement and conducted meta-analyses of those studies to determine the effect size of the factors on student achievement[16]. He describes three types of factors that impact student achievement: school-level factors, student-level factors and teacher-level factors. What factors can SWEPT/RETs most influence? Generally student-level factors, such as socioeconomic level, education of

parent, etc., are not factors that are addressed by SWEPT programs. However there are two teacher-level factors (instructional strategies, and classroom curriculum design), as well as two school-level factors (collegiality and professionalism) that relate well to the SWEPT-variety professional development, and that can potentially be used as indicators of change in program evaluations.

How well do SWEPT programs address and affect teachers' implementation of research-supported best practices? Anecdotal evidence and self-reported surveys administered by SWEPT/RET programs, such as the GIFT surveys discussed below, suggest that participants change their teaching practices, by increasing the use of strategies such as inquiry/hand-on learning and integrating disciplines and subjects, after participation in the SWEPT program. The positive impact of collaborations between teachers and mentors is also evident in articles written by teachers participating in SWEPT/RET. Research-based experiences enhance content knowledge and can lead to the development of classroom lessons that use best practices such as problem-based learning. In one such example, a Georgia Tech biomedical engineering faculty member, a graduate student, and a high school biology teacher have embarked on a journey of developing and implementing problem-based units that revolve around various biomedical engineering topics.[17] Another teacher reported that one of the values of the RET experience was to help bridge the gap between the STEM professionals on the one hand, and K-12 teachers on the other, and that an effective way of doing this is to place teachers in settings to "do science as well as teach it."[18]

Classroom observation of SWEPT/RET participants is another means of assessing the use of best practices among participants. Many SWEPTs use the observation of participants as a means of program evaluation. Observable inquiry practices of teachers include that the teacher "poses challenges/scientific questions causing students to look for observable evidence to building improved explanations, and helps students connect their experiences to current scientific thinking and their inquiry into how scientists think and work."[19] Classroom observers should see students actively engaged in investigations, seeking alternative explanations and following the methods of scientific inquiry.

In the diagram below, a "SWEPT Theory of Impact" is proposed to depict the factors that the research shows has an impact on student achievement. SWEPT/RET programs can be structured in a way to maximize the impact on teacher professional development by providing opportunities to enhance teacher content knowledge, to provide experiences using scientific inquiry, and to provide effective instruction in best practices. A list of inquiry resources can be found in Appendix C to provide background information on utilizing inquiry strategies.



In general, the evaluation of teacher professional development has its own set of unique challenges. Guskey[20] proposes a 5 level model for evaluating professional development that has potential as a model for evaluating SWEPT/RET programs. The levels include participants' reactions, participants' learning, organizational support and change, participants' use of new knowledge and skills and student learning outcomes. The levels are hierarchical and each level builds on the one that comes before it. The model is used during the case study discussion of the GIFT program.

GIFT Program – A Case Study

The Georgia Intern-Fellowships for Teachers (GIFT) program began in 1991 as the Georgia Industrial Fellowships for Teachers program. Since that time GIFT has placed 668 teachers into 1089 research positions in both university and corporate settings. GIFT provides teachers with the opportunity to interact with faculty and corporate mentors, experience cutting-edge research, establish relationships with other motivated educators and develop inquiry-based activities for students. One of the goals of GIFT is that teachers return to their classrooms enriched and rejuvenated following their summer experience. Another goal is that university and corporate mentors gain insight into the issues of K-12 education and form relationships with teachers and schools that promote increased and more productive educational outreach. GIFT sponsors have included, among others, Georgia Institute of Technology, Georgia State University, Emory University, UGA Agricultural Experiment Station in Tifton, Georgia Power, EMS Technologies, Bellsouth, Georgia Pacific, Medical College of Georgia, Gwinnett Medical and the Medical Center of Central Georgia, UPS and the Centers for Disease Control and Prevention. The GIFT program also has an active Advisory Board composed of university research and corporate mentors as well as educational leaders from school districts. GIFT is

managed by the Center for Education Integrating Science, Mathematics and Computing (CEISMC) at Georgia Tech.

GIFT operates under the philosophy, supported by educational research mentioned above, that by providing teachers with rich, in-depth and content-rich experiences in "real world" science, engineering, and technology, the research community can assist teachers and schools in improving student achievement and better preparing students for the future workforce. By stressing changed teaching practice and promoting the inclusion of inquiry-based strategies, GIFT assists Georgia teachers in better aligning their classroom instruction with the new Georgia Performance Standards for K-12 science and mathematics education and with the National Science Education and National Council of Teachers of Mathematics (NCTM) Standards. These standards all support the view that rich, inquiry-based experiences for students help improve the achievement level of the students. The increasing involvement of engineering laboratories has also provided teachers in Georgia, and by extension their students, with increased exposures to the wide variety of fields of engineering. This exposure provides students with realistic applications of science and mathematics content and also increases their awareness of STEM fields as possible future career options.

GIFT participants, termed GIFT Fellows, receive a stipend of $5000 for a standard 7 week position. However the lengths of positions vary between 4 and 8 weeks, with the stipend level pro-rated accordingly. Fellows may receive up to 10 Professional Learning Units (PLU's) upon completion of program requirements. Each GIFT Fellow develops a GIFT Action Plan to transfer their experience back to their classroom. GIFT Facilitators, who are former GIFT participants and "master teachers", assist participants with the development of the Action Plan through large and small group meetings throughout the summer. Facilitators also apply a 2-dimensional scoring rubric to the Action Plan to determine if it meets set criteria. During the subsequent school year, GIFT Fellows are strongly encouraged to invite GIFT organizational staff to their classrooms when implementing their Action Plans.

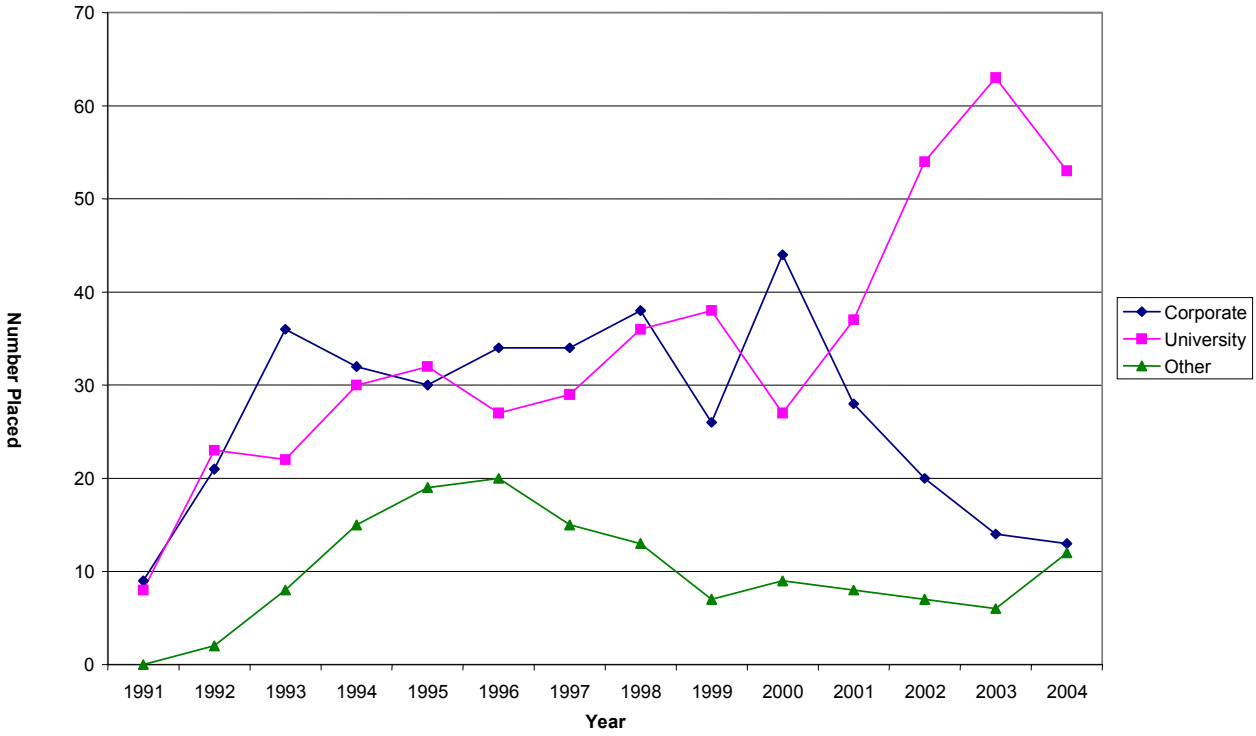
GIFT internship positions can be categorized into three general types: "university" positions, "corporate" positions, and "other" positions (which include positions at informal science entities, such as Zoo Atlanta, and at public health education units such as those at the Centers for Disease Control and Prevention (CDC).)[21] As shown in Figure 1, since 2001 GIFT has seen a dramatic increase in the number of University research position due in part to the "Criterion 2" category in grant proposals, namely that NSF grantees are required to address explicitly the broader educational impacts of their research. At this time NSF also made readily available RET grant supplements, enabling faculty and academic units to support financially GIFT teachers without depleting basic research funds. Corporate placements declined during that period due to a downturn in the national economy.

GIFT placements vary greatly in length, intended scope and type of research experience, and can be grouped into the following general categories[22]:

1. Fellowships in technical data analysis divisions of corporations;
2. 7 – 8 week experiences in which teachers conduct science, engineering, or social science research in academic laboratories;

3. International experiences in which teachers travel with university lab members to conduct research or compare cross-cultural models of academic instruction;
4. Student mentoring experiences where teachers supervise high school student research projects conducted in the university laboratory,
5. Fellowships created to help develop K-12 or informal education curriculum units based on academic research and/or Georgia Performance Standards

Figure 1--GIFT Participants 1991-2004



GIFT Program Evaluation

The GIFT program uses a variety of evaluation tools to assess and modify program components, determine the impact on participants and rate the Action Plan developed by participants. The current evaluation plan includes surveys of program participants, a survey of all former participants the assessment of the Action Plan and classroom observations. Overall, the goals of the evaluation plan are to assist in evaluation the merit of the program and its impact on teacher professional development and the intended impact on student achievement. Based on the Guskey model for evaluating professional development programs, CEISMC staff developed the following program evaluation questions for the GIFT program. Specific evaluation tools are discussed below.

	Evaluation Questions	Information Needed to Answer the Question	When and How the Information will be Collected	Data Analysis and Interpretation Procedures
Participant Reactions	How many teachers and mentors participated?	N teachers N mentors N districts N students working with teachers Demographic Data of Participants	GIFT Database contains a participant list with districts and organizations identified	Count Graphs
	Are the participants satisfied with: • The workshops • Orientation • Small Group meetings • Summer Work Experience • Overall Experience	Feedback Forms/Electronic Surveys	**Feedback forms:** • Workshops: Kick-Off, Midsummer, End of Summer	Report averages and percentages in each response category
			Surveys: Three teacher surveys (pre-summer, post-summer, school follow up)	Report averages and percentages in each response category
			Mentor Survey	Report averages and percentages in each response category
Participant Learning	Have they written an action plan? How good is the action plan?	Facilitator ratings of the action plans	Facilitators rate each plan using a rubric	Report unsatisfactory, satisfactory, exemplary ratings
	What have the teachers learned regarding Inquiry Based Learning?	Teachers report or demonstrate knowledge of IBL List of activities transferred from instruction and experience into classroom action.	Surveys (pre-summer and school year follow up) Action Plans (pull out examples of IBL application)	Report averages and percentages in each response category Synthesize examples of IBL and GPS

Participant Actions	How have they applied IBL in the classroom? Has teaching practice changed?	Teachers report, demonstrate, and apply knowledge of IBL Teachers report change	*Surveys (before/after: understanding and application of IBL))* Observations (facilitators /program staff observe teachers using an observation rubric) GIFT Alumni Survey	Report averages and percentages in each response category Report observation rubric scores and synthesized field notes.
Organizational Change	What gets transferred from summer experience to the classroom (action plans, other learning opportunities, equipment, etc.)?	Review action plans; observe the plan being implemented	Facilitator Action Plan Scores (above) Observation rubric (above)	Report unsatisfactory, satisfactory, exemplary ratings Report observation rubric scores and synthesized field notes.
Student Achievement	What does the research indicate as the connection between IBL and student achievement?	Research evidence that IBL and real-world experience predicts improved student achievement.	Literature Review (include SWEPT study)	Report lit review findings

I. GIFT Program Surveys

Over the years, the GIFT program has administered a variety of surveys to participants including surveys of teachers at the beginning and end of the summer and after they have spent a school year implementing their Action Plan, and also a survey of research mentors at the end of the summer experience. These surveys are included in Appendix A. The information collected has been primarily used as a formative assessment, impacting the structure and day-to-day operation of the GIFT program. A few changes based on the formative evaluation include streamlining the Action Plan, implementing electronic submission of the Action Plan, and decreasing the typical GIFT experience from 8 weeks to 7 weeks.

Since the summer of 2004, the GIFT program has also administered a series of electronic surveys based on a standard RET survey series from the RET Network website[23], a resource developed following the 2002 - 2003 conferences on Research Experiences for Teachers National Conference sponsored by the National Science Foundation. These surveys include a Pre-Summer Survey, Post Summer Survey and School Year Follow-Up administered to teacher participants and a Mentor Survey administered to Mentors at the end of the summer (see Appendix A for 2004 versions). Questions pertain to teacher and mentor satisfaction with their experiences, but also give teachers an opportunity to reflect on GIFT's impact on their teaching methods. The response rate on the surveys varies, with participants being more likely to complete the Pre-Summer Survey (n = 47) and less likely to complete the School Year Follow-

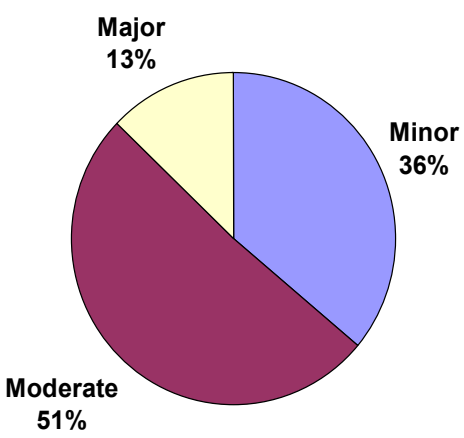
Up Survey (n = 24). The Pre-Summer and School Year Follow-Up Surveys ask questions about the importance of, and frequency that teachers utilize, various classroom practices, and attempt to quantify changes in the types of pedagogical strategies most often considered to be best practices.

In Figures 2-4 teachers who participated in GIFT from the summer 2004, through the following spring 2005, were asked at the beginning of the summer, and then at the end of the following school year to rate "how much emphasis you give to each of the following teaching methods". In each of the illustrated cases, pertaining to the following:

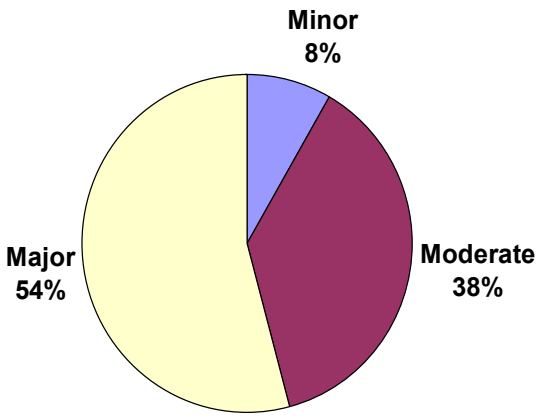
- integrating the course curriculum with other subjects or fields of study,
- using inquiry and hands-on activities, and
- incorporating "real life" examples of subjects,

A higher percentage of reporting teachers placed major emphasis on these best practices after their full-year GIFT experience than before.

Figure 2--Integrating the course curriculum with other subjects or fields of study

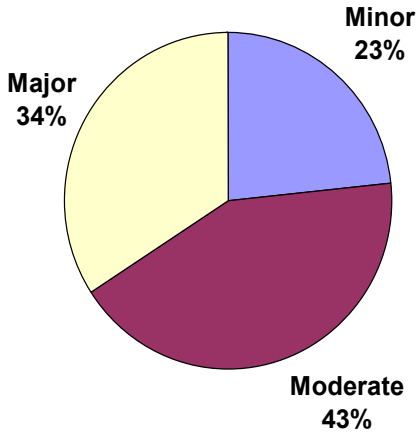


Pre-GIFT
N=47

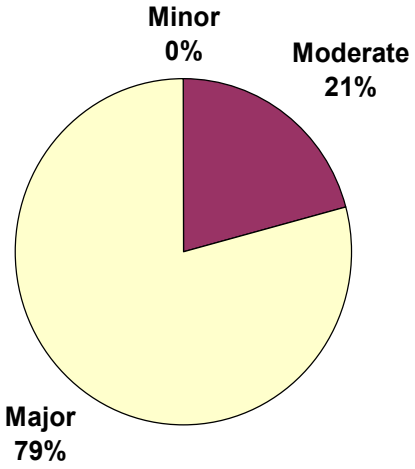


Post-GIFT
N=24

Figure 3--Using inquiry and hand-on activities

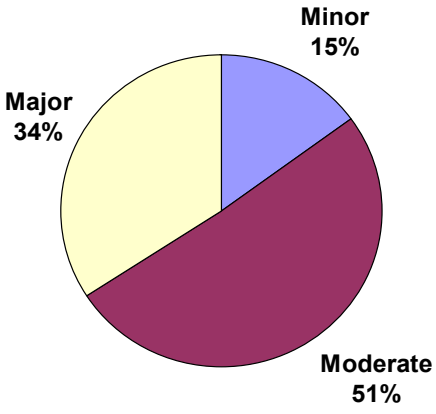


Pre-GIFT
N=47

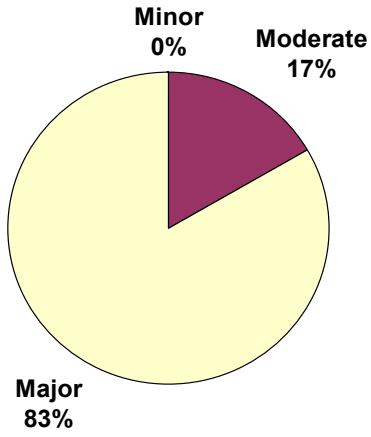


Post-GIFT
N=24

Figure 4--Incorporating "real life" examples of subject



Pre-GIFT
N=47



Post-GIFT
N=24

Teachers were also asked to rate the amount of time their students were engaged in various learning activities. Increases can be seen in the frequency that students work on:

- hand-on activities (Figure 5),
- consider real-world problems (Figure 6),
- investigate careers (Figure 7), and
- design or implement their own scientific investigation or mathematical theory or proof (Figure 8).

All of these practices are considered to be important goals of the GIFT program and reflect best practices by science educators. Though encouraging and suggestive of changed classroom practice, these results have the limitation common to many teacher surveys in that they reflect self-reported impressions of teacher classroom practice. In addition, the School Year Follow-Up survey was returned by only a self-selected sub-population of the participating teachers, thus further complicating the analysis of the results. The discrepancy in sample size poses a dilemma for program evaluators and steps will be taken to increase the sample size for the 2005-06 cohort.

Figure 5--Work on hands-on activities

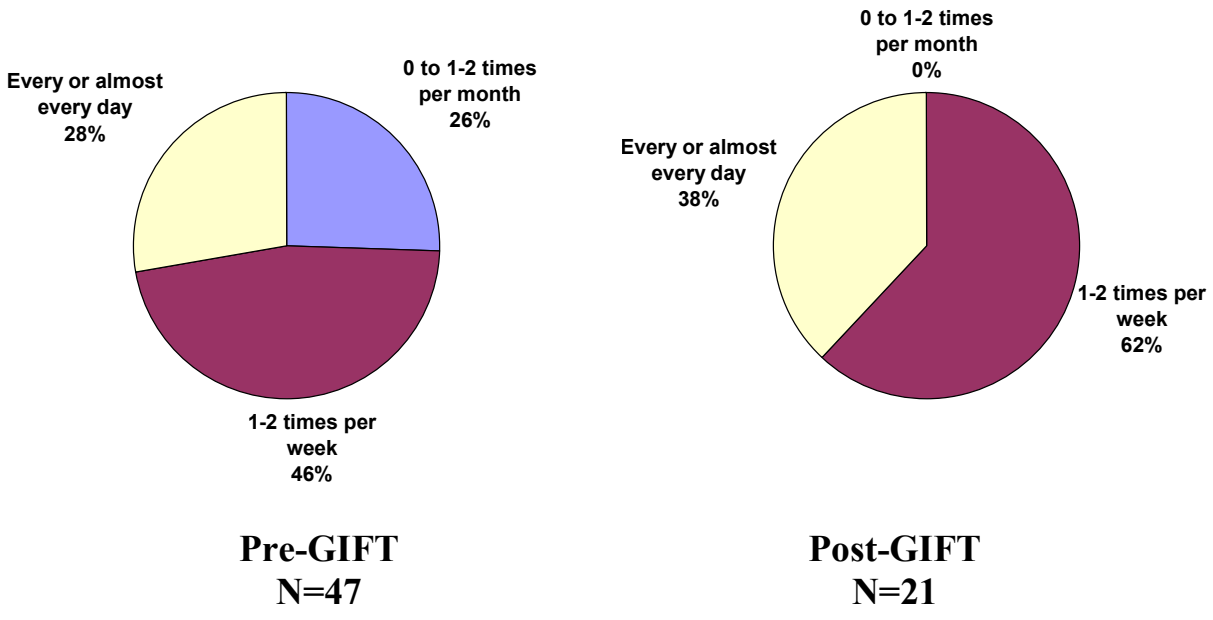
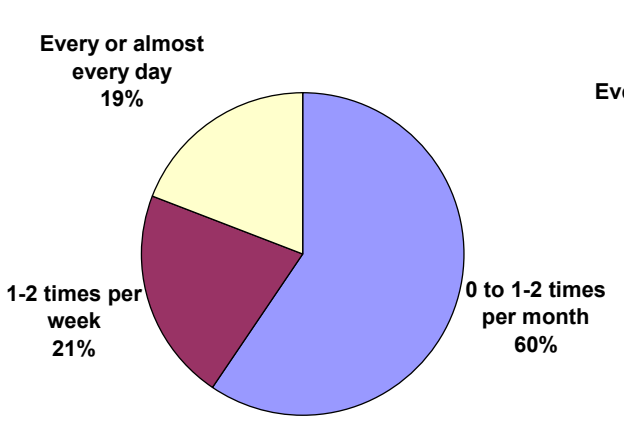
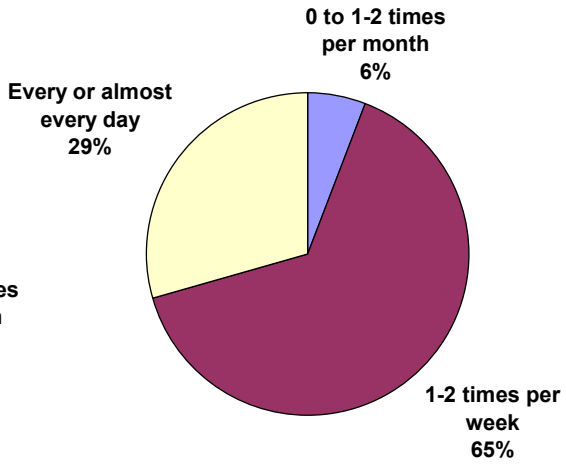


Figure 6--Consider real-world problems relevant to the course and work on ways to address it

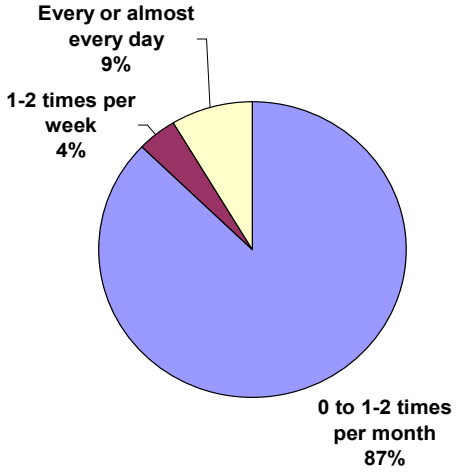


Pre-GIFT
N=47

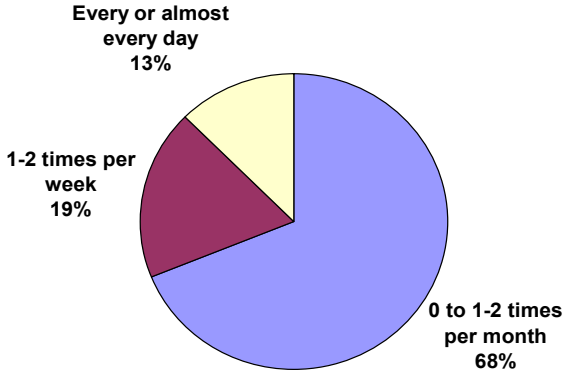


Post-GIFT
N=17

Figure 7--Investigate possible career opportunities in science, mathematics and technology

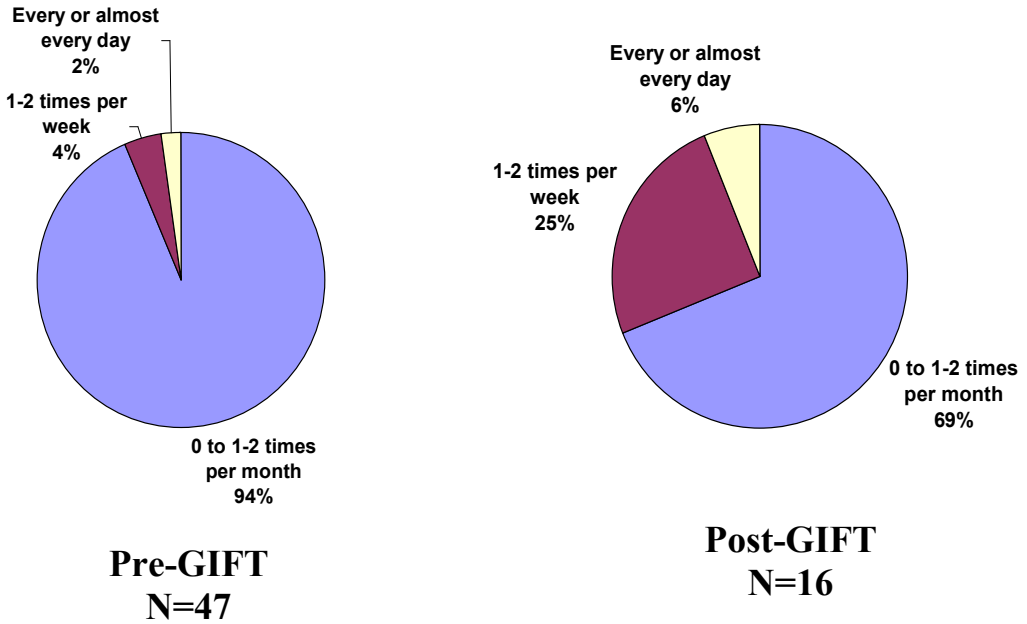


Pre-GIFT
N=47



Post-GIFT
N=16

Figure 8--Design or implement their own scientific investigation or mathematical theory or proof



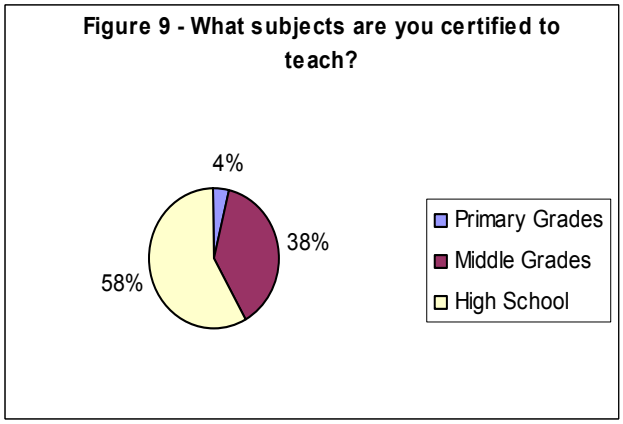
II. GIFT Program Alumni Survey

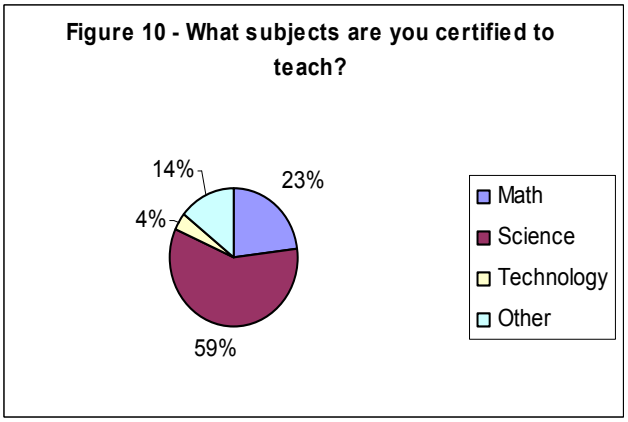
The GIFT program recently conducted a "GIFT Alumni Survey" (see Appendix B) to solicit information about the program's impact on teacher retention, the academic leadership positions held by former participants, the rate of National Board certification among participants, the number of AP courses taught, the implementation of Action Plans with students, the level of teacher involvement with science and mathematics competitions and student research projects and the continued communication between teacher participants and their mentors.

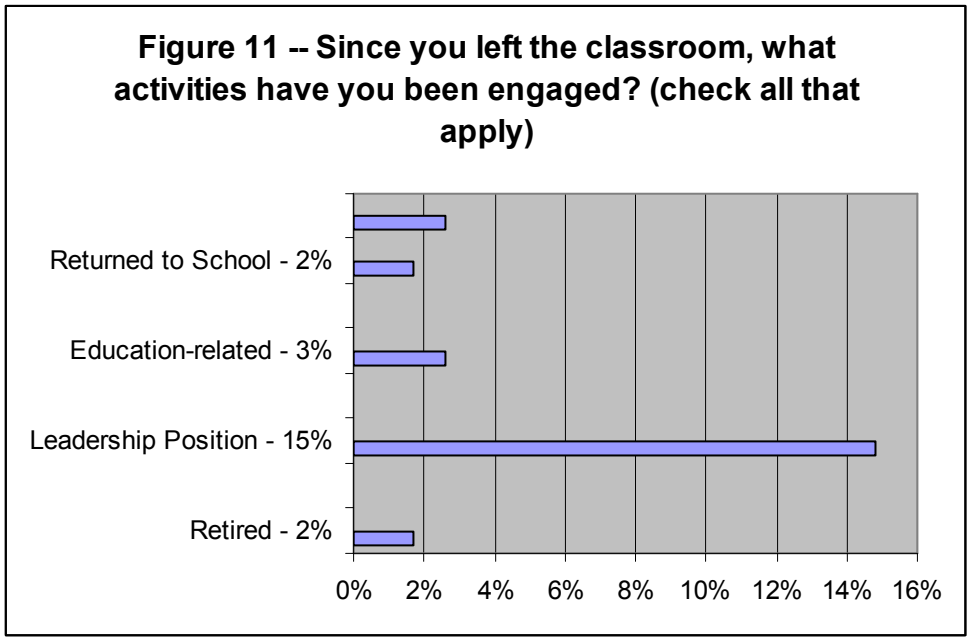
As part of this process, a GIFT database of former participants was compiled that included 668 teachers from 63 school districts in Georgia who had been placed in 1089 GIFT positions since 1991. We attempted to locate current contact information for all former participants (e-mail addresses, addresses, phone numbers) by using existing contact information, contacting school districts and conducting internet searches. In December of 2005, two electronic surveys were sent to all former participants who could be located. Of the 664 former participants, there was no contact information for 122 participants, primarily those whose internships were during the years 1991 - 1997. Hard copy letters were mailed to the last known mailing address of 163 participants for whom no e-mail address could be located and 35 of those letters were returned to sender. With 107 completed surveys returned from the 507 surveys sent, the response rate is currently 21%. Efforts will be made to increase this number, but it is challenging to maintain contact with the large numbers of program participants since 1991.

The first survey was used to update current contact information on former participants, determine their level of teaching certification, the courses they taught, whether they are still in the teaching profession and if not, why they left teaching and if they had published in a scientific journal. The second survey, which was administered as an anonymous web survey, asked teachers to reflect upon the program's impact on their teaching, and included questions about how much continued contact the teachers had with their GIFT mentor, the success of their GIFT Action Plan implementation, how involved the teachers are in various school leadership roles, and about their view of GIFT's impact on classroom pedagogy.

Figures 9-13 show some preliminary results of this survey, reflecting the responses of slightly over 100 former GIFT Fellows. This data shows that the majority of respondents (58%) teach high school (Figure 9) and that 59% teach science (Figure 10). Eighty percent of respondents are still in the teaching profession. Of the 20% who have left the classroom, the vast majority (15%) have taken a leadership position within their school districts (assistant principal, principal, or curriculum coordinator) while approximately 3% took a job in an education related field and 2% retired.







The GIFT program advisory board has periodic discussions about whether or not teachers who participate in GIFT are teachers who typically seek professional development opportunities and would be considered leaders in their fields, or if the GIFT program influences leadership opportunities of its participants. As seen in Figure 12, 49% of GIFT participants have held the position of department or grade level chairperson. Of the 49%, 33% were in that leadership role before their GIFT experience and 16% acquired that position after their GIFT experience. Twenty one percent of former GIFT participants became involved in leadership roles such as school administration (principal/assistant principal) and district coordinators as seen in Figure 13. It should be noted that seven of fifteen Atlanta Metro-area middle and high school science and mathematics coordinators are former GIFT participants.

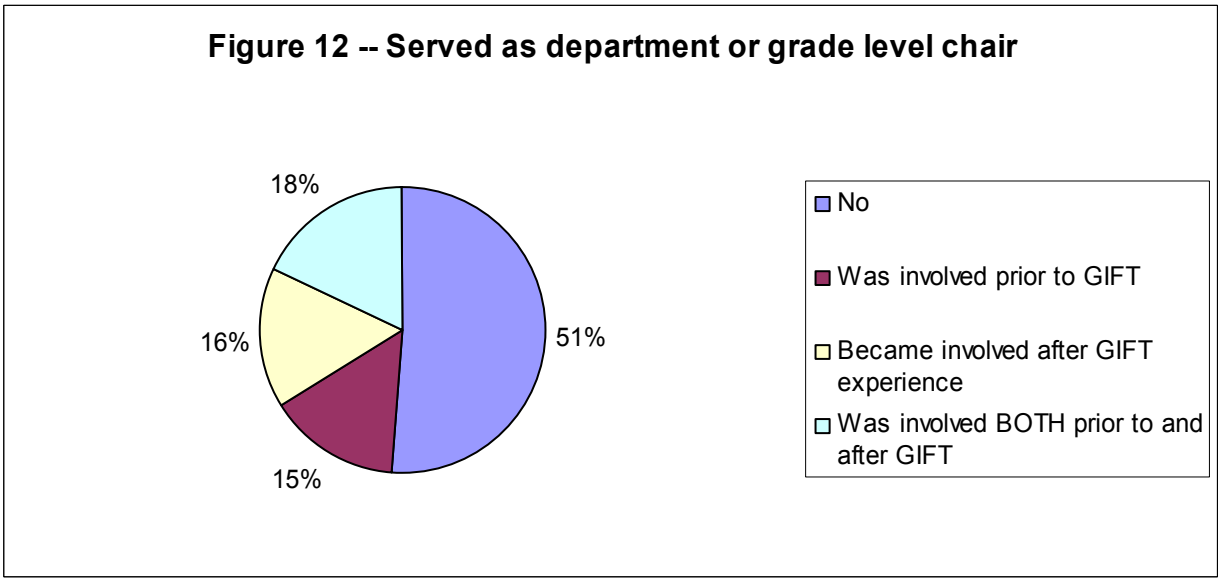


Figure 13 -- Held a leadership position in my school district (AP, Principal, Coordinator)

Table 2 contains information regarding participant's perception of the impact of the GIFT program on them as a learner. Respondents overwhelmingly agreed that the program increased their content knowledge, awareness of STEM careers and applications in STEM fields.

Table 2: To what extent, if any, do you feel that you experienced each of the following types of learning as a result of your participation in GIFT? (n = 102)	**Strongly Agree or Agree**	**Neither Agree nor Disagree**	**Strongly Disagree or Disagree**
I gained a greater understanding of the applications science, mathematics, and/or technology in every day life.	93.10%	4.90%	2.00%
I increased my knowledge of current issues in scientific or mathematical research.	91.20%	4.90%	3.90%
I increased my knowledge of careers that utilize science, mathematics, and/or technology.	95.10%	3.90%	1.00%
I became familiar with new materials and equipment that I can use in my teaching.	88.20%	9.80%	2.00%
It increased my comfort level with inquiry-based learning strategies.	76.00%	18.00%	6.00%
It increased my ability to incorporate "real life" examples of the subjects I teach.	96.10%	3.90%	0.00%

Conclusion

Evaluation is a major, and necessary, component of every teacher professional development and student enrichment program. Both types of programs ultimately aim to increase student achievement. However assessing the indirect impact that teacher professional development programs have on student achievement is a major challenge for these programs.

Most SWEPT and RET programs, which are generally small scale, place too few teachers to be statistically valid, have difficulties finding valid controls, and are run on a shoestring budget that does not include the funds necessary to develop and execute large-scale student achievement studies. Those programs that have made a serious effort to assess student achievement scores tend to be large evaluation projects, such as the $1.6 million Multi-Site SWEPT Study.

However the inability to directly assess student achievement scores should not deter SWEPT programs from implementing good assessment plans. It is important that SWEPT/RET program leaders across the country continue to collaborate and to develop a library of standardized evaluation instruments that can be used by large and small programs alike. The national science and engineering community, led by the National Research Council and the American Association for the Advancement of Science, has come together to develop professional development standards, and to give guidance on the types of teaching practices that best nurture the development of STEM knowledge in students. The educational research community, exemplified by researchers like Robert Marzano, has also conducted large-scale research projects to determine the qualities of a "high quality" teacher. So in the absence of straightforward methods to assess the indirect effect of RETs on student achievement, SWEPT and RET programs should concentrate efforts on determining whether their programs succeed in increasing teachers' use of these best practices, and whether they have succeeded in increasing the "quality" of the teaching workforce. It is vitally important that these types of programs reinforce research supported best practices, provide teachers with exposure to authentic inquiry experiences, and encourage the use of inquiry based learning strategies in the classroom.

Finally, it is important for dialogues to continue among SWEPT/RET programs across the country. Potential discussion topics include 1) reviewing the current questions used in survey instruments to increase their alignment with research-based best practices, 2) surveying programs to determine commonalities in structure and evaluation instruments, 3) developing standardized instruments to be used across programs, and 4) continuing to wrestle with program impact on student achievement.

Appendices

Appendix A: Survey Series - GIFT 2004 Pre-Experience Survey

Fellow: _____ Mentor: _____

School: _____ System: _____

# of years teaching: _____

Previous GIFT experiences: _____

Please complete the survey below to provide the GIFT program with information about your current teaching practices. The purpose of the survey is to provide us with statistical information about teaching methods. Individual responses will remain confidential; we encourage you to be candid with your responses.

1. On average, how much emphasis do you give to each of the following?

	None 0	Minor 1	Moderate 2	Major 3	Desired Level
a. Integrating the course curriculum with other subjects or fields of study					
b. Teaching facts, rules, or vocabulary					
c. Using inquiry and hand-on activities					
d. Incorporating "real life" examples of subject					

2. Approximately how often do you use each of the following teaching methods on average?

	Never 0	1-2 times per month 1	1-2 times per week 2	Almost every class 3	Every class 4	Desired Level
a. Lecture or talk to the whole class						
b. Teacher-led whole class discussions						
c. Students responding orally to questions on course subject matter						
d. Student-led whole group discussion or presentations						
e. Students working together in groups						

3. Approximately how often (2003-04 school year) did your have students engage in the following learning activities?

	Never 0	1-2 times per month 1	1-2 times per week 2	Almost every class 3	Every class 4	Desired Level
a. Work on hands-on activities						
b. Reflect on course material through journal writing						
c. Work individually on written work or assignments in a workshop or textbook						
d. Critique/evaluate their own work or other students' classwork or homework						
e. Consider real-world problems relevant to the course and work on ways to address it						
f. Listen to guest speakers or go on field trips relevant to the course material						
g. Investigate possible career opportunities in						

science, mathematics and technology						
h. Design or implement their own scientific investigation or mathematical theory or proof						
i. Use state of the art equipment or technology, specify:						

4. Please indicate how confident you feel about the following aspects of your teaching:

	None 0	Minor 1	Moderate 2	Major 3	Desired Level
a. Your knowledge about the application of the subject to everyday life					
b. Your ability to advise students about job opportunities in the subject area					
c. Your ability to use inquiry-based instructional practices					
d. Your ability to supervise research projects of your students					
e. Your ability to make presentations at in-services or professional meetings					

5. During the past 12 months, have you been involved in the following activities related to your teaching?

	Yes	No
a. Served as department chair		
b. Developed or piloted new curricula		
c. Held leadership position in state or national professional organization		
d. Supervised student teachers		
e. Conducted in-services or workshops for teachers		
f. Represented the school district on an instructional reform project		
g. Other, specify:		

6. Please identify the proportion of your course content which comes from the follow sources (total should equal 100%)

a. Text book		d. Teacher-adapted	
b. Kits		e. Teacher-created	
c. School/district material		f. Other, specify:	

7. What do you consider to be your greatest strengths as a teacher? Please be as specific as you can. Think about the areas of content mastery and instructional strategies when answering the question.

8. What areas of your teaching do you think need improvement? Think about the areas of content mastery and instructional strategies when answering the question.

9. If you have participated in GIFT in previous years, why did you decide to participate again?

10. Any other feedback you would like to share:

GIFT Program Survey Series adapted from the surveys found at www.retnetwork.org

Name: _____

Which of the following best describes the type of internship in which you were involved:

Corporate		***Research***		***Curriculum Development***	

To what extent, if any did you engage in each of the following activities during the summer:

	Not at all	Small extent	Moderate extent	Great Extent
I operated instruments, equipment, and other technologies				
I participated in conducting research or collecting data.				
I wrote a paper that was suitable for submission to a professional journal.				
I used advanced applications of computer software.				

To what extent, if any, do you feel that you experienced each of the following types of learning as a result of your participation in GIFT?

	Not at all	Small extent	Moderate extent	Great Extent
I gained greater understanding of the applications of science, mathematics, or technology in everyday life.				
I acquired greater understanding of fundamental concepts in science, mathematics or technology.				
I became familiar with new materials and equipment that I can use in my teaching.				
I increased my knowledge or current issues in scientific or mathematical research.				
I gained an appreciation of the difficulties some students encounter when learning new material.				
I better understand how collaborative inquiry can be done successfully.				
I increased my knowledge of careers that utilize science, mathematics or technology.				

Please rate the extent to which your mentor met your expectations in each of the following areas:

	Not at all	Small extent	Moderate extent	Great Extent
Your mentor's preparation for your arrival.				
Your mentor's knowledge and support of the goals of GIFT.				
Your mentor's interest in helping you develop a plan to improve education in science, mathematics and technology.				
Your mentor's ability to communicate information and expectations clearly.				

To what extent, if any, was the GIFT experience successful in each of the following ways?

	Not at all	Small extent	Moderate extent	Great Extent
It was responsive to your professional development needs.				
It was appropriate to your knowledge, skills and interests.				
It provided opportunities to engage in inquiry/corporate/research activities that you will be able to adapt for classroom use.				
The work was enjoyable and stimulating to you.				
The scope of the project was appropriate for the time you were on site.				

Please provide us with information regarding the impact of the GIFT experience :

	Not at all	Small extent	Moderate extent	Great Extent
It increased my confidence in myself as a teacher				
It elevated my level of enthusiasm for teaching/learning				
It increased my interest and commitment to learning and seeking new ideas on my own				
It increased my interest and ability to network with teachers and other professionals				
It stimulated me to think about ways I can improve my teaching				
It increased my personal knowledge level of the subject I teach				
It increased my interest in integrating course curriculum with other subjects or fields of study (writing/math/science)				
It increased my awareness of the National Standards in my subject area				
It increased my ability to incorporate “real life” examples of the subject I teach				
It increased my knowledge base of careers in the areas of math, science and/or technology				
It increased my comfort level with inquiry-based learning strategies.				

In your opinion, what was the primary professional or personal benefit of the GIFT experience?

Do you think the GIFT experience will have an impact on student achievement? If so, how?

Were there any particular aspects of the GIFT experience that you feel should have been handled differently or could be improved? If so, please describe.

GIFT Program Survey Series adapted from the surveys found at www.retnetwork.org

Appendix A: 2004 GIFT School Year Follow-Up

1. On average, how much emphasis do you give to each of the following?

	None 0	Minor 1	Moderate 2	Major 3
a. Integrating the course curriculum with other subjects or fields of study				
b. Teaching facts, rules, or vocabulary				
c. Using inquiry and hand-on activities				
d. Incorporating "real life" examples of subject				

2. Approximately how often do you use each of the following teaching methods on average?

	Never 0	1-2 times per month 1	1-2 times per week 2	Almost every class 3	Every class 4
a. Lecture or talk to the whole class					
b. Teacher-led whole class discussions					
c. Students responding orally to questions on course subject matter					
d. Student-led whole group discussion or presentations					
e. Students working together in groups					

3. Approximately how often (2003-04 school year) did your have students engage in the following learning activities?

	Never 0	1-2 times per month 1	1-2 times per week 2	Almost every class 3	Every class 4
a. Work on hands-on activities					
b. Reflect on course material through journal writing					
c. Work individually on written work or assignments in a workshop or textbook					
d. Critique/evaluate their own work or other students' classwork or homework					
e. Consider real-world problems relevant to the course and work on ways to address it					
f. Listen to guest speakers or go on field trips relevant to the course material					
g. Investigate possible career opportunities in science, mathematics and technology					
h. Design or implement their own scientific investigation or mathematical theory or proof					
i. Use state of the art equipment or technology, specify:					

4. Please indicate how confident you feel about the following aspects of your teaching:

	None 0	Minor 1	Moderate 2	Major 3
a. Your knowledge about the application of the subject to everyday life				

b. Your ability to advise students about job opportunities in the subject area				
c. Your ability to use inquiry-based instructional practices				
d. Your ability to supervise research projects of your students				
e. Your ability to make presentations at in-services or professional meetings				

5. To what extent do you feel each of the following statements describe the kind of teacher you are?

	None 0	Minor 1	Moderate 2	Major 3
a. I am motivated to expand on the instructional techniques that I use				
b. I am motivated to change the way I use hands-on materials and manipulatives in my teaching				
c. I am motivated to use more technology in my main field of teaching				
d. I consider myself a "subject matter expert" in my main field of teaching				
e. I consider preparing students for the kinds of expectations they will encounter in a work setting as an important part of my job				
f. I believe I can make a difference in the lives of my students in terms of their choices for further education and their careers				

6. During the past 12 months, have you been involved in the following activities related to your teaching?

	Yes	No
a. Served as department chair		
b. Developed or piloted new curricula		
c. Held leadership position in state or national professional organization		
d. Supervised student teachers		
e. Conducted in-services or workshops for teachers		
f. Represented the school district on an instructional reform project		
g. Other, specify:		

7. Please identify the proportion of your course content which comes from the follow sources (total should equal 100%)

a. Text book		d. Teacher-adapted	
b. Kits		e. Teacher-created	
c. School/district material		f. Other, specify:	

Please provide us with information regarding the following:

1. Have you maintained contact with your mentor? Briefly describe the nature of the contact.

2. Describe honors received by students or science fair projects of note during 2004 -05.

3. Describe honors/recognition received by you during the 2004 - 05 school year.

4. Describe the implementation of your Action Plan.

5. Other comments:

GIFT Program Survey Series adapted from the surveys found at www.retnetwork.org

Mentor: | **Fellow:**

1. Type of Position *(Mark an x beside the term that best describes the type of position that best describes the summer work experience of the teacher)*

Corporate		***Research***		***Curriculum Development***	

2. Please rate the following logistical aspects of the GIFT program?

The *GIFT* program…	**Strongly Disagree**	**Disagree Somewhat**	**No Opinion**	**Agree Somewhat**	**Strongly Agree**
a. The steps for sponsorship (letter of intent, on-line database, interviews) were appropriate/user-friendly					
b. The online database was user-friendly					
c. The Mentor Orientation was beneficial in increasing my understanding of the programs objectives and mentoring strategies					
d. The Mentor Handbook was useful and provide appropriate resources					
e. GIFT personnel were available to provide assistance					
f. GIFT Facilitator visited the worksite and was available as a resource					

3. To what extent do you think each of the following statements accurately describes the GIFT teacher's experiences and accomplishments this summer?

The *GIFT* teacher…	**Strongly Disagree**	**Disagree Somewhat**	**No Opinion**	**Agree Somewhat**	**Strongly Agree**
a. Completed assignments within the expected time frame					
b. Demonstrated an ability to learn and apply new skills to his/her own endeavors					
c. Demonstrated increased enthusiasm toward the applications of science, mathematics, or technology to real-world activities					
d. Accepted constructive criticism in a professional manner					

e. Adjusted to the challenges of the work environment					
f. Demonstrated initiative in seeking job responsibilities					
g. Contributed positively as a team member at staff meetings or discussions					
h. Demonstrated increased proficiency at using materials, equipment, and technology in performing job tasks					
i. Contributed to my work environment/research project					
j. Persuaded you that this type of program was worthwhile for teachers					

4. Would you accept this teacher into your department or organization again, or recommend him or her for another fellowship?

Yes		No	

5. To what extent do you agree or disagree with each of the following statements about your own experience as a mentor?

	Strongly Disagree	**Disagree Somewhat**	**No Opinion**	**Agree Somewhat**	**Strongly Agree**
a. It persuaded me that these kinds of workplace experiences are worthwhile for teachers					
b. It persuaded me that this program was worthwhile for me as a mentor					
c. It was a positive experience in which I would participate again in the future					
d. Working with the teacher was a learning experience for me					
e. It caused me to reevaluate my views about the demands and needs of K-14 teachers					

6. If you have any additional comments about your experience with the GIFT program that you think it would be important for us to know, please write them in the space below.

GIFT Program Survey Series adapted from the surveys found at www.retnetwork.org

Appendix B: GIFT Program Alumni Survey II

(Consent procedures, followed by survey)

Thank you for completing the GIFT Program Alumni Survey, we appreciate your time in providing the following information about the impact of the GIFT program. This type of information is very important to the program and we appreciate your honesty in completing the following questions.

1. In the table below, please indicate which subjects you have taught, and whether you taught them before, after, or both before and after your GIFT experience.

Please check the subjects taught:	Taught prior to GIFT experience	Taught after GIFT experience	Taught BOTH prior to and after GIFT
Middle Grades Earth Science			
Middle Grades Life Science			
Middle Grades Physical Science			
High School Physical Science			
High School Chemistry			
High School Biology			
High School Physics			
Middle Grades Mathematics			
Algebra			
Geometry			
Trigonometry			
Statistics			
Other (please specify)			
AP Subjects Taught, please specify below			

2. To what extent, if any, do you feel that you experienced each of the following types of learning as a result of your participation in GIFT?

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I gained a greater understanding of the applications science, mathematics, and/or technology in every day life.					
I gained greater understanding of					

fundamental concepts in science, mathematics or technology.					
I increased my knowledge of current issues in scientific or mathematical research.					
I increased my knowledge of careers that utilize science, mathematics, and/or technology.					
I increased my knowledge of the relevant specific material or subject matter					
I became familiar with new materials and equipment that I can use in my teaching.					
I gained an appreciation of the difficulties some students encounter when learning new material.					
It increased my comfort level with inquiry-based learning strategies.					
It increased my ability to incorporate "real life" examples of the subjects I teach.					

3. The next section refers to the degree your participation in GIFT impacted your teaching. "Material" refers to any activities, resources or ideas developed as part of your GIFT experience and Action Plan. Please indicate the extent to which you agree or disagree with the following statements.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I implemented material developed for my GIFT Action Plan into my classroom.					
I implemented material from my experience to more than one class.					
I implemented the material developed in multiple years.					
The material was easy to add to the lesson plans I was currently following.					
The material developed followed my district/state curriculum					

Other teachers at my school were interested in the material developed					
My principal was interested in the material developed					
I encouraged others at my school to use the material developed					
I increased the frequency in which my students are involved in inquiry-based learning strategies.					
I frequently discussed my GIFT experiences with my students					
Describing my GIFT experiences to my students helped validate my expertise as an academic professional					

4. Please indicate which of the following career development activities you have engaged in, and whether they occurred before, after, or both before and after your GIFT experience.

	No	Was involved prior to GIFT	Became involved after GIFT experience	Was involved BOTH prior to and after GIFT
Served as department or grade level chair				
Held a leadership position in my school district (AP, Principal, Coordinator)				
Held leadership position in state or national professional organization				
Supervised student teachers				
Conducted in-services or workshops for teachers				
Created/sought more opportunities for professional development				
Mentored/coached other teachers				

5. Please indicate which of the following teaching activities you have engaged in, and whether they occurred before, after, or both before and after your GIFT experience.

	No	Was involved prior to GIFT	Became involved after GIFT experience	Was involved BOTH prior to and after GIFT
Sponsored a Science Olympiad Team				
Sponsored a Math Counts Team				
Sponsored an Odyssey of the Mind Team				
Worked with students on long term Science Projects				
Had students whose long term Science Projects place at the district or state level				
Sponsored a club related to math, science or technology				
Developed or participated in summer science programs for students				
Participated in other National Competitions (Brain Bee, Ocean Bowl, etc.)				

6. Please rate the overall impact of the GIFT experience on your professional development. To what degree did GIFT impact the following:

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
It improved my professional self concept (confidence in abilities, sense of professionalism)					
It increased my commitment to teaching (enthusiasm, importance of role)					
It provided access to and use of community resources (contact with mentor, connecting students to community)					
It increased my interest in interacting					

with the scientific community					
It increased my personal content knowledge of the subject I teach					
It increased my interest in integrating course curriculum with other subjects or fields of study (writing/math/science)					
It increased my awareness of the National Standards in my subject area					
It increased my ability to incorporate 'real life' examples of the subject I teach					
It increased my knowledge base of careers in the areas of math, science, and/or technology					
It increased my comfort level with implementing inquiry-based learning strategies in my classroom.					
It increased my interest in taking STEM (science, technology, engineering and mathematics) courses					
It influenced my decision to pursue a degree/certificate program in STEM fields					

7. Please answer the following questions related to your continuing contact with your mentor.

	Not at all	The year following my GIFT experience	For 2 – 3 years following my GIFT experience	More than 3 years following my GIFT experience
My mentor and I maintained contact following my GIFT experience.				
My mentor and I maintained contact via e-mail				
My mentor visited my classroom and spoke to students.				
My students visited my mentors work site.				
My mentor assisted with student projects such as science fair or science and math competition				
My mentor and I published a scientific paper or presented at a conference				

together				
Other, please describe below.				

8. Briefly describe the nature and extent of your contact with your mentor:
9. Do you think your participation in GIFT had an impact on student achievement in your classroom? If so, how?
10. Did your GIFT experience influence your decisions to seek certain certifications, degrees or leadership positions? If so, please explain.
11. Did you present any aspect of your GIFT experience at a professional conference?

    Yes No

    If so, briefly describe the nature of the presentation, the approximate date and name of the conference.

12. Did you publish any aspect of your GIFT experience in a professional journal (GSTA Observations, The Science Teacher, etc?)

    Yes No

13. Did you receive publicity in a newspaper about your GIFT experience?

    Yes No

14. How would you rate GIFT among other professional development activities that you have participated in?

a. Top 10%
b. Top 20%
c. Less than Top 30%

15. Is there any other information about your GIFT experience that you would like to share?

Appendix C: Resources: Inquiry Based Learning

Books:

National Science Education Standards - http://www.nap.edu/readingroom/books/nses/

Inquiry and the National Science Standards: A Guide for Teaching and Learning – National Research Council www.nap.edu

Project 2061: Benchmarks for Science Literacy (Online)- http://www.project2061.org/publications/bsl/online/bolintro.htm

Principal and Standards for School Mathematics: An Overview. National Council for Teachers of Mathematics - http://www.nctm.org/standards/overview.htm

Inquiry: Thoughts, Views & Strategies for the K-5 Classroom - http://www.nsf.gov/pubs/2000/nsf99148/pdf/nsf99148.pdf

Websites:

The Exploratorium Institute for Inquiry - http://www.exploratorium.edu/IFI/index.html

Visiting a High School Inquiry Classroom: How to Prepare and Observe: http://cse.edc.org/pdfs/products/observerguide.pdf

Workshop: Inquiry Based Learning http://www.thirteen.org/edonline/concept2class/inquiry/index.html

Montgomery County Public Schools Science Instruction http://www.mcps.k12.md.us/curriculum/science/instr/instr.htm

What is Inquiry? - http://www.learner.org/channel/workshops/inquiry/faq.html

Teaching Tips on Inquiry - http://www.emints.org/ethemes/resources/S00000902.shtml

Power Point on Inquiry - http://www.usc.edu/dept/education/science-edu/Inquiry_Science_Instr2.pdf

Characteristics of Inquiry - http://www.usoe.k12.ut.us/curr/science/core/5th/TRB5/inquiry.htm

Inquiry – http://www.nwrel.org/msec/science_inq/answers.html

Article:

Volkmann, Mark J. and Sandra K. Abell. "Rethinking Laboratories: Tools for converting cookbook labs into inquiry." The Science Teacher. September 2003.

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