Linking Service with Academics in the Undergraduate Engineering Curriculum: An Overview of Selected K-12 Tutoring and Mentoring Programs at the Georgia Institute of Technology

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Abstract – Georgia Tech's Center for Education Integrating Science, Mathematics and Computing (CEISMC) has actively developed several K-12 tutoring and mentoring programs that partner Georgia Tech undergraduates with elementary, middle, and high schools in metro Atlanta school districts. Together, these individual programs comprise the CEISMC Mentoring Program (CMP) and share the common goals of improving K-12 education through individual or small group tutoring and mentoring and providing undergraduate students with valuable community service experiences. This paper will discuss the goals, objectives, funding, and program models of two programs within the CEISMC Mentoring Program: All Kids Count in Atlanta (AKC), a program that works with elementary students in the Atlanta Public School System, and Mentoring for Success (MFS), a program that works with middle and high school students in the City Schools of Decatur. In addition, the effectiveness of these programs will be briefly highlighted.

Keywords: tutoring, mentoring, K-12 outreach, undergraduate, education

INTRODUCTION

Integrating community service into the highly structured undergraduate engineering curriculum poses several challenges. Yet, it is well documented that linking academics to service not only improves the surrounding community but also enhances the education of the students who participate in such service. For example, Astin and Sax studied 3,450 students attending 42 undergraduate institutions [1]. The study analyzed 35 outcome variables in three categories: civic responsibility, academic development, and life skills. The researchers concluded that seven of the ten academic outcomes were positively influenced by participation in community service. These outcomes included knowledge gained, grades earned, degrees sought after and time devoted to academic endeavors. In a second study with data collected from 22,236 undergraduates, service participation showed significant positive effects on the three academic outcomes- GPA, writing skills, and critical thinking skills [2]. It was further noted in the qualitative findings that service is effective because it facilitates an increased sense of personal efficacy, an increased awareness of the world, an increased awareness of one's personal values, and an increased engagement in the classroom experience.

At the Georgia Institute of Technology (Georgia Tech), there are numerous opportunities for students to become involved in community service experiences. Because of the Institute's strengths in mathematics, science, computing, and engineering, Georgia Tech is well-positioned to offer programs that can enhance these areas in both

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Atlanta and the state of Georgia. One area of particular need is the improvement of K-12 mathematics and science education. It is vital that students graduating from high school be proficient in mathematics, science, and technology- not only to improve their ability to attend post-secondary institutions, but also to become competent and skilled workers.

In this paper, two programs which utilize Georgia Tech students as tutors and mentors in urban educational settings are described. The All Kids Count in Atlanta (AKC) program is a partnership with the Atlanta Public School System that began in 1999 and places Federal Work-Study (FWS) students in third - fifth grade classrooms. The Mentoring for Success (MFS) program, funded through grants from the GE Foundation and The Arthur M. Blank Family Foundation, is a partnership with City Schools of Decatur that began in 2002 and places undergraduates in middle and high schools. Both of these programs are coordinated through the Center for Education Integrating Science, Mathematics and Computing (CEISMC), a department within Georgia Tech's College of Sciences and its largest K-12 outreach division, and fall under a larger "umbrella" program termed the CEISMC Mentoring Program (CMP). The paper will discuss the history and overview of CMP, the recruiting and training of students to work in these programs, a profile of student tutors, and specific information related to the goals and objectives, funding, and program structure of the two individual programs (AKC and MFS). In addition, the effectiveness of both programs will be briefly discussed. Data will be presented for the past two academic years: 2002-2003 and 2003-2004.

THE CEISMC MENTORING PROGRAM

History and Overview

CEISMC, The Center for Education Integrating Science, Mathematics and Computing, was created as a unifying support system for core undergraduate courses in science, mathematics, and computing on the campus of Georgia Tech in the early 1990s. With the backing and support of Georgia Tech, the National Science Foundation, corporate partners, and other groups, CEISMC then began initiating or co-sponsoring a coordinated set of programs at the pre-college level. Though officially a division of the College of Sciences, CEISMC works with all academic units at Georgia Tech.

The CEISMC Mentoring Program (CMP) began in 1999 as an effort to establish an "umbrella" program to house several existing tutoring and mentoring programs as well as accommodate future programs. The common element in all programs within CMP is the utilization of Georgia Tech students as tutors and mentors in K-12 classrooms in the local community. For the last two years, AKC and MFS have been the largest programs within CMP.

The All Kids Count program was one of the original programs that comprised CMP in 1999. This program was partially established with support from the Georgia Tech Office of Student Financial Planning and Services in an effort to take advantage of newly established Federal Work-Study regulations that allowed 100% of wages of work-study students who served as mathematics tutors to be paid by Federal Work-Study (typically, only 75% of wages are paid by Federal Work-Study with the other 25% paid by the hiring department). These regulations were a part of the Clinton Administration's "America Counts" initiative and were retained under the Bush Administration [3]. The America Counts waiver allows universities to compensate tutors, up to a salary of $10 per hour, for tutoring, travel to and from schools, and time spent in training. The initiative is limited to tutoring in elementary and middle school (1st through 9th grade). To support Georgia Tech's existing partnership with Atlanta Public Schools, CEISMC chose to work with selected elementary schools that were both convenient to the campus and in need of improving standardized test scores in mathematics.

In 2002, Mentoring for Success was established in partnership with the City Schools of Decatur with funding from the GE Foundation and The Arthur M. Blank Family Foundation. The overarching goal of the program is to encourage students from underrepresented groups to consider careers in the quantitative disciplines, and to assist them in developing the skills and acquiring the knowledge necessary to be successful in those fields. The program began with a group of 32 sixth grade students and 20 ninth grade students. New cohorts of sixth and ninth grade students were added in 2003 and 2004, so that the program now has a group of students in each grade, 6th through 11th, representing 10-12% of each class. Decatur was chosen for this pilot project because the city offers a mid-size public school district with an urban setting, staffed with a competent professional staff.

Program Publicity and Recruitment

Publicity and recruitment of tutors for both AKC and MFS is conducted jointly and occurs twice during the academic year: at the beginning of fall semester (August) and the beginning of spring semester (January). Advertising is accomplished through traditional methods: posting signs around campus, putting table tents in student dining halls, submitting ads and/or articles in Tech's student newspaper (*The Technique*), sending representatives to campus work-study and volunteer job fairs, word-of-mouth through current tutors, and speaking at various organizations on campus (honor societies, student engineering organizations, fraternities and sororities, and service-oriented organizations). In addition, information sessions are held a few times during the recruitment period to meet with students directly and answer any specific questions.

Most of the advertising directs students to the CMP website [http://www.ceismc.gatech.edu/cmp] where they can read more about the individual programs, find out the qualifications and job descriptions, and download an application (in Microsoft Word format). Students are required to submit a paper application to the office, and if applying as a Federal Work-Study student, must submit verification of their work-study award. On the applications, students are asked to indicate any preference of program; provide contact information, desired work schedules, references and academic backgrounds; and describe their background and interest in working with children.

Applications are first screened to ensure that certain preliminary requirements are satisfied. These requirements mandate that the student: be currently enrolled full-time (undergraduate or graduate); be in good academic standing (GPA $\geq$ 2.0); have transportation or be willing to use public transportation; have the ability to work 5-10 hours per week during the school day; and indicate some level of interest in working with children of all levels and backgrounds (though it is not necessary for a student to have significant background working as a tutor). Selected applicants are then invited for a short interview to discuss the program and job. Finally, all applicants offered positions as tutors must have a background investigation performed by the Georgia Tech Office of Human Resources and Georgia Tech Police Department before an employment offer is finalized. Tutors in both programs, regardless of experience, class standing, or Federal Work-Study status, receive a salary of $10 per hour.

Tutor Training

Once the hiring phase is complete, an initial orientation and training session is held on a Saturday, typically two or three weeks into the semester. This is an all-day event, lasting from 9AM until approximately 4PM (with a lunch break), and tutors are paid for this time. The session is divided into two parts: a morning session for all tutors and an afternoon session which is program specific (i.e. AKC tutors attend the AKC session and MFS tutors attend the MFS session). In the morning session, administrative details related to completion of hiring paperwork, submission of timesheets, scheduling of hours, attendance policies, and other issues such dress code, proper etiquette in schools, are discussed. In addition, tutors are clearly informed of specific rules and regulations at schools. It is important to provide a "refresher" to college students about policies in public schools. One area emphasized is dress code, specifically issues such as which clothing is prohibited in the schools (i.e. clothing which advertises tobacco or alcohol products, hats or bandanas, and in many schools, shorts or mini skirts). Tutors are encouraged to dress casually but modestly. Due to the independent nature of this position, another area addressed is attendance. Tutors are asked to submit a weekly tutoring schedule based on their availability and when the schools can accommodate tutoring. Once this schedule is determined, tutors are reminded that attendance is an important component of their job and that their students, teachers, and school administrators are relying on them to be reliable and dependable. To document attendance and job performance, tutors are required to complete biweekly "Tutor Logs," which describe each tutoring session over the past time period and must be signed by the classroom teacher or administrator. The morning session concludes with a brief introduction to the role of a tutor and mentor in the classroom, a discussion related to classroom diversity (both in terms of ethnicity, gender, socioeconomic status, and learning styles), and further discussion of job responsibilities. In the afternoon session, each program manager reviews details related to the job descriptions of the specific program. School assignments, schedules, and other details are addressed here.

After this initial training session, on-going training sessions are scheduled throughout the semester. These shorter (1-2 hour) sessions are usually held on weekday evenings or weekends to avoid school-related schedule conflicts. Attendance at these sessions is required of all tutors. The content of these sessions varies widely but is generally

geared towards discussing pedagogical issues related to mathematics tutoring. Examples of sessions have included guest lecturers such as teachers and principals, lesson planning, hands-on and inquiry-based teaching, and how to teach standardized test taking strategies.

Tutoring Resources

Several resources are available to tutors to assist them with their job responsibilities. Each tutor is provided with a 3-ring notebook which contains copies of all job-related materials as well as curriculum-related materials, calendars, and areas for lesson planning. Tutors are also provided with a copy of *The Master Tutor: A Guidebook for More Effective Tutoring* [4]. This short, casually-written, and interactive workbook covers topics such as the tutoring role, the tutoring cycle, tutoring options, tutoring patterns, and tutoring inter-culturally. New tutors are required to complete the activities independently as a part of their training. Though geared more towards peer-to-peer tutoring, the book offers valuable insights into the role of a tutor and has been very popular with the Georgia Tech tutors.

The CMP website provides several electronic resources [http://www.ceismc.gatech.edu/cmp/current.htm]. In addition to providing important details such as directions to schools, announcements, deadlines, downloadable forms, and calendars, the site also contains helpful tips, answers to frequently asked questions, and links to educational web sites.

Finally, a permanent "Tutoring Resource Center" was established at CEISMC's office in 2001. This resource center contains items such as workbooks, math-related games, flash cards, calculators, protractors, rulers, graph paper, small dry erase boards and markers, motivational items (e.g. stickers, erasers, pencils), and basic school supplies (e.g. construction paper, pens, pencils, markers). Most recently, Leapfrog iQuest and LeapPad, interactive technology products, were purchased for the center [5]. In addition to checking out resources, tutors also have access to a computer, printer, and copier for use in preparing lessons and activities.

Profile of Tutors for 2002-2003 and 2003-2004 Academic Years

Selected demographics of tutors in both programs for the academic years 2002-2003 and 2003-2004 are shown in Table 1. Of the 256 tutors who worked in these years, 75% worked with AKC and 25% worked with Mentoring for Success. This difference is largely due to funding, as AKC tutors are paid entirely through Federal Work-Study (or volunteer) and MFS tutors are paid through grant funds. Furthermore, the total number of MFS tutors is lower, because this is also constrained by the number of mentees enrolled in the program.As Table 1 further shows, most of tutors are upper level (juniors and seniors) engineering undergraduate students. Gender is fairly evenly divided, with a slight majority of males in AKC and females in MFS. The gender ratio in MFS, however, is constrained due to the matching aspect of this program (see section below). Finally, most tutors work 5-6 hours, which includes travel to and from schools. Federal Work-Study tutors are constrained to a maximum of 20 hours per week, but it is rare that a student works this many hours. In addition, FWS tutors are not allowed to have a second, on-campus job.

In the sections that follow, specific details related to each program will be discussed. These details include the goals and objectives, funding, program structure, partner schools, and program effectiveness.

ALL KIDS COUNT IN ATLANTA (AKC)

Goals and Objectives

The All Kids Count in Atlanta program partners with the Atlanta Public School system and has two specific goals:

- To improve standardized testing scores in mathematics for students in grades three through five through one-on-one or small group tutoring
- To foster and encourage a mentoring relationship between Georgia Tech students and "at-risk" children who may benefit from such a relationship

Table 1: Profile of Tutors in the CEISMC Mentoring Program for Academic Years 2002-03 and 2003-04

Program	All Kids Count		Mentoring For Success		Total
Academic Year	2002-2003	2003-2004	2002-2003	2003-2004	
Total Tutors	113	77	22	44	256
Funding					
Paid, FWS[1]	109 (96%)	74 (96%)	0	1 (2%)	184 (72%)
Paid, Non FWS	0	0	22	43 (98%)	65 (25%)
Volunteer	4 (4%)	3 (4%)	0	0	7 (3%)
Gender					
Male	66 (58%)	49 (64%)	9 (41%)	14 (32%)	138 (54%)
Female	47 (42%)	28 (36%)	13 (59%)	30 (68%)	118 (46%)
Major					
Engineering	74 (65%)	56 (73%)	15 (68%)	28 (64%)	173 (68%)
Science	12 (11%)	4 (5%)	3 (14%)	5 (11%)	24 (9%)
Architecture	5 (4%)	4 (5%)	0	3 (7%)	12 (4.5%)
Computing	8 (7%)	4 (5%)	2 (9%)	2 (4.5%)	16 (6%)
Liberal Arts	8 (7%)	6 (8%)	1 (4.5%)	3 (7%)	18 (7%)
Management	6 (6%)	3 (4%)	1 (4.5%)	2 (4.5%)	12(4.5%)
Other[2]	0	0	0	1 (2%)	1 (1%)
Class Standing[3]					
Freshman	18 (16%)	12 (16%)	1 (5%)	3 (7%)	34 (13%)
Sophomore	27 (24%)	11 (14%)	5 (23%)	2 (5%)	45 (18%)
Junior	29 (26%)	21 (27%)	6 (27%)	16 (36%)	72 (28%)
Senior	33 (29%)	29 (38%)	9 (41%)	17 (39%)	88 (34%)
Graduate	6 (5%)	4 (5%)	1 (4%)	6 (13%)	17 (7%)
Median Weekly Hours Worked	5.9	5.5	5.0	4.0	5.1

Notes:
[1]*FWS- Federal Work-Study*
[2]*Other includes Undecided or Unspecified*
[3]*At time of hire into program*

Program Structure

The program is designed to be structured around the individual, partnering schools' needs, but with the requirement that tutors only be used for the purpose of tutoring and mentoring. There are three aspects of the program: weekday tutoring, the Saturday Academy, and the homework hotline.

Weekday tutoring takes place at the school location, either during the school day or after school. Each tutor is assigned to a specific classroom teacher, and the teacher then designates a child or small group (2-3) of children to work with the tutor. Teachers are encouraged to allow the tutors to work with the same children throughout the year to develop a mentoring relationship, but ultimately this decision is at the discretion of the teacher. In addition, several schools offer after school programs from 2:15 – 4:00 PM. This afternoon time has worked well with the tutors' class schedules. These sessions are typically tutorial sessions in which students come for homework help.

The Saturday Academy takes place at Fickett Elementary School each Saturday from 8:00 AM – 12:00 PM. This program is run with a local community partner and involves children from kindergarten through fifth grade. Because of the time and lack of academic conflicts, this is the most popular of the tutoring options, with typically 60-70% of AKC tutors working here. The program is divided into three stations- a math station, a science station, and a language arts station. Georgia Tech tutors primarily run the math station, but they also provide assistance for the science and language arts stations.

Starting in 2003, tutors were asked to assist teachers working at Atlanta Public School's Homework Hotline program. This is a phone hotline staffed by teachers in which students in any grade level may call for assistance in any subject. AKC tutors come in the early afternoon (3:00 – 5:00 PM) and assist in elementary or middle school students calling for homework help in math.

Funding

Funding for tutors' salaries is through the Federal Work-Study (FWS) program. Briefly, FWS is a need-based program which provides "funds earned through part-time employment to assist students in financing the costs of postsecondary education" [6]. Financial need is determined by the U.S. Department of Education using a standard formula established by Congress. Universities are required to use approximately 7% of their federal work-study allocation to employ students in community service positions. Tutoring programs qualify as community outreach, but do have restrictions defined by the U.S. Department of Education [7].

Profile of Partner Schools

The Atlanta Public School system has an enrollment of 51,000 students in a total of 85 schools: 59 elementary (K-5); 16 middle (6-8); 10 high (9-12) and 7 charter schools [8]. Among the elementary schools, Georgia Tech has partnered with three: John Hope Elementary, Herndon Elementary, and Fickett Elementary. These schools were selected by the APS Mathematics Coordinator based on their proximity to Georgia Tech and their need for improvement in standardized testing scores in mathematics. Table 2 summarizes some of the demographic information regarding these schools.

Table 2: Profile of Partner Schools in the All Kids Count Program

School	Enrollment (Grades K-5)	Demographics	% Eligible for Free or Reduced Lunch
Fickett Elementary	725	98% Black, 1% Vietnamese, 1% White	95
Herndon Elementary	375	99% Black, 1% Hispanic	98
John Hope Elementary	340	84% Black, 15% Hispanic, 1% White	98
Source: Atlanta Public Schools, 2003-2004			

Program Effectiveness

The effectiveness of the program may be evaluated by two primary criteria: improving the education of the tutors through their involvement in the program and improving the education of the children with whom the tutors worked. Data are not currently available for these goals, but all three schools have improved performance on mathematics test scores.

Another important criterion in assessing the effectiveness of the program, however, is the change in attitude of the work-study tutors towards tutoring and K-12 education. To evaluate the response to the program by the Georgia Tech tutors, an end-of-year survey is administered to all tutors at the final training session. Table 3 summarizes a few of the attitudinal responses, using a scale of 1-5, with 5 being strongly agree.

Table 3: End-of-Year Assessment of Student Attitudes Towards the AKC Program

Statement	2002-2003 (N=35)	2003-2004 (N=32)
Initially, I was nervous about traveling to my assigned school.	2.74	2.46
By the end of the program I was comfortable at school location.	4.64	4.66
The teachers appreciated the work I was doing.	4.41	4.32
The school administrators were generally receptive to me.	4.35	4.26
The students I worked with were anxious to work with me.	4.03	3.97
I felt I made a positive difference in the students I worked with.	4.35	4.4
Responses Based on a Scale of 1 (Strongly Disagree) to 5 (Strongly Agree)		

Additionally, some of the qualitative responses to the program are listed below:

- "Tutoring [in elementary schools] is more difficult because schools are more hectic and students are less attentive."
- "I am glad I took the job because I enjoyed the time I spent with the kids."
- "Yes, the work I did with the kids was very gratifying, it felt good when I could tell I made a difference"
- "I realized that I wasn't just a tutor but [that I] played a bigger role in the kids' lives as well and that it is more of a commitment and a great investment."
- "…I would even volunteer next year of I'm not eligible for work study."
- "…it wasn't about money anymore- I enjoyed making a difference in the students I tutored"
- "I realized that there was a big need for tutors."
- "It was harder than I thought it would be."

In general, the tutors' appreciate and understand the significance of their work. Most tutors, even if they began the position simply to earn money, developed a strong enthusiasm for both their students and the program.

MENTORING FOR SUCCESS (MFS)

Goals and Objectives

Mentoring for Success is a three-year pilot program in science, mathematics, and technology designed for approximately 150 middle and high school students from underrepresented groups in the City Schools of Decatur. African-American students comprise approximately 52% of the student population of the district. However, these, and other, minority students are not equally represented in the district's higher-level courses, and they typically score lower on standardized tests. MFS student participants are nurtured in science and mathematics skills to encourage them to take higher level high school mathematics and science courses. In addition, the program supports teachers of these students by enhancing their content knowledge and ability to stimulate students' interest in furthering their education, and their ability to create a truly equitable learning environment.

Mentoring for Success seeks to assist the City Schools of Decatur in meeting three specific system goals:

1. To increase the total number of students in the system that score on Level 3 (exceeds expectations) on the Georgia Criterion Referenced Competency Test (GCRT), and to decrease the total number of students who score on Level 1(fails to meet expectations).
2. To increase the number of minority students who are prepared for Algebra 1 by the 8th grade and enroll in higher level mathematics and science courses at the high school level.
3. To decrease the number of students who do not pass the science and mathematics sections of the Georgia High School Graduation Tests on the first attempt.

Program progress and effectiveness is measured on several fronts, including student performance on standardized tests (including the GCRT), the number of minority students who are prepared for Algebra 1 by the 8th grade, and the proportion of students completing higher-level science and mathematics courses. Changes in the frequency and diversity of hands-on inquiry based activities in the classes of participating teachers, as well as changes in their utilization of instructional technology tools, as documented on pre and post participation surveys, are other important indicators of the program's efficacy.

Program Structure

The program seeks to maintain a 1:2 mentor to student ratio. Beyond the consideration of gender, surveys of interests and lifestyle preferences are used to assist in the matching of students and mentors. Mentoring for Success employs a variety of interventions to facilitate achieving the goals of the program. These include:

- Mentors provide academic support/enrichment for participating students.
- Mentors assist the classroom teachers with labs and demonstrations.
- Mentors establish and maintain electronic communications with the participating students and teachers.
- Mentors interact with participating students in off-site recreational/leisure activities.
- Students participate in summer enrichment activities.

Mentors make weekly visits to the schools and work with students individually on their mathematics and science assignments and projects. They also visit the students' mathematics and science classes in order to gauge the instructional styles of the teachers, observe the students' classroom interactions, and keep abreast of current assignments and activities. Mentors are encouraged to make themselves available to assist the teachers in carrying out laboratory and other hands on activities as a means of extending the impact of the program beyond the students directly involved. A teacher liaison at each of the participating schools assists with on site monitoring of mentors as well as other activities.

E-mail communication is used as a bridge between the weekly visits. Mentors contact the students at least 1-2 times per week, typically as a reminder of, or follow-up to, a school visit. Mentors also plan and carry out appropriate recreational activities with their students several times over the course of the school year. These activities require parental approval and transport but are funded by the program.

Summer enrichment activities are available for students and teachers. Middle school students are encouraged to participate in CEISMC's SummerScape program. SummerScape offers a learning experience based on student participation and activity. The program encourages creative thinking and problem solving skills over the memorization of facts and data. Mentoring for Success participants are eligible for scholarships to defray the cost of attending the summer program. High school students are encouraged to participate in the summer camps and internship programs. Teachers are encouraged to participate in the Georgia Intern Fellowship for Teachers (GIFT). GIFT is a is a fulltime, 6-8 week summer program that provides work experiences in leading Georgia businesses and university laboratories. Teachers develop leadership skills, and take new science/mathematics perspectives, new knowledge, and new strategies back to their classrooms and students.

Funding

Three years ago, working in collaboration with a committee of stakeholders from the school district, and staff from the Development Office at Georgia Tech, CEISMC submitted proposals to several foundations and organizations with histories or stated missions supportive of programs of this type. Those efforts culminated in grant awards from The Arthur M. Blank Family Foundation and the GE Foundation to partially support the initial phase of this program. Funds from the grants are used to support salaries for the college mentors, provide partial support for CEISMC staff and school district liaisons, and cover costs associated with the educational and recreational activities offered to the program's participants. A concerted effort is made to leverage the available grant funds by recruiting college mentors from the pool of students eligible for Federal Work Study awards. CEISMC provides additional funding for staff salaries and other programmatic support.

Profile of Partner Schools

City Schools of Decatur is a small public school system in Decatur, Georgia, an urban town of 18,000 residents that borders the eastern edge of Atlanta - just 15 minutes from downtown. With a history of strong test scores, City Schools of Decatur is committed to small neighborhood schools. The school system has a population of approximately 2,397 students serviced by five elementary schools, one middle school, and one high school. These schools are staffed by more than 200 teachers, over 70% of whom have advanced degrees. There is strong parent and community involvement in all of the schools.

The Mentoring for Success Program works with students at Renfroe Middle School and Decatur High School. Renfroe, a Title 1 School, has a current enrollment of 589 students in grades 6-8. The student body of the school is representative of diverse cultural and economic backgrounds and ability levels which is highly valued and promoted. The faculty members are professionals who are committed to cultivating and nurturing achievement in all students as evidenced by the school's consistently high performance on state and national achievement tests. Renfroe has been designated as a Georgia Beacon School in recognition of its progress in meeting nationally endorsed criteria for high performing middle schools, including measurable gains in the academic achievement of all students. As such, Renfroe serves as a model and mentor for other schools seeking to effect similar improvements.

Decatur High School has a current enrollment of 712 students in grades 9-12. Throughout the school's history there has been a strong emphasis on academic achievement. The students' consistent above-average performance on standardized tests is a testimony to that focus. Members of the faculty are highly trained professionals who make every effort to ensure the success of all of their students. This is facilitated by a relatively small teacher/student ratio which allows teachers to give special attention to the needs of individual students. Typically, 85% of the graduating seniors continue their education after high school and, of those, 85% qualify for Georgia's HOPE scholarship. In addition to the academic program, students have a wide variety of athletics and activities with which to become involved.

Program Effectiveness

In the short time since the program was implemented, indications are that it has made a positive impact on the program's constituency. Data collected at the end of the first year revealed that targets related to achieving programmatic goals were all met or exceeded. Additionally, observations, as well as feedback on surveys from the student participants and their teachers, and comments from parents and school administrators, point to an overall heightened student interest in activities in science and mathematics, which has also had some carryover effect to other core subjects. College mentors overwhelmingly rated their experiences in the program as highly satisfying and rewarding. Their qualitative responses in assessing the personal value of participating in the program included a greater clarification of their own goals and values as well as a more focused approach to their academic development.

Females and minorities still enter careers in the quantitative fields in disproportionately low numbers. Thus a program such as Mentoring for Success, with its mechanisms to enhance student knowledge and skills, provide motivation and support, and monitor and advise students, is a valuable and much needed tool to aid in increasing the success rates of minority students in these fields.

CONCLUSIONS

This paper described two programs at the Georgia Institute of Technology that seek to improve K-12 math and science education by using undergraduate engineering students as tutors and mentors. Though the engineering curriculum is highly structured, allowing little free time outside of academic work, it is possible to develop programs that link students' strengths in mathematics and science to children who can benefit from one-on-one or small group tutoring. Furthermore, taking advantage of alternative funding sources- such as Federal Work-Study and foundation grants- can provide seed money from which to initiate and sustain such programs. Though a detailed evaluation and assessment of these programs' effectiveness is not presented here, preliminary qualitative results indicate that involvement of undergraduate engineering students in K-12 tutoring and mentoring programs has a positive impact both on the college students and the children with whom they work. Therefore, it is hoped that more higher education institutions with engineering programs consider utilizing these models to improve the mathematics, science, and technology education of their surrounding communities.

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