

*Auburn University*

*Evaluation of  
Research Experience in  
Pervasive and Mobile  
Computing*

**Summer 2008**

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## **Introduction**

The Center for Governmental Services Survey Research Lab at Auburn University contracted with the Department of Engineering to evaluate the 2008 summer *Auburn University Research Experience for Undergraduates in Pervasive and Mobile Computing*. The purpose of the evaluation was to determine how well the program met the following core goals:

- Increase the number of future professionals in the areas of pervasive and mobile computing.
- Develop students' ability to apply computer and information-based technologies to real-world problems.
- Stimulate enrollment in graduate studies through the involvement of students in scientific investigations under the mentorship of research faculty.
- Promote collaborative ties between the student's institution and Auburn University faculty, staff, and students and to provide a basis for future cooperative studies.

Pre-program and post-program evaluations were conducted in order to gauge how well the program met these goals. On the first and last day of the program, students were asked to fill out in-depth questionnaires to determine the success of the program.

## Participants

The *Auburn University Research Experience for Undergraduates in Pervasive and Mobile Computing* program included ten undergraduates from around the United States. Five participants were from Alabama, and other students represented Pennsylvania, South Carolina, Virginia, Kentucky and West Virginia.

Seven students had two family members who were engineers or scientists. All of the students had previous research or work experience

When asked why they decided to apply to the program, most participants said they wanted to find some summer jobs and have some research experience. Other reasons included:

- Topic was interesting
- Have more technical knowledge
- Location and timing was favorable

Participants had a strong sense that pervasive and mobile computing is, and will remain, an important field that will promote technological advances. They considered mobile computing very important due to the potential for day-to-day application and the ability to improve the standard of living.

### *Highlights:*

*The 2008 REU program included ten participants from states across the Country.*

*Students had different reasons for attending the program including the desire to have additional research knowledge and experience.*

## Accommodations

At the beginning of the program, all of the students reported that faculty and staff contacts with whom they communicated via e-mail were very helpful. A majority also felt that they were given adequate information about what to expect regarding housing, travel and expenses.

**Based on communication through e-mail, the contacts for the department were thought to be very helpful**

	Frequency	Percent
Strongly Agree	9	90
Somewhat Agree	1	10
Total	10	100

**Adequate information about housing, travel and other expenses was provided by the department so I knew what to expect when I got to Auburn**

	Frequency	Percent
Strongly Agree	5	50
Somewhat Agree	4	40
No Opinion	1	10
Total	10	100

Follow-up questions at the end of the program confirmed that most students agreed that they were reimbursed for travel as they expected, and that the amount was sufficient to meet their needs. Similarly, most participants strongly agreed that he or she received meal allowances and stipends as they anticipated and most considered the amounts adequate.

**The amount of allowable travel reimbursement was adequate to meet my financial needs**

	Frequency	Percent
Strongly Agree	7	70
Somewhat Agree	1	10
No Opinion	1	10
Somewhat Disagree	1	10
Total	10	100

### *Highlights:*

*All of the students at least somewhat agreed that department members with whom they communicated were very helpful.*

*Participants widely agreed that they had adequate advance information about travel, housing, and expenses so they knew what to expect in Auburn.*

*Funding for travel and meal allowances was adequate to meet most students' needs.*

**The meal allowance/stipend was adequate to meet my financial needs**

	Frequency	Percent
Strongly Agree	6	60
Somewhat Agree	4	40
Total	10	100

Six out of ten students agreed that housing arrangements were satisfactory. Also, all students felt that they were welcomed at Auburn and felt at home when they first arrived at the campus. By the end of the program, all students agreed that they felt welcomed and at home throughout the summer.

**Housing arrangements were satisfactory**

	Frequency	Percent
Strongly Agree	3	30
Somewhat Agree	3	30
No Opinion	2	20
Somewhat Disagree	2	20
Total	10	100

**Upon arriving at Auburn, I was welcomed and felt at home**

	Frequency	Percent
Strongly Agree	7	70
Somewhat Agree	3	30
Total	10	100

**During my stay at Auburn, I was welcomed and felt at home**

	Frequency	Percent
Strongly Agree	6	60
Somewhat Agree	4	40
Total	10	100

Number who Changed Opinion	Upon Arrival	During Stay
2	Strongly Agree	Somewhat Agree
1	Somewhat Agree	Strongly Agree

**Major Points:**

*Six out of ten found housing arrangements satisfactory.*

*All students agreed that they felt welcome upon arrival and during their stay in Auburn.*

Social events were coordinated to help participants acclimate to the program and the environment. Six of the ten students agreed that social events were enjoyable and four said it helped them feel comfortable. Those who were less satisfied noted that it would be helpful to have a few social events with other REU groups.

**Major Points:**

*Some participants were less satisfied with social events than others.*

**Social events that took place during the program were enjoyable**

	Frequency	Percent
Strongly Agree	5	50
Somewhat Agree	1	10
No Opinion	3	30
Somewhat Disagree	1	10
Total	10	100

**Social events that took place during the program helped me feel more comfortable**

	Frequency	Percent
Strongly Agree	2	22.2
Somewhat Agree	2	22.2
No Opinion	4	44.4
Somewhat Disagree	1	11.1
Total	9	100

## Program Expectations

At the beginning of the program, all students agreed that they had a pretty good idea of what to expect based on information provided by the Department. After completing the program, some participants changed their opinions about how well the information helped them have clear expectations of the summer project.

### Based on information provided by the department, I believe I have a pretty good idea of what to expect from the summer project

	Frequency	Percent
Strongly Agree	5	50
Somewhat Agree	5	50
Total	10	100

### Information provided to me by the department prior to the start of the program gave me a good idea of what to expect from the summer project

	Frequency	Percent
Strongly Agree	4	40
Somewhat Agree	3	30
No Opinion	0	0
Somewhat Disagree	3	30
Total	10	100

Number who Changed Opinion	Before Program	After Program
1	Somewhat Agree	Strongly Agree
1	Somewhat Agree	Somewhat Disagree
2	Strongly Agree	Somewhat Disagree

### Highlights:

*In the beginning all students agreed that information provided by the department gave them a pretty good idea of what they could expect from the REU project. Three of them however disagreed with that after they completed the program.*

At the beginning of the summer, all students felt sufficiently prepared for the project requirements of the program. When looking back over their summer experiences, a majority still felt that they were sufficiently prepared. When asked a companion question at the conclusion of the program, one participant indicated that they felt under-prepared for their project because they had never written a paper before; on the other hand, another student felt over-prepared, noting that they felt they were the only one working in the group while others were depending upon their work.

**Thinking about the information you have received about this program, and the education that you have so far received as an undergraduate, how prepared do you feel you are for the project requirements of this program**

	Frequency	Percent
Under Prepared	0	0
Sufficiently Prepared	10	100
Over Prepared	0	0
Not Sure	0	0
Total	10	100

**How prepared do you feel you were for the project requirements for this program**

	Frequency	Percent
Under Prepared	1	10
Sufficiently Prepared	8	80
Over Prepared	1	10
Total	10	100

Two students changed their opinions about how prepared they were for the project requirements by the conclusion of the program.

Number who Changed Opinion	Before Program	After Program
1	Sufficiently prepared	Under prepared
1	Sufficiently prepared	Over prepared

**Major Points:**

*Overall, all students felt that they were adequately prepared for the project requirements before entering the program.*

*When students reviewed their experiences at the end of the program, a majority continued to agree that they were sufficiently prepared for project requirements.*

Most participants agreed that information provided about the program before the beginning of the program accurately reflected what took place during the summer. However, three somewhat disagreed.

**Information provided to me by the department prior to the start of the program accurately reflected what actually took place**

	Frequency	Percent
Strongly Agree	4	40
Somewhat Agree	3	30
Somewhat Disagree	3	30
Total	10	100

Most students agreed that they participated in specific activities that program literature described.

**As part of my experience in the program, I conducted extensive reading and research on a new topic**

	Frequency	Percent
Strongly Agree	8	80
Somewhat Agree	1	10
Somewhat Disagree	1	10
Total	10	100

**During the program, I learned more about how to design and execute well-planned experiments**

	Frequency	Percent
Strongly Agree	3	30
Somewhat Agree	5	50
Somewhat Disagree	1	10
Strongly Disagree	1	10
Total	10	100

**As part of my experience in the program, I learned how to write quality formal research papers**

	Frequency	Percent
Strongly Agree	3	30
Somewhat Agree	5	50
No Opinion	1	10
Somewhat Disagree	1	10
Total	10	100

**Major Points:**

*A majority of participants agreed that information provided before the commencement of the program accurately reflected what occurred during the program.*

*Most participants conducted extensive research, learned how to write research papers, and design and execute experiments.*

**I became more knowledgeable about how to prepare and deliver presentations to an audience through my experiences in the program**

	Frequency	Percent
Strongly Agree	8	80
Somewhat Agree	1	10
Somewhat Disagree	1	10
Total	10	100

**As part of my participation in the program, I developed a web page describing my project and experience**

	Frequency	Percent
Yes	10	100

*Major Points:*

*Every program participant developed a web page describing his or her project and experience.*

## Instruction and Advising/Mentoring

Six out of the ten students felt that weekly seminars provided relevant and useful information. In addition, a majority of the students agreed that the information was appropriate for their level of education. One student had no opinion while two students only somewhat agreed that the information was appropriate for their level of education.

### Weekly seminars provided relevant and useful information about pervasive and mobile computing

	Frequency	Percent
Strongly Agree	2	20
Somewhat Agree	4	40
No Opinion	2	20
Somewhat Disagree	1	10
Strongly Disagree	1	10
Total	10	100

### Did you feel that the information presented at weekly seminars was appropriate for your educational level (new and challenging enough to be interesting, but not so advanced that you felt lost)

	Frequency	Percent
Strongly Agree	5	62.5
Somewhat Agree	2	25.0
No Opinion	1	12.5
Total	8	100

One student took field trips as part of the project and agreed that the trips offered relevant learning experiences.

### Did field trips taken during the program offer learning experiences that were relevant

	Frequency	Percent
Strongly Agree	1	100

### Major Points:

*Six of the ten participants felt that they received relevant and useful information during weekly seminars and that such information was adequate to their education levels.*

All students agreed that they met once a week with their advisor or mentor to plan weekly goals, and that the meetings occurred once a week to review progress in goal attainment.

**During the program, I met with an advisor/mentor to plan weekly goals**

	Frequency	Percent
Strongly Agree	3	30
Somewhat Agree	7	70
Total	10	100

**During the program, I met with my advisor/mentor at least once a week to review my progress in meeting my goals**

	Frequency	Percent
Strongly Agree	6	66.67
Somewhat Agree	3	33.33
Total	9	100

All students noted that goals were set through collaboration and that the goals were attainable.

**Goals set with my advisor/mentor were made collaboratively and my input was taken into consideration**

	Frequency	Percent
Strongly Agree	10	100

**Goals set with my advisor/mentor were attainable**

	Frequency	Percent
Strongly Agree	7	70
Somewhat Agree	3	30
Total	10	100

All students agreed that mentors or advisors were approachable and available.

**I was able to approach my advisor or mentor with any questions I had regarding the program or work that was undertaken**

	Frequency	Percent
Strongly Agree	10	100

**Major Points:**

*Weekly meetings took place so advisors and students could plan goals or track progress.*

*All of students agreed that goals were made through collaboration and were attainable.*

**My advisor/mentor made him- or herself available to me when I needed help or advice**

	Frequency	Percent
Strongly Agree	8	80
Somewhat Agree	2	20
Total	10	100

Almost every student expressed satisfaction with the level of interest shown in their projects by advisors or mentors. Most agreed that a positive working relationship was developed with advisors or mentors.

**I am satisfied with the level of interest that my advisor/mentor showed in my project throughout this program**

	Frequency	Percent
Strongly Agree	1	10
Somewhat Agree	5	50
Somewhat Disagree	1	10
Total	10	100

**I developed a positive working relationship with my advisor/mentor**

	Frequency	Percent
Strongly Agree	9	90
No Opinion	1	10
Total	10	100

A majority of students agreed that a graduate assistant was available and approachable when help was needed.

*Major Points:*

*There was strong agreement that mentors were approachable and available to assist students.*

*Most participants developed positive working relationships with advisors and were mostly satisfied with the level of interest advisors showed toward their efforts.*

**There was a graduate assistant available who I was able to approach for help if needed**

	Frequency	Percent
Strongly Agree	6	66.67
No Opinion	3	33.33
Total	9	100

Seven students agreed that they felt comfortable seeking assistance from the Academic Director. While the majority of students for the most part felt comfortable approaching faculty members for assistance, two indicated that they did not feel comfortable.

**I felt comfortable that I could approach the Academic Director for assistance with general research questions, issues with a mentor, program questions, or other issues.**

	Frequency	Percent
Strongly Agree	5	50
Somewhat Agree	2	20
No Opinion	2	20
Somewhat Disagree	1	10
Total	10	100

**I felt comfortable that I could approach other faculty members who were knowledgeable about my research area for assistance, if needed**

	Frequency	Percent
Strongly Agree	1	11.11
Somewhat Agree	5	55.56
No Opinion	1	11.11
Somewhat Disagree	2	22.22
Total	9	100

*Major Points:*

*Six of the students agreed that there was a graduate assistant available to provide assistance.*

*Most felt that students could seek help from the Academic Director if needed.*

*Six participants felt that, for the most part, faculty members could be comfortably approached for assistance.*

## Confidence in Abilities

At both the beginning and the end of the program students were asked to rate how confident they felt in the strength of a number of their abilities. For most of these abilities, participants felt more confident at the end of the program than they were at the beginning of the program.

While more students claimed the ability to work in a group as a *definite strength* after completing the program, students felt more confidence working individually too.

### Ability to work in a group (before)

	Frequency	Percent
Definitely One of My Strengths	2	20
Somewhat Strong, But Could Use Improvement	8	80
Total	10	100

### Ability to work in a group (after)

	Frequency	Percent
Definitely One of My Strengths	5	50
Somewhat Strong, But Could Use Improvement	4	40
Definitely not one of my strengths	1	10
Total	10	100

### Ability to work independently on an engineering project (before)

	Frequency	Percent
Definitely One of My Strengths	6	60
Somewhat Strong, But Could Use Improvement	3	30
Not Sure	1	10
Total	10	100

### Ability to work independently on an engineering project (after)

	Frequency	Percent
Definitely One of My Strengths	6	60
Somewhat Strong, But Could Use Improvement	4	40
Total	10	100

### Major Points:

*Slightly fewer students felt confident that they could work in a group after they completed the program.*

*Slightly more participants found that they were confident in being able to work independently on an engineering project at the end of summer.*

More students considered practical abilities, such as being able to solve creative engineering problems and applying technologies to real-world problems, as being strong areas after experiencing the program.

**Ability to solve creative engineering problems (before)**

	Frequency	Percent
Definitely One of My Strengths	4	40
Somewhat Strong, But Could Use Improvement	5	50
Not Sure	1	10
Total	10	100

**Ability to solve creative engineering problems (after)**

	Frequency	Percent
Definitely One of My Strengths	5	50
Somewhat Strong, But Could Use Improvement	5	50
Total	10	100

**Ability to apply computer and information-based technologies to real-world problems (before)**

	Frequency	Percent
Definitely One of My Strengths	4	40
Somewhat Strong, But Could Use Improvement	4	40
Not Sure	2	20
Total	10	100

**Ability to apply computer and information-based technologies to real-world problems (after)**

	Frequency	Percent
Definitely One of My Strengths	7	70
Somewhat Strong, But Could Use Improvement	3	30
Total	10	100

**Major Points:**

*Students felt greater confidence that they could apply lessons to solve problems after they experienced the program.*

Students expressed a greater ability to complete an engineering project and present research results in reports or presentations after concluding the program.

**Ability to complete an engineering project (before)**

	Frequency	Percent
Definitely One of My Strengths	3	30
Somewhat Strong, But Could Use Improvement	4	40
Definitely Not one of My Strengths	1	10
Not Sure	2	20
Total	10	100

**Ability to complete an engineering project (after)**

	Frequency	Percent
Definitely One of My Strengths	1	10
Somewhat Strong, But Could Use Improvement	9	90
Total	10	100

**Ability to write research reports (before)**

	Frequency	Percent
Definitely One of My Strengths	1	10
Somewhat Strong, But Could Use Improvement	1	10
Definitely Not One of My Strengths	6	60
Not Sure	2	20
Total	10	100

**Ability to write research reports (after)**

	Frequency	Percent
Definitely One of My Strengths	1	10
Somewhat Strong, But Could Use Improvement	7	70
Definitely Not One of My Strengths	2	20
Total	10	100

**Major Points:**

*More students felt that they were able to complete an engineering problem after the course than before and that they could successfully explain results in written reports.*

**Ability to make project presentations (before)**

	Frequency	Percent
Definitely One of My Strengths	1	10
Somewhat Strong, But Could Use Improvement	8	80
Not sure	1	10
Total	10	100

**Ability to make project presentations (after)**

	Frequency	Percent
Definitely One of My Strengths	5	50
Somewhat Strong, But Could Use Improvement	4	40
Definitely Not One of My Strengths	1	10
Total	10	100

**Major Points:**

*There was stronger confidence among students that they could make project presentations after their summer experiences.*

## Perceptions about Engineers and the Engineering Field

At the beginning of the summer program, students were asked what they considered qualities and skills that make a good engineer in the areas of pervasive and mobile computing. Most of them mentioned knowledge of networking and mobile devices, programming skills, drive, determination and a willingness to learn.

After the participants completed the program, they were able to better specify the skills that would be needed by engineers in pervasive and mobile computing. There was a strong consensus that these engineers need to be willing to learn new things, should have analytical and problem solving skills, a strong math background, research skills and work ethics. Some pointed out the knowledge of devices and software being used.

Students were asked a number of questions at the beginning and end of the program designed to assess perceptions about engineers and engineering. Questions were asked to assess perceptions of what engineers' work entails; engineering working conditions; what knowledge or intelligence is required of engineers; how engineering is related to U.S. success; and how engineering might affect the student on an individual level.

### *Major Points:*

*After the program was completed, more students identified concrete skills and abilities that make a good engineer.*

In the beginning some students had an opinion that engineers primarily deal with theory. By the end of the summer, though, most felt that engineers indeed get to do practical works.

*Major Points:  
Upon the completion of the program, participants more strongly felt that engineering is not only about theories and that they get to do practical work.*

**Engineers deal primarily with theory (before)**

	Frequency	Percent
Somewhat Agree	2	20
Somewhat Disagree	5	50
Strongly Disagree	3	30
Total	10	100

**Engineers deal primarily with theory (after)**

	Frequency	Percent
Somewhat Agree	1	10
Somewhat Disagree	4	40
Strongly Disagree	5	50
Total	10	100

**A problem with engineering is that engineers seldom get to do anything practical (before)**

	Frequency	Percent
No Opinion	1	10
Somewhat Disagree	3	30
Strongly Disagree	6	60
Total	10	100

**A problem with engineering is that engineers seldom get to do anything practical (after)**

	Frequency	Percent
Strongly Disagree	10	100

Fewer students felt that engineers spend most of their time doing complex math after concluding the program.

**Engineers spend most of their time doing complex mathematical calculations (before)**

	Frequency	Percent
Somewhat Agree	2	20
Somewhat Disagree	5	50
Strongly Disagree	3	30
Total	10	100

**Engineers spend most of their time doing complex mathematical calculations (after)**

	Frequency	Percent
Somewhat Agree	1	10
Somewhat Disagree	4	40
Strongly Disagree	5	50
Total	10	100

From the beginning most had opinions that engineers spend time dealing with other people. By the end of the program, students more strongly agreed that engineers spend time dealing with others.

**Engineers spend relatively little time dealing with other people (before)**

	Frequency	Percent
Somewhat Agree	1	10
Somewhat Disagree	4	40
Strongly Disagree	5	50
Total	10	100

**Engineers spend relatively little time dealing with other people (after)**

	Frequency	Percent
Somewhat disagree	3	30
Strongly Disagree	7	70
Total	10	100

**Major Points:**

*Most students decided that engineers do not necessarily spend most of their time doing complex math by the end of the program.*

*Participants realized more strongly that engineers spend time with other people.*

Opinions about if engineers spend most of their time working in offices did not change drastically after the summer. By the end of the program, there was slightly stronger agreement that engineers spend most of their time in offices. One student expressed no opinion both before and after.

**Engineers spend most of their time working in offices (before)**

	Frequency	Percent
Somewhat Agree	3	30
No Opinion	1	10
Somewhat Disagree	4	40
Strongly Disagree	2	20
Total	10	100

**Engineers spend most of their time working in offices (after)**

	Frequency	Percent
Somewhat Agree	3	30
No Opinion	1	10
Somewhat Disagree	6	60
Total	10	100

By the end of the summer, one student thought that being a good engineer requires an IQ in the genius range. However their disagreement was also stronger later.

On the other hand, there was slightly stronger disagreement to the opinion that engineers need an inborn aptitude for science and mathematics.

**To be a good engineer requires an IQ in the genius range (before)**

	Frequency	Percent
Somewhat Disagree	4	40
Strongly Disagree	6	60
Total	10	100

**To be a good engineer requires an IQ in the genius range (after)**

	Frequency	Percent
Somewhat Agree	1	10
Somewhat Disagree	2	20
Strongly Disagree	7	70
Total	10	100

**Major Points:**

*After the program, there was slightly more disagreement that engineers work in offices most of the time.*

*One additional student agreed that a good engineer should have a very high IQ after the program was completed. However the overall disagreement was stronger afterwards.*

**Engineers need a great deal of inborn aptitude for science and mathematics  
(before)**

	Frequency	Percent
Strongly Agree	1	10
Somewhat Agree	6	60
Somewhat Disagree	3	30
Total	10	100

**Engineers need a great deal of inborn aptitude for science and mathematics  
(after)**

	Frequency	Percent
Strongly Agree	1	10
Somewhat Agree	6	60
Somewhat Disagree	2	20
Strongly Disagree	1	10
Total	10	100

At the start of the summer program, two students agreed that engineers seldom become involved in business decisions. Only one person expressed agreement about this question at the end of the program.

**Engineers seldom get involved in business decisions (before)**

	Frequency	Percent
Somewhat Agree	2	20
Somewhat Disagree	3	30
Strongly Disagree	5	50
Total	10	100

**Engineers seldom get involved in business decisions (after)**

	Frequency	Percent
Somewhat Agree	1	10
Somewhat Disagree	5	50
Strongly Disagree	4	40
Total	10	100

**Major Points:**

*There was slightly less agreement that engineers should have a great deal of inborn aptitude for science and mathematics by the time the program concluded.*

*After the program, more students felt that engineers get involved in business decisions.*

While most students expressed agreement that engineers need to be knowledgeable about economics before and after the summer, there was stronger agreement on this question before the program. There was also slightly more agreement in the beginning that engineers should be knowledgeable about political matters, but there was slightly more agreement that engineers should be knowledgeable about environmental issues at the completion of the program.

**Engineers need to be knowledgeable about economics (before)**

	Frequency	Percent
Strongly Agree	5	50
Somewhat Agree	5	50
Total	10	100

**Engineers need to be knowledgeable about economics (after)**

	Frequency	Percent
Strongly Agree	3	30
Somewhat Agree	6	60
Somewhat Disagree	1	10
Total	10	100

**Engineers need to be knowledgeable about political matters (before)**

	Frequency	Percent
Strongly Agree	2	20
Somewhat Agree	6	60
Somewhat Disagree	2	20
Total	10	100

**Engineers need to be knowledgeable about political matters (after)**

	Frequency	Percent
Strongly Agree	1	10
Somewhat Agree	6	60
No Opinion	1	10
Somewhat Disagree	2	20
Total	10	100

**Major Points:**

*Almost all of the program participants expressed agreement that engineers should have knowledge about economics both before and after.*

*Most agreed that engineers should know about political matters.*

**Engineers need to be knowledgeable about environmental issues (before)**

	Frequency	Percent
Strongly Agree	5	50
Somewhat Agree	4	40
No Opinion	1	10
Total	10	100

**Engineers need to be knowledgeable about environmental issues (after)**

	Frequency	Percent
Strongly Agree	4	40
Somewhat Agree	6	60
Total	10	100

For the most part, students felt that engineers need to deal with questions about ethical issues before and after the program, but after the program one student somewhat agreed that engineers have little to do with ethical issues.

**Engineers have little need to deal with questions about ethical issues (before)**

	Frequency	Percent
Somewhat Disagree	4	40
Strongly Disagree	6	60
Total	10	100

**Engineers have little need to deal with questions about ethical issues (after)**

	Frequency	Percent
Somewhat Agree	1	10
Somewhat Disagree	3	30
Strongly Disagree	6	60
Total	10	100

**Major Points:**

*While a majority of students felt that engineers should be knowledgeable about environmental issues, there was slightly more agreement at the end of the summer.*

*For the most part, students recognized at both the start and the end of the program that engineers have a need to deal with questions about ethics.*

Both before and after the program, all students expressed agreement that engineering is important to future U.S. economic success, and a majority strongly agreed.

**Engineering is important to future U.S. economic success in the world (before)**

	Frequency	Percent
Strongly Agree	9	90
Somewhat Agree	1	10
Total	10	100

**Engineering is important to future U.S. economic success in the world (after)**

	Frequency	Percent
Strongly Agree	9	90
Somewhat Agree	1	10
Total	10	100

At the start of the program, all participants disagreed that engineering job availability depends upon defense spending. By the end of the summer, there was considerable agreement on that opinion.

**In engineering, job availability is highly dependent upon defense spending (before)**

	Frequency	Percent
Somewhat Disagree	4	40
Strongly Disagree	6	60
Total	10	100

**In engineering, job availability is highly dependent upon defense spending (after)**

	Frequency	Percent
Somewhat Agree	3	30
No Opinion	1	10
Somewhat Disagree	3	30
Strongly Disagree	3	30
Total	10	100

**Major Points:**

*All students agreed that engineering is important to U.S. economic success before and after the program.*

*Initially all disagreed that engineering job availability is dependent upon defense spending. However, the opinion turned mixed later.*

When students were asked about potential benefits engineers receive from working in the field, most strongly agreed that an engineering career would be financially rewarding at both the beginning and the end of the program. Most students also agreed that skills learned in engineering would be useful in everyday life.

**A career in engineering will be financially rewarding (before)**

	Frequency	Percent
Strongly Agree	8	80
Somewhat Agree	2	20
Total	10	100

**A career in engineering will be financially rewarding (after)**

	Frequency	Percent
Strongly Agree	7	70
Somewhat Agree	2	20
Somewhat Disagree	1	10
Total	10	100

**Most of the skills learned in engineering will be useful in everyday life (before)**

	Frequency	Percent
Strongly Agree	4	40
Somewhat Agree	5	50
Somewhat Disagree	1	10
Total	10	100

**Most of the skills learned in engineering will be useful in everyday life (after)**

	Frequency	Percent
Strongly Agree	5	50
Somewhat Agree	4	40
No Opinion	1	10
Total	10	100

**Major Points:**

*All but one participant maintained the belief that a career in engineering would be financially rewarding and that skills learned in engineering would be useful in everyday life.*

## Perceptions about Achievements

Overall, participants in the program were satisfied with the research that they conducted over the summer, and a majority of participants were *very satisfied*.

### How satisfied are you with the research that you conducted this summer

	Frequency	Percent
Very Satisfied	5	50
Somewhat Satisfied	3	30
Not Very Satisfied	2	20
Total	10	100

Students were asked at the beginning of the program what they hoped to gain from their experience and then were asked what they did gain at the completion. Students who responded to both questions indicated that they did gain significant knowledge, skills, or benefits that they hoped to gain from their program experiences.

What knowledge, skills, or other benefits do you hope to gain? <i>(In descending order of frequency of responses)</i>	What knowledge, skills, or other benefits did you gain? <i>(In descending order of frequency of responses)</i>
<ul style="list-style-type: none"> <li>Gain technical knowledge of several kinds (programming, wireless networking etc.)</li> <li>Learn how to conduct research</li> <li>Get help getting into a good grad school</li> <li>Write technical reports</li> <li>Present research effectively</li> <li>Work independently</li> <li>Work in groups</li> </ul>	<ul style="list-style-type: none"> <li>Gained technical knowledge of several kinds (writing software, network simulation, CTT, HTML, using map to write software etc.)</li> <li>Learned about paper writing.</li> <li>Improved presentation skills.</li> <li>Developed new contacts</li> <li>Learned to work in groups</li> </ul>

### Major Points:

*Generally, there was a high level of satisfaction with research conducted in the program.*

*Most students gained skills or benefits that they hoped to obtain through their experiences in the program.*

When asked what the most valuable thing that students learned about research from the program, seven students mentioned the need to have patience and explore things. Some participants also found it difficult and risky in the sense that you may not get any results. Some of them also acknowledged that research is not very difficult and it can be fun.

***Major Points:***

*Participants understood the need to have patience and keep exploring to succeed in research. Some of them found it fun too.*

## Future Plans and Expectations

After the program, more participants planned to pursue a graduate degree in computer science and software engineering than did so at the start of the summer. Most of the students agreed that the program helped them decide their future education goals and prepare for graduate education.

### After receiving your bachelor's degree, are you planning to pursue a graduate in computer science and software engineering (before)

	Frequency	Percent
Yes, Definitely	3	30
Maybe	5	50
Definitely Not	2	20
Total	10	100

### After receiving my bachelor's degree, I am planning to pursue a graduate degree in computer science and software engineering (after)

	Frequency	Percent
Yes, Definitely	3	30
Maybe	6	60
Definitely Not	1	10
Total	10	100

### I feel that this program helped me decide on future education goals

	Frequency	Percent
Strongly Agree	5	50
Somewhat Agree	5	50
Total	10	100

### I feel that this program helped me prepare for graduate education

	Frequency	Percent
Strongly Agree	5	50
Somewhat Agree	2	20
No Opinion	3	30
Total	10	100

### Major Points:

*Eight students considered pursuing graduate studies in computer science and software engineering at the start of the program while nine expected to do so at the conclusion.*

*There was widespread agreement that the REU program helped students decide future education goals and prepare for graduate studies.*

All of the participants agreed that they learned something in the program that they can apply in real world situations in the future. Of these, a majority felt strongly that this was true.

**I feel that I learned something in this program that I will be able to take with me and apply in real world situations**

	Frequency	Percent
Strongly Agree	7	70
Somewhat Agree	2	20
Somewhat Disagree	1	10
Total	10	100

The students elaborated. Typical comments included:

- *I now have an understanding of the basics of research. I can use this to help me decide whether or not I want to go to graduate school.*
- *I learned a great deal about how to efficiently research a topic, create and experiment, and write the results in a paper.*
- *This program taught me how to work with partner/mentors to achieve goals that were set. ... I also received a lot of useful information on presentations.*
- *I have learned “what graduate school really is”. ...A lot of stuff about networking, also how to conduct experiments*
- *I will be able to use my skills in technical writing and making presentations that were honed through this experience in the future.*
- *I learned the importance of communication; be it through papers, presentations, talking in a group, etc... I'm ...the type who works alone until the task is finished. However, in the real world, people give clear presentations of what they are doing.*
- *...I have improved my skills in programming through this program.*

Most of the students agreed that they will be very comfortable recommending the REU program to other undergraduates at their home institutions. The majority strongly agreed.

**I will be very comfortable recommending this program to other engineering undergraduates at my home institution**

	Frequency	Percent
Strongly Agree	8	80
Somewhat Agree	1	10
No Opinion	1	10
Total	10	100

**Major Points:**

*There was strong agreement that students learned things in the program that they would apply in real world situations.*

*Almost all agreed that they would feel “very comfortable” recommending the REU program to others.*

## Conclusions

Results of the pre- and post-program surveys indicated that students had positive experiences over the summer course. Overall, they felt welcome and comfortable at Auburn and in the program. They described having accurate expectations of program requirements, felt well prepared, and clearly understood what they would be doing during the course of the summer.

There was general agreement that the mentoring process went well and that students were satisfied with their interactions with advisors and department members. Also, through the course of the program, students gained confidence in many of their abilities. However, they felt better able to work individually than in groups. They gained confidence to solve engineering and technology problems, and to complete a research project successfully and present results in writing or through presentations.

Students had very clear expectations about what they would like to gain from participation in the program. Many of their expectations were met. They reported that they learned about the field of Pervasive and Mobile Computing. They also gained a greater understanding of how to conduct engineering research, how to prepare written research reports, and how to present research results. They gained knowledge about the importance of teamwork and honed specific skills such as programming.

Most of the students plan to attend a graduate program in computer science and software engineering. They agreed that the program helped them decide future education goals and that the program helped prepare them for advanced education. They also felt that they would be able to apply what they learned in the program in the real world.

Almost all of the students said that they could comfortably recommend the program to others.

## **Achievement of Program Goals**

Each of the four core program goals was significantly achieved:

*Increase the number of future professionals in the areas of pervasive and mobile computing.*

The participants in the program showed a greater inclination to enter the field of pervasive and mobile computing because of their experiences in the summer program. If they do enter this field, they have more confidence in their ability to conduct rigorous research and to contribute professionally to the field by proficiently writing technical research reports and presenting information to colleagues.

*Develop students' ability to apply computer and information-based technologies to real-world problems.*

Students participated in a number of activities that developed their abilities to apply what they learned in the program to real-world problems. They expressed more confidence in their ability to apply technology to such problems by the end of their experience. Through practical application, participants gained greater confidence in being able to solve creative engineering problems and complete an engineering project.

*Stimulate enrollment in graduate studies through the involvement of students in scientific investigations under the mentorship of research faculty.*

Students expressed a desire to learn how to conduct research in preparation for graduate studies in the REU program. They enjoyed positive mentoring relationships and were able to gain an understanding of graduate education. Participants worked in an environment that required teamwork and collaboration similar to what they would experience in a graduate environment. At the end of their experience in the program, most students were planning to pursue a graduate degree in computer science and software engineering. They indicated that the REU program helped them decide on and prepare for their future education goals.

*Promote collaborative ties between the student's institution and Auburn University faculty, staff, and students and to provide a basis for future cooperative studies.*

Results of the program evaluation indicate that participants enjoyed a very collegial atmosphere in which they developed networks that should persist in the future. They expect to take what they learned in their experience and apply it at their home institutions. Participants, overall, strongly agreed that they will recommend the REU program when they return home.

## **Comparison with 2007 Program**

In 2007 and 2008, the REU program evaluations indicated that students were satisfied with their experiences. Important similarities and differences are outlined below.

### Accommodations

Overall, students seemed more satisfied with accommodations and hospitality in 2007 compared to 2008. This year they felt more welcome upon arrival and over the duration of the program but were slightly satisfied with housing and funding arrangements.

### Program Expectations

Compared to the previous year, there was a better understanding about what to expect during the program. In addition, a greater percentage of students concluded that they were prepared for the program requirements by the end of the 2008 program.

### Instruction and Advising/Mentoring

Overall, students in 2007 seemed to be more satisfied with the advising/mentoring process than students were in 2007. Students in both years, more often than not, felt comfortable seeking assistance from other members of the department. This was almost the same in both years.

### Confidence in Abilities

In 2007 and 2008, students expressed little confidence in their ability to write research reports in the beginning. In 2007, though, students received a greater boost in confidence that they could write research reports over the course of the program than did students in 2008. Greater percentage of people gained confidence in group work in 2007 than in 2008.

### Perceptions about Engineers and the Engineering Field

From the beginning 2008 participants had better perception about engineering profession than previous year.

In 2008, opinions slightly changed about whether engineers primarily deal with theory or seldom get to do anything practical. In 2007 it had remained mostly the same.

In 2007 and 2008, many students disagreed that a good engineer must have a very high IQ (genius range) or need a great deal of inborn aptitude for science and mathematics. However, this year one person agreed to that later.

In 2007, some students agreed that job availability in engineering is highly dependent upon defense spending both at the beginning and at the end of the program. In 2008, all students disagreed to that initially. Opinions turned mixed at the end of the program in 2008.

### Perceptions about Achievements

While students in both 2007 and 2008 gained hoped-for knowledge, skills, or other benefits from their experiences in the programs, the group in 2008 seemed to find greatest value in learning

technical skills and research. The group of students in 2007 placed greater value on time management skills.

#### Future Plans and Expectations

Most students in both 2007 and 2008 expected to attend graduate school to pursue a degree in computer science and software engineering, but there was stronger agreement in 2007 that the program helped them to prepare for graduate education.