

Gearing Up for Transportation Engineering, A Summer Institute: Phase IX

By

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Prepared by

UTCA

University Transportation Center for Alabama

The University of Alabama, The University of Alabama in Birmingham,
and the University of Alabama in Huntsville

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16. Abstract The numbers of female and minority students enrolled in engineering schools are increasing slowly, however there is still a relatively small percentage drawn to the field of transportation civil engineering. As a consequence, there is a need to educate young people about the profession to encourage under-represented individuals to appreciate the contributions of engineers to society and encourage them to become civil engineers. This summer institute project consisted of bringing middle school students, after recommendations by their teachers, to the University of Alabama in Huntsville campus to learn about engineering as a career and experience a variety of transportation engineering design topics. The participants gained knowledge about the role of engineers in society as well as learned how engineers use their knowledge in design applications. An additional program was held this year in which the alumni were invited back for more advanced research in civil engineering projects. Several UAH faculty members and Society of Women Engineer professionals acted as team mentors. As an important part of this project, local minority and female engineers served as mentors for the program. This was the ninth year of the transportation summer program at UAH.			
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Executive Summary

The numbers of female and minority students enrolled in engineering schools are increasing slowly, however there is still a relatively small percentage drawn to the field of transportation engineering. As a consequence, there is a need to educate young people about the profession to encourage under-represented individuals to appreciate the contributions of engineers and encourage them to become civil engineers. This summer institute project consisted of two programs, the first was similar to previous years where 20 middle school students were invited to The University of Alabama in Huntsville (UAH) campus to learn about engineering as a career and experience a variety of transportation engineering design topics. The participants gained knowledge about the role of engineers in society as well as learned how engineers use their knowledge in design applications. The second program was a school visit and transportation engineering challenge for middle school classes held on campus. A technical paper was prepared and presented at an ASCE national conference.

Four UAH engineering faculty members, as well as professionals representing the Society of Women Engineer (SWE), NASA Marshall Space Flight Center, and National Society of Black Engineers acted as instructors for the hands on laboratories. As an important part of this project, several minority and female engineering students served as mentors for the program.

1.0 Introduction

Problem Statement

Objectives

The numbers of female and minority students has been increasing overall in engineering and science (National Commission on Excellence in Education, 1983), however there is still a relatively small percentage drawn to the field of civil and transportation engineering. As a consequence, there is a need to educate young people about the profession to encourage under-represented individuals to become engineers and contribute to transportation technology.

Approach

The major goal of this program was to introduce middle school students, with preference to under-represented groups, to basic engineering and transportation-related concepts. An additional approach of the project was to draft local minority and female engineers to act as team instructors and mentors. Participants used real world examples and new technologies in their hands-on activities to reinforce the concepts presented by the engineering mentors. A final comprehensive team project was used to tie all the knowledge together in a design competition.

2.0 Background

Purpose

In past years, the University of Alabama in Huntsville (UAH) and the American Society of Civil Engineers (ASCE) worked with local schools in the Huntsville, Madison County and Morgan County area and became aware that local public schools do not have any formal relationship with the engineering academic and technical community. In addition, all those school systems have a high ratio of minority students, approximately 25 percent of total enrollment. As a consequence, local county middle and “science magnet” school principals and teachers were asked to nominate students for this Summer Institute. Under-represented students, female and minorities, were given preference. This Summer Institute project consisted of bringing selected middle school students to the UAH campus to learn about various aspects of engineering and experience transportation-related design and safety topics. A committee consisting of representatives from each of the participating groups selected these participants based on potential rather than classroom grades. These students were selected based on their interest and performance in the past. This year a survey instrument was disseminated to past participants (2002-2004) to assess if their exposure to engineering had any impact on their choice of careers and college

A new element that was added for this year was a transportation engineering challenge. It was offered on a limited scale to local middle school teachers so that a larger number of students would be exposed to the program. The school visits were followed up with a “transportation engineering” challenge held on campus during engineer’s week. This opportunity may encourage them to consider civil and transportation engineering as a career option and increase diversity of the workforce, a problem in some areas of the country (US DOT, 2000).

3.0 Methodology

Program Strategy

Recent efforts to reform science education in schools have led to the development of the Science/Technology/Society (STS) teaching method. Some important aspects of the STS method are that students must feel a concept is personally useful for solving specific problems, and students who learn through an experience will retain information and will be better able to apply the information later to new situations. Alabama has adopted a policy for effective instructional strategies to ensure that students are actively engaged in the learning process, have opportunities for interaction with the environment, and have time for reflection upon learning. Members of the Science State Course of Study Committee and Task Force support the use of inquiry-based instructional models such as the Five E Instructional Model shown below (Huntsville City Schools, 2003). We have incorporated the following Alabama guidelines in the GUTEP program.

ENGAGE

Providing students with activities such as brainstorming; Know, Want to Know, Learned (KWL); and making simple observations to stimulate interest, evaluate and make connections between past and present learning, and identify prior misconceptions

EXPLORE

Allowing students to build upon prior knowledge through new experiences that incorporate active participation in a range of activities, including analysis, reflection, and data collection

EXPLAIN

Providing students with opportunities to construct meaning by verbalizing understanding of activities, making explanations, addressing questions, correcting misunderstandings, and introducing new science vocabulary

EXTEND

Offering students challenging opportunities to practice skills and extend understanding through research, projects, and presentations

EVALUATE

Having students reflect on their own learning in conjunction with teacher evaluations and self-assessment of understanding

In previous years, instructional and interactive experiences were developed with this grant to motivate interest in transportation engineering and related science topics. The program was initiated in the Gearing Up for Transportation Engineering Summer Program (GUTEP) in 2000, the current year's program contains refined laboratory activities and initiated an alumni program to keep participants' interest levels high.

The strategy of this program was to produce students who know "how to find out" and "how to examine and evaluate evidence." As discussed in the first year's UTCA final report [Leonard, et al. 2000], the following criteria were used in designing the hands-on experiments:

- The activities were designed so that the students could complete them by themselves; not demonstrations performed by the instructors for the class.
- The students had to be able to read, perform and document the experiments themselves with limited adult supervision.
- Each experiment was designed such that the results were sufficiently dramatic to keep the student's attention with a high probability of success.
- Experience has shown that middle school students work best in teams, so the activities and equipment were appropriately structured.
- In general, each experiment took approximately 1-1.5 hour including set-up and clean-up, and follow-up discussions were held to highlight concepts and results.
- Safety and good lab protocol were practiced and stressed throughout.

To accomplish these goals, students were encouraged to use the following design heuristic in their team transportation problem:

1. Define the problem.
2. Generate possible solutions, using brainstorming and other creative thinking techniques.
3. Decide on a course of action.
4. Integrate the solution.
5. Evaluate the solution.

This project meets UTCA goals of increasing diversity in the transportation field, and thus affects Alabama's future human resource population by using technology transfer through focused educational activities.

4.0 Project Results

Tasks Completed

This project had a one-year duration commencing January 2008. The following tasks were completed to achieve the desired goal of transportation education through technology transfer.

Recruiting

The program committee sent out letters to schools, made phone calls to science teachers and made follow-up contacts. Dr. Leonard made site visits to several middle schools to meet with science and math teachers for additional recruiting. The program committee got together to select twenty students for the initial GUTEP week and an additional twelve for the alumni program based on potential and interest levels.

Schedule Mentors

The principal investigator contacted professional organizations (National Society of Black Engineers, Society Women Engineers, American Society of Civil Engineers), college chapters of the societies, NASA Marshall Space Flight Centers, local companies (SEI Group, Boeing and Sverdrup), and Huntsville Center of US Army Corps of Engineers.

Set-Up Schedule and Lab Experience

- The principal investigator met several times with instructors to discuss objectives of each lab experience.
- Professors were asked to update individual experiments as indicated by last year's survey results.
- Instructors developed six hour labs for the alumni program: GPS and Surveying (Dr. Anderson), Geotech (Dr. Schwarz), Robotics (Edgar Blevins - ISE), Composite Materials (Dr. Toutanji) and Solar Power (Dr. Leonard).
- Ran through labs with several middle school students prior to GUTEP.
- Finalized laboratory instructions from co-PIs.
- Obtained supplies and collated student manuals.
- Scheduled rooms on campus and field trips.

Summer Institute –Week 1: June 16-20, 2008

- Divided students into five teams of four students to run concurrently in labs.
- Followed schedule. (See Appendix A.)
- Friday of each institute participants gave demonstrations and oral reports on their team's future transportation design to parents and instructors.

Transportation Engineering Challenge – February 20, 2008

- PI visited 3 schools to make a presentation about transportation engineering and disseminated supplies for Popsicle bridge competition.
- The students built the bridges with their classes according to guidelines.
- Classes visited UAH on the Friday of Engineer's week in February to participate in load testing and seminars by local civil engineers.
- Individual winners received ribbons and certificates. Class winners received pizza parties.

Après Program

- Thank you letters and certificates were sent to instructors and field trip sponsors.
- Compiled participant surveys.
- Instructors met to discuss ways to improve program for subsequent years.
- Proposal was submitted for 2006 UTCA funding.

Deliverables

- Completed manual for students and as a teacher resource. All investigators were responsible for completing their laboratory experiments.
- The manual was posted on the UAH UTCA web site in html format (<http://coeweb.eb.uah.edu/cee/utca.htm>).
- Principal investigator was responsible for quarterly reports to UTCA. The draft final report was completed and sent to UTCA in 2008.
- Technology Transfer: A full conference paper and presentation were made by the principal investigator at the 2008 ASCE-EWRI National Conference. .

Synopsis of Curriculum

Traffic Simulation

Objective: To learn about the traffic engineering concept, level-of-service, and how traffic engineers use micro-simulation to analyze roadway intersections and design city streets.

Description: In this activity, students explore traffic micro-simulation and determine existing and future levels of service for different roadways systems. The students will learn about highway design principles related to intersections and traffic signal control.

Space Transportation

Objective: To demonstrate how rocket liftoff is an application of Newton's Laws of Motion. Students also will learn about the history and future of space transportation in the USA (NASA, 2000).

Description: To demonstrate how rocket liftoff is an application of Newton's Laws of Motion. Students construct a rocket powered by the pressure generated from an

effervescing antacid tablet reacting with water. Students also use the NASA disk "Space Transportation: Past, Present and Future" to learn about space applications.

Construction Materials

Objective: To learn about different types of materials used for roads, bridges, parking lots, dams, and buildings.

Description: In this activity, students learn about engineering materials used in transportation, such as wood, metals, concrete, pavements and composite materials. They will prepare and test some of these materials.

Engineering Shapes

Objective: To learn how to enhance the strength and stability of simple structures.

Description: In this activity, students will build and test a column, dome and truss and make predictions on loads.

Alternative Energy

Objective: To explore alternative energy sources, other than fossil fuels, for future transportation modes. Also, to stress the importance and effectiveness of alternative energy sources.

Description: In this activity, students perform experiments using a solar cell. They will observe the physical power of light/heat absorption through a small free moving device with black and white panels. Each student will construct a battery powered fan boat.

Bridges

Objective: To learn about different types of bridges by building simple models.

Description: In this activity, students construct a simple span bridge. They will use an interactive computer simulation model to design a suspension bridge to carry the load of a truck. They will also build a scale model of their bridge design.

Geotechnical Materials – Mud Pie Magic

Objective: To understand the principles of soil compaction and the behavior of layered soil systems when supporting a dynamically applied load.

Description: Students will perform simple experiments in the UAH Soil Mechanics Laboratory to demonstrate the behavior of a layered soil system and load carrying ability of the system for dynamic loadings similar to wheel loads imposed by traffic.

Transportation Safety

Objective: To explore issues related to automobile safety and to explore alternatives that would design safety into cars.

Description: In this activity, students learn about bike, bus and auto restraints safety. They also perform experiments illustrating passive and active safety features using eggs.

Robotic Car

Objective: To learn about new technology that can be adapted to transportation to increase safety and performance.

Description: Each team of two students will build, program and test a robotic automobile.

Future Transportation Design Problem

Objective: To design and build a working model of the team's vision of a future transportation vehicle.

Description: In this activity, students design a prototype of a vehicle of the future. They construct a working model with motorized K'nex kit to meet energy, safety, and infrastructure constraints. The team prepares a presentation for the class and parents of the last afternoon that illustrates their objectives, approach and selection of a future vehicle.

Goals Met

The major goal of this program was to introduce middle school students with preference to under-represented groups, to basic scientific and engineering concepts. These groups have potential for science and engineering, but might lack role models and motivation to pursue a career in transportation engineering. The selection committee used the teacher references to rate the students (criteria were student statements of interest, teacher comments and ethnicity). Through the UTCA summer program, we were successful in recruiting 53 percent minority students (African American, Asian and Hispanic) and 63 percent female students for the first week. The ethnicity and gender breakdown is given in Table 4-1.

Table 4-1. Participants' Ethnicity Information

Week 1	Female	Male	Percent
Total number	12	7	100%
African American	3	2	26%
Asian	1	0	5%
Caucasian	6	3	47%
Hispanic	1	1	10%
Native American	1	1	10%

Significance and Benefits of the Program to Participants

The participants gained knowledge about the role of transportation planning, management, safety, and design in modern society. The emphasis was on how engineers use their knowledge in design applications. The last day of the Summer Institute concentrated on the team design in transportation engineering, where they combined the knowledge acquired in the laboratory experiences. A faculty member or professional acted as each team's mentor and helped them to

prepare an electronic and oral presentation of their design. Students in the winning design team were awarded certificates of accomplishment and gifts at the closing ceremony on Friday. All the students received a prize of some kind, from the safety challenge, bridge design, rocket launch, etc., which helped to instill a sense of accomplishment and pride.

Since the middle school curriculum contains hard science and algebra, which are directly related to engineering, this program enhanced classroom instruction with "hands on" experience. In addition, the principal investigators and professionals that acted as team mentors also functioned as role models for minority and female students. This may help to increase the numbers of these students who will become transportation professionals. The use of UAH minority and women engineering students as lab assistants encouraged them to become involved in the community as professionals.

The program was intended to be a fun learning experience with a lot of basic information, team building skills, and hands-on laboratory experience of the latest transportation safety and management technology. On the last afternoon of the program, the students were asked to complete a program survey course.

The advantages for participants included the following:

- fun and enjoyable exposure to science, engineering and transportation technology topics
- development of thinking and problem-solving skills
- learn what civil engineers do and their contributions to society
- meaningful and immediate experimental learning
- fuel for their natural curiosity
- self-directed learning opportunities in team design
- increased self-esteem from completion of institute
- multiple exposure to difficult topics and inter-relationships to transportation issues
- opportunity to learn within academic facilities – may take away fear of technology
- diversity of mentors help students feel comfortable at institute

Assessment of the Impact of the Program

Since this proposal is the commencement of sixth year for this UTCA project we have an alumni-base of over 180 students, with some at college entry age. A survey of the alumni from the first two years was conducted to determine if the past participants have entered engineering or science studies to quantify the impacts of this program in North Alabama. Although the return rate on the surveys was low (60 surveys were mailed, with 21 returned) due to the lack of current addresses, some general conclusions can be made about the program. Table 4-2 shows the responses. For example, 100 percent of the respondents were planning on going to college and the majority was going to study engineering. Of these students, two females were planning on studying civil engineering. Question number seven asked about the role that the GUTEP played in their decision and the majority responded that it did. Although we do not have a

general statistic from this age and demographic population, it seems that our numbers show success in that most of these students are going to college (they would be first generation college graduates) and the majority are going into a technical field.

Prior to the program, the majority of the students did not have any relatives or acquaintances who were engineers, so their knowledge of the profession was limited. Participants were surveyed immediately after the program to determine their attitudes about engineering as a career. The vast majority enjoyed the program and stated that they would consider choosing engineering as a future occupation. Since this project has been funded for nine years by the University Transportation Center for Alabama, there is an alumni base of over 150 students, with some at college entry age. Thus a survey of the alumni from programs in 2002, 2003 and 2004 was conducted to determine if the past participants have entered college and/or engineering studies to quantify the impacts of this program in the surrounding area. The results indicate success in that the vast majority of the students are attending college and approximately 38 percent are either currently enrolled in or are planning on going into engineering.

UAH Student Involvement

The project employed four undergraduate student assistants (all minorities and/or females) to help in designing the projects, documenting plans, laboratory set-ups, and assist with the participating middle-school students at the Institute. Two female high school students who completed both of the programs, volunteered to help as mentors this year. Both were planning on entering college as engineering majors. Other university students acted as laboratory volunteers through the Society of Women Engineers, American Society of Civil Engineers and National Society of Black Engineers student chapters.

Table 4-2. Gearing Up for Transportation: Results of Four-Six Year Follow Up Survey

Question	No.	Percentage
1. Respondents Gender: 43% male, 57% female		
2. Are you in high school or college now?		
high school	8	38%
college	13	62%
neither		0%
3. Are you attending or planning on going to college?		
Yes	21	100%
No	0	0%
not sure	0	0%
4. Are you planning on studying engineering?		
Yes	8	38%
No	12	57%
not sure	2	10%
5. If you answered yes to question #4 - What major of engineering are you interested in?		
Civil	3	36%
chemical	1	13%
electrical		0%
industrial		0%
mechanical	4	50%
Other		0%
6. Are you planning on going into some other scientific or technical field?		
Yes	5	38%
No	1	8%
not sure	3	23%
7. Did the UAH summer program help you in making your decision about going to college?		
Yes	17	81%
No	5	24%
not sure		0%
8. Did the UAH summer program help you in making your decision about going to UAH?		
Yes	8	38%
No	9	43%
not sure – 2 go to UA Tuscaloosa	5	24%
Total Number of Respondents	22	

6. Project Conclusions

Education and Technology Transfer Activities

The summer program and class “transportation engineering challenge” exposed over 100 middle school students to the career of transportation engineering in a fun atmosphere. Results of the four-six year follow-up survey revealed that all of the previous attendees are either in college or plan on attending. Further, 38 percent are going into engineering, which is a much higher number than the general population of “under-represented groups”. This is definitely a success for the UTCA.

Additionally, the team members completed the lab activities' manual (both teacher instruction and student activity guides) for implementation at school visits and for next year's program. A web page was posted through UAH - UTCA home pages to allow on-line access.

A technical paper was written and presented by the PI at the 2008 ASCE-EWRI Annual Conference, in the “engineering education” division. The manuscript title is “Gearing Up for Civil Engineering: Review of a Summer Institute for Increasing Under-Represented Students to Civil & Environmental Engineering.” The citation is given in the references section.

Research Relevance and Impacts to Alabama

This project addressed the mission and several major goals of the UTCA. In addition to providing **educational experiences** for minority students within Alabama, the project focused on **diversity issues**. This program has the potential to affect the future workplace (human resources issues) since the students may wish to become involved in working on transportation-related safety research at an early age and thus may gravitate towards the profession as they mature. The project also addresses the **technology transfer** goal of the UTCA since student assistants, mentors and participants were exposed to state of the art technology within the university curriculum.

After the program was finished the students completed a survey and all thought that the program was fun and educational. Most of them did not know what transportation engineers did prior to coming to UAH and were surprised at all the variations. Finally, they would all recommend the program to their friends.

Recommendations for Next Program

The survey results will be helpful in composing next year's summer program. The least favorite lab will be updated with new material. The new activity, "Transportation Challenge," will be continued next year to increase the number of students included in this venture.

6.0 References

- Huntsville City Schools. *Science Curriculum Guide: Content and Sequence*, 2003.
www.hsv.k12.al.us/dept/merts/instruction/curriculum_guides/6-8/science/Sci_K8VA.PDF.
Accessed 2008.
- Leonard, K., Toutanji, H., Anderson, M., Delatte, N., and J. Hodges. *University Transportation Center for Alabama (UTCA) Report Number 00304 - Gearing Up for Transportation Engineering, A Summer Institute*. UTCA, Tuscaloosa, AL, 2000.
- Leonard, K. M. Gearing Up for Civil Engineering: Review of a Summer Institute for Increasing Under-Represented Students to Civil and Environmental Engineering. *Proceedings of 2008 ASCE Environmental and Water Resources Institute Conference*. Hawaii, May 2008.
- Massachusetts Institute of Technology, Department of Urban Studies & Planning. *Urban Mode Transit Site*, 2000. <http://yerkes.mit.edu/DOT2/Introduction/Introduction.html>. Accessed 2008.
- National Commission on Excellence in Education. *A Nation at Risk: The Imperative for Educational Reform*. US Government Printing Office, Washington, DC, 1983.
- National Research Council. *National Science Standards*. National Academy Press, Alexandria, VA, 1998.
- National Aeronautics and Space Administration (NASA). *Instructional Materials*, 2000.
<http://spacelink.nasa.gov/Instructional.Materials/NASA.Educational.Products/Rockets/>.
Accessed 2008.
- US DOT, Bureau of Transportation Statistics. *Education and Careers in Transportation*, 2000.
<http://www.bts.gov/edu/68.html>. Accessed 2008.

Appendix A: Program Schedule

Past Modes of Transportation

Huntsville Train Depot & Museum – Church St

Current Modes of Transportation

Huntsville Shuttle Service (Mass Transit) – tour and design exercise

Huntsville Traffic Office – Sign shop, Intelligent Transportation System

Hands-On Sessions (4 Groups of 4 students each)

Title (coordinator)

1. Traffic Simulation (Dr. Mike & Jeff)
2. Space transportation (Dr. Edgar & SWE)
3. Construction Materials (Dr. Sam & Ming)
4. Engineering Shapes (Dr. Mike & MK)
5. Alternative Energy/Boats (Dr Kate & Lee)
6. Bridges (Dr. Sam & Earlan)
7. Geotechnical Materials (Dr. Ashraf & Christy)
8. Transportation Safety (Dr. Kate & Lee)
9. Robot Cars (Dr. Edgar & Lee)

Room

- TH S242
 TH S208 & outside
 TH S207 & outside
 TH S242
 TH S203
 TH S208
 TH S224
 TH S201
 TH N106

DAILY SCHEDULE

	Monday 16th	Tuesday 17th	Wednesday 18th	Thursday 19th	Friday 20th
9:00-10:30	Introduction History of Transportation	Exp 6	HSV Shuttle Leonard, Lee	Exp 7	Bowling - competition
10:30-12:00	Team Building	Exp 6	RR museum Picnic	Exp 2	Team Design Project
12:00 – 12:30	<i>Lunch – Pizza</i>	<i>Lunch – Subs</i>	City Eng	<i>Lunch –</i>	<i>Lunch – Pizza</i>
12:30 -2:00	Exp 3	Exp 8	City Eng	Exp 9	Design presentation
2:00 – 3:45	Exp 1	Exp 4	Exp 5	Competition	
4:00	Depart	Depart	Depart	Depart	Depart

Appendix B: Photos from GUTEP 2008



Figure B-1. GUTEP participants.



Figure B-2. Wood bridge design/build unit.



Figure B-3. Concrete bowling ball mixing.

Appendix C:

FOUR-SIX YEAR FOLLOW UP SURVEY

We would appreciate your honest responses to the following questions so that we can evaluate the effectiveness of our summer program.

1. How old were you when you participated in the UAH Civil Engineering Summer Camp? _____ age _____ Don't remember

2. Are you in high school or college now?
_____ high school _____ college _____ neither

3. Are attending or planning on going to college?
_____ Yes _____ No _____ Not Sure

4. Are you planning on studying engineering?
_____ Yes _____ No _____ Not Sure

5. If you answered yes to question #4 - What major of engineering are you interested in?
_____ civil _____ industrial
_____ chemical _____ mechanical
_____ electrical _____ other

6. Are you planning on going into some other scientific or technical field?
_____ Yes _____ No _____ Not Sure

7. Did the UAH summer program help you in making your decision about going to college?
_____ Yes _____ No _____ Not Sure

8. Did the UAH summer program help you in making your decision about going to UAH?
_____ Yes _____ No _____ Not Sure