Exposing Minority Students to Transportation and STEM-related Careers Through Summer Education Programs

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ABSTRACT

The aging American workforce will lead to shortages in skilled workers throughout the country in the near future. Minorities are already underrepresented in the transportation industry, and without immediate intervention the conditions will not improve. To address the anticipated shortfall in skilled minority labor, the Federal Highway Administration, in coordination with the South Carolina Department of Transportation and South Carolina State University, developed the Summer Transportation Institute (STI). In the Texas Gulf Coast region, the Center for Transportation Training and Research (CTTR) at Texas Southern University has introduced the transportation industry to minority high school students while emphasizing the importance of science, technology, engineering, and mathematics (STEM) skills in tomorrow’s workplace through summer education programs for nearly ten years. This study examines the core curriculum of those programs and discusses their potential applicability in other regions of Texas.

Keywords: Transportation Education, Minority Students, STEM Programs
INTRODUCTION

Officials in the US have long accepted the ideology that economic strength has been inexorably linked to educational performance. During the Cold War years Americans boasted about the apparent superiority of their educational system in producing world class scientists and engineers that made space travel possible. As a result, the American economy was arguably the cornerstone of the world’s economy. However, in the aftermath of the Cold War, the U.S educational system had not kept up with its foreign counterparts. As the twentieth century came to a close, US education officials acknowledged the poor performance in STEM subjects by American students when compared to students from the East (China and India) was an indicator that these countries would eventually surpass the US in the global marketplace (1).

To address the perceived decline in educational performance in STEM-related subjects, officials began encouraging the development of summer education programs for exceptional secondary school students to expose them to STEM career fields. Additionally, summer programs were also seen as a positive strategy in the recruitment of underrepresented groups. For example, the University of Akron established a summer education program with a curriculum that focused on mathematics, sciences, language arts, technical writing, and computer science. Participants in the six week residential program also received practical hands-on experience in engineering design that served as a “bridge” between their high school academic pursuits and college curriculum standards and expectations (2).

Just as US officials recognized the shortages in STEM-related professionals; they also acknowledged the aging workforce in the transportation industry. The anticipated retirements of the baby boom generation could potentially debilitate the industry if qualified replacements are not available. As a result, in 1991, the Federal Highway Administration's (FHWA) Historically Black Colleges and Universities (HBCU) and other Minority Institutions of Higher Education Task Force recommended the establishment of partnerships to increase the involvement and participation of HBCUs, Tribal Colleges, and Universities, and Hispanic Serving Institutions in the Agency's Federal and Federal-aid highway Programs. Such partnerships were required to have, at a minimum, the active participation of an FHWA Division Office, a State Department of Transportation (DOT) and a college or university. In response to the recommendation, the FHWA South Carolina Division Office, the South Carolina DOT and the South Carolina State University (SCSU) developed a transportation-focused career awareness initiative entitled "Summer Transportation Institute" (STI). This USDOT/FHWA educational initiative addressed a crucial workforce need for the transportation industry. An unprecedented number of transportation employees are or will soon become eligible for retirement. This creates a need for and provides a great opportunity to prepare youth for future transportation careers.

The STI Program is designed to introduce secondary school students to all modes of transportation careers and encourage them to pursue transportation-related courses of study at the college/university level. From the success of the first STI on the SCSU campus in 1993, other FHWA Division Offices, State DOTs and colleges and universities expressed interest in and established STIs. After a six-year pilot program, Congress in the Transportation Equity Act for the 21st Century authorized funding for the
first transportation career education program for secondary school youth entitled
the "National Summer Transportation Institute" (NSTI).

To date, the NSTI Program has expanded from one university to over 67 colleges and
universities, with more than 8,000 students participating in the program. Participating
colleges and universities throughout the United States, District of Columbia, and Puerto
Rico serve as host sites. States, colleges and/or universities, and private organizations
interested in participating in the program should contact their local FHWA division
office. (3)

In the Texas Gulf Coast region, the Center for Transportation Training and Research
(CTTR) at Texas Southern University (TSU) has hosted the STI since 2002 and in
summer 2012, introduced the Transportation Security Institute (TSI). The STI and TSI
are summer educational programs designed to introduce the region’s best minority high
school students to the transportation industry and the future career opportunities therein.
The core curriculums emphasize the following skills: STEM-related proficiencies,
communications, and computer technologies.

PROGRAM OBJECTIVES

The principle objectives of the summer educational programs in the Houston Gulf
Coast area have focused on exposing promising minority high school students to the
many aspects and career opportunities within the transportation industry locally,
regionally, and globally. The curriculum was designed to create an educational
environment that incorporates hands-on training, lectures, and field trips that will
ultimately accomplish the following:

- exposure and training through a core curriculum designed as an introduction to
  the transportation industry and its various modes;
- introduction to a series of academic, research, and practical experiences designed
  to motivate and encourage interest in pursuing transportation careers;
- training and exposure to science, mathematics, and technological enrichment
  through planned educational activities;
- educational field trips and on-site seminars to introduce various transportation
  services and modes; and
- opportunities to participate in leadership and other professional development
  activities.

PROGRAM MANAGEMENT AND FOCUS

Program Management

The organizational structure of TSU’s summer educational programs include a
director, program coordinators, student interns; local university faculty and staff,
industry guest lecturers, and advisory boards. Figure 1 is a diagram of TSU’s summer
program’s organizational structure. The director manages and coordinates all aspects of
the programs, which includes coordinating activities with local representatives of the
host institution, area universities, the state highway department, local transit agencies,
airport and water transportation officials, and area engineering and planning firms. The
program coordinators assume the daily supervision of the summer programs, as well as
the coordination of the academic staff and other speakers.

Figures 1. Organizational Structure of TSU’s Summer Educational Programs

Faculty and staff members are responsible for conducting academic instruction and
related activities, which includes daily interaction with program participants and any
other duties relevant to the success of the program. The advisory boards are composed of
members from various fields in transportation and focuses on establishing public-private
partnerships, curriculum oversight, and identifying relevant speakers, as well as
coordinating field trips and tours to transportation facilities throughout the region. Table
1 lists the composition of TSU’s Houston National Summer Transportation Institute
(HNSTI) advisory board.

Table 1. HNSTI Intermodal Advisory Board/Partners/Sponsors

| Government and Public Agencies                  | • National Aeronautics and Space Administration (NASA) |
|                                               | • Texas Department of Transportation (TxDOT)         |
|                                               | • Federal Highway Administration (FHWA)             |
|                                               | • Texas Transportation Institute (TTI)              |
|                                               | • Burlington Northern Santa Fe (BNSF)               |
|                                               | • Metropolitan Planning Organization: Houston-Galveston Area Council (H-GAC) |
|                                               | • Houston Transportation Management Center: Houston TranSTAR |
|                                               | • Metropolitan Transit Authority of Harris County (METRO) |
|                                               | • Port of Houston Authority (PHA)                   |
|                                               | • City of Houston                                  |
| Academic Institutions                         | • Texas Southern University (TSU)                   |
|                                               | • University of Texas at Arlington (UTA)            |
|                                               | • Prairie View A&M University (PVAMU)               |
|                                               | • Houston Independent School District (HISD)        |
|                                               | • Stafford Municipal School District (SMSD)         |
| Industrial Partners                           | • Walter P. Moore & Associates                      |
|                                               | • Vatani Consultant P.L.L.C.                       |
|                                               | • Wilbur Smith and Associates                      |
Each year before the enrollment of students, the advisory board members meet at TSU to review the course curriculum, assess the report on student recruitment, and provide comments on all aspects of the summer programs.

**Program Focus**

It is anticipated that the HNSTI summer educational program will create interest in the field of transportation among high school students by providing an overview of the different aspects of the transportation industry. This broad-based and multi-modal focused program instructs on the following:

- The history and significance of the transportation industry and all modes of travel;
- Transportation Career opportunities in public and private sector, with an emphasis on emerging and new occupational requirements for the next millennium;
- Various modes of travel, including public transit, automobiles, buses, vans, trains, airplanes, as well as freight, rail, ports, waterways, and pipelines with an emphasis on intermodalism;
- Advanced technology and intelligent transportation systems, including aviation and space technology; and
- Career options in transportation design, engineering, planning, and research.

**PROGRAM ACADEMIC CURRICULUM**

**Urban Planning**

*Objectives*

The urban planning curriculum involves a 3-4 hour block of instruction designed to introduce students to the basic terminologies, challenges, academic preparation, and career opportunities in urban and regional planning. Specifically, this course’s objectives are the following:

- Introduction to the history of urban planning and design;
- Understanding the social, political and economic impacts of urban planning

*Activities*

Faculty and guest lecturers provide an overview of urban planning careers and present student participants with a variety of scenarios in classroom lectures and hands-on activities to address the needs of various communities.

The following are examples of the activities presented to student participants during a past summer Program.

- Staff members from the Houston-Galveston Area Council (HGAC) used a slide show to acquaint students with what city planning is and what they do on a daily basis. The slide show also featured well-known places such as the Champs-Élysées in Paris to emphasize to students that a city plan is made with the intent to create a scenic, safe, and efficient environment for all users of the area. Students were divided into groups and asked to design their own city. This
allowed the students to see the methods used by city planners, the issues they addressed, and the challenges they face during the design process.

- A research staff member at TSU lectured on the US Census and the importance of the census data to transportation planning. Students were shown the Census website and instructed on the use of its databases and information in city planning. Students volunteered to give information about their families to learn how to analyze the census data and later display how that knowledge may be useful for planning purpose. Students also learned the implications of urban mobility and transportation infrastructure when the mobility needs change from one generation to another.

**Water Transportation**

*Objectives*

The water transportation curriculum focuses on the multifaceted uses of today’s ports; from passenger travel to the movement of goods and supplies. In a four hour block of instruction, student participants are given an overview of water transportation activities at one of the busiest ports in our nation. The objectives include:

- Understanding the challenges of securing the port in the present age of terrorism;
- Identifying the various career opportunities in the current and future trends of port operations; and
- Appreciating the role water transportation plays in the nation’s economy.

*Activities*

During the 2012 summer program, faculty and guest lecturers discussed the historical importance of water transportation during the nation’s origins in the 18th century as well as its current and future role in intermodal transportation networks. An official from the Port of Houston spoke with the students about the various career fields available at the Port of Houston. He also discussed the challenges in securing water transportation facilities and the measures taken by private and military personnel in deterring terror-related incidents at the Port. Lastly, he discussed the role of water transportation in the regional and national economy and how new technologies are making water travel safer while simultaneously increasing productivity.

**Highway Engineering/Design**

*Objectives*

The development of roads has been crucial to the success or failures of countless societies throughout history. From the rock-strewn roads used by Alexander the Great to Adolf Hitler’s the Autobahn, the ability to efficiently move man and machine has been the utmost challenge facing any society. In the 1950s, the U.S Federal government sponsored the creation of a national network of interconnected roadway and highway systems. The engineering and design of that network would ultimately allow this country’s economy to enjoy unprecedented growth, even in the face of periodic
recessions and downturns. The highway engineering and bridge design curriculum is a ten hour block of instruction with the following objectives:

- Understanding the correlation between effective urban mobility and the economy;
- Identifying the challenges in protecting the nation’s roadway networks from potential terrorist threats; and
- Understanding the importance of efficient intersection and bridge designs.

Activities

For the 2012 summer program, engineering faculty and professional guest lecturers were invited to oversee activities that accomplished curriculum objectives. A specific activity involved the examination of the importance of signal timing to the safe and efficient movement of pedestrians and vehicle traffic through a particular intersection and/or corridor.

The fundamentals of signal timing were discussed along with the importance of math-related skills. For example, the instructor explained that after one set of lights at the intersection turn red the other lights all stay red for a few seconds in order to allow the traffic from the lights that just completed the cycle to clear the intersection. As an example of an engineering field activity, students evaluated the effectiveness of a preselected intersection near the host institution. Figure 2 (a) shows students working in the field evaluating the effectiveness of the traffic signal system near TSU’s campus. The field activity was computer-based and designed to provide the knowledge, techniques, and skills that are commonly used in intersection signal timing. The students spent considerable time on the field study and computer calculations while under very close supervision from the instructor. Students were assigned to groups, with each group in charge of one intersection. Each group completed a survey consisting of vehicle types; and vehicle movements during a one hour period. Once completed, the survey data was analyzed for green time, red time, and yellow time. Figure 2 (b) shows the students calculating signal timing in the computer lab. Afterwards, each group made their presentations regarding their specific intersection. Qiao et al. summarized how the curriculum was designed so as to increase the students’ interests (4).

Figure 2. Students (a) Evaluating the Effectiveness of an Intersection near the Host Institution, and (b) Calculating Signal Timing in the Lab under the Supervision of the Instructor
Another activity involved the design and construction of bridges. A guest lecturer from the state highway department and a local engineering consultant discussed the reasons it is important to have bridges when constructing roads and freeways, and the roles they play in the transportation industry. The guest lecturer used a Power Point presentation that illustrated the different types of bridges, what they are used for, and how they are constructed. The guest lecturer used computer software to construct a simulated bridge and test it. The components of construction, compression, tension, and cost were heavily stressed in this activity. The students competed to see who could come up with the safest and most efficient bridge design at the lowest cost to show the economic challenges bridge designers face on a regular basis. Students were very pleased to see a simulated truck safely cross their bridge design without the bridge collapsing. Figure 3 shows an engineering consultant and the students engaged in hands-on activities.

Figure 3. Local Consultant Demonstrating Bridge Design During Class Activity

Security/Emergency Management

Objective

The terrorist attacks on September 11, 2001 and the devastation caused by Hurricane Katrina in 2005 exposed the need to develop effective emergency management plans and contingency strategies. Perhaps the key aspect of any emergency and contingency activities is the ability to move large numbers of people away from danger zones and affected areas. The objectives for the two-hour block curriculum include:

- Identifying applicable federal and local laws governing emergency management;
- Understanding the obstacles faced by city planners in developing emergency management plans.

Activities

Local faculty introduced the students to the basics in emergency and security preparation and response procedures as they are addressed by urban and transportation officials. The history of terrorism against the US was discussed with emphasis on the transportation security aspect of the September 11, 2001 terror attacks. Students also learned how the Department of Homeland Security, the Transportation Security
Administration, and other related government agencies on both state and federal levels were formed. The concept of “See Something, Say Something” was introduced to students to inform them about how to handle being around suspicious activity and what they need to do when put in these types of situations. The students watched a short movie on what to do when in these types of situations while taking public transportation, which can be adapted to other circumstances. The students were then placed into groups and were given a scenario on “See Something, Say Something” and had to reach a consensus on what action they would take, not take, and how they would handle themselves in a real-world emergency situation. The group leader then spoke to the class about their situation and addressed how the group decided to handle it. Their peers critiqued them and the class discussed the right and wrong ways to handle high stress situations.

**Air Transportation**

**Objective**

Air travel is arguably the fastest growing mode of travel in the US, given the number of individuals and the miles traveled. Coupled with the new regulations governing airport security, air travel will demand new attention from transportation and public officials. The summer program allocated six hours of instructions and focused on the following:

- Introduction to air travel;
- Performing simulated exercises; and
- Learning the basic terminologies of airport operations.

**Activities**

- Faculty members introduced students to aviation; the history and development of air travel in the US and future career opportunities (i.e. air traffic controllers and commercial pilots). They also emphasized the importance of STEM-related training in the aviation industry and the need for minority students to be able to compete in an industry that will continue to expand globally.

- Students were taught how to fly a simulated plane and learned about the safety measures put in place so that they would not crash on the flight simulators while the other group became the flight control room operators who provided flight instructions for students on the simulators. Figure’s 4 (a) and (b) shows students as they are engaged in the flight instruction and simulation classes.

- Students performing as air traffic controllers in the simulated airport tower experienced the challenges of managing the flights of numerous aircraft vehicles approaching a single airport.
Figure 4. Students were instructed on how to “Fly” in the Flight Simulator and how to operate in a Simulated Airport Tower

Alternative Energy Sources

Objectives

As our society continues to move away from its reliance on fossil fuels, there continues to be a need to further develop alternate sources of energy. This curriculum was a six hour block of instruction that allow students to accomplish the following:

- Learn the basics of solar energy; and
- Complete a basic experiments involving solar energy.

Activity

During the 2012 summer camp, guest faculty lectured on the different principles of solar energy as well as other forms of renewable energy and their future applicability in the transportation industry. Students conducted the following experiments: baking cookies in the sun, building and testing water (hydro) powered cars, and converting heat energy from the sun into solar power used to charge batteries.

Academic and Professional Development

Objectives

Participants in the summer program were also exposed to a variety of lectures and activities that reinforced basic academic and professional skills. This curriculum involved between 2-6 hours of instruction with the following objectives:

- Reinforcement of STEM-related skills;
- Introduction to professional writing, speaking and entrepreneurship; and
- Applicability of geographic information system (GIS) software in transportation planning.

Activities

During the 2012 summer camp the following was emphasized and accomplished:

- Introduced the concept of geographic information systems (GIS) and how it is used in the transportation industry. Emphasis on the various GIS applications through the Petrochemical Incident Location System (PILS) software.
A guest lecturer discussed his experiences as a business owner; including overseeing profit management and personnel decisions. Students developed their own mock product and created an income statement so that they could see all of the expenses versus revenues that go into making their imaginary company profitable. Most students felt their company’s would fail half way through the activity, but the income statement put real life money situations into perspective for the types of decisions they would have to make if they were to go into business for themselves.

Faculty discussed presentation skills and the importance of verbal and written communications in the academic environment and the workplace.

Local graduate students lectured on resume writing and interview strategies and also demonstrated the basic functions of Excel and PowerPoint applications that are used in the academic and professional environments.

Students were exposed to the basic mathematics skills necessary to provide the foundation of a career in transportation.

OTHER ACTIVITIES

Field Trips

In addition to classroom lectures and activities, students participating in the summer program were able to visit local area transportation facilities, interact with local professionals and gain greater insights into the working environment of the transportation professional.

- Student participants and their mentors toured the facilities at the National Space Aeronautics Administration (NASA) in Clear Lake, TX. The tour was led by a representative of NASA who discussed the history, missions, and objectives of NASA’s manned space program. Students asked questions not only about the future projects and missions of the NASA, but also employment opportunities, particularly in the math and science fields, within the federal government.

- Students visited the offices of the Metropolitan Transit Authority (METRO) of Harris County and toured the light rail maintenance facility, as seen in Figure 5. Representatives actively sought input from the participants during a presentation on METRO’s current discussions on future light rail and bus service areas. METRO representatives emphasized to the participants that the future of this region’s public transportation services is being decided now and their input would be a valuable contribution to present conversations. Students were then led on the tour of the light rail facility.

- Participants traveled to the Port of Houston to tour the facilities of the Seamen’s Church Institute, which included the Center for Maritime Education. A representative discussed the long history of the Seamen’s Church Institute as the largest, most comprehensive service agency in North America, specifically created to provide for the personal, professional, and spiritual needs of mariners.
around the world since 1834. The Center for Maritime Education (CME) is a facility that provides on-going professional maritime training through the use of modern computer simulation technologies. These computer simulation technologies provide personnel realistic challenges to measure the reactions and skills of the mariners and enhance their opportunities for professional advancement. HNSTI participants were able to use the simulators and found the three-dimensional projections both fascinating and challenging. Representatives concluded the tour by discussing the many career opportunities available within the maritime industry and the skills and educational prerequisites to qualify for them.

![Figure 5. Student Participants Touring the Houston METRO Light Rail Facility](image)

Enhancement Program

The HNSTI program provides enhancement activities that focus on exposing the students to transportation and STEM-related careers. Program staff directs student participants in activities that emphasize academic achievement, improve study skills, enhance professional development, and foster increased self-awareness and creativity. During the 2012 program, students watched and discussed videos on “What Does Business Casual for Women/Men Really Mean?”, “Time Management”, “Road to Riches”, and “Creating Winning Presentations” as well as the proper decorum in restaurants; and business meetings. Lastly, program faculty and staff encouraged student participants to embrace the concept and principles of HICA, which stands for Honesty, Integrity, Commitment, and Accountability, and how important these characteristics are for not only professional success, but the achievement of overall fulfillment in life.
Sports and Recreation Program

The 2012 HNSTI summer program not only emphasized the importance of transportation and STEM-related academic curriculums, but also the importance of maintaining a healthy lifestyle through diet and exercise. Campus recreation facilities were made available for participants to engage in team sport activities during the program. Team sports not only provide exercise, but also serves as a tool to help the participants learn how to manage and function within the group dynamic where different team members possess different skill-sets. A local health care provider serves a guest lecturer and discusses various teen-related health issues and how important it is to stay in good mental and physical condition. In particular, the lecture focuses on obesity, diabetes, positive self-images, instances of teenage depression and the extreme instances of teenage suicides.

ASSESSMENTS AND STUDENTS PLACEMENT

Student and Parent Assessments

The comments from student participants and parents have been extremely positive. Students often comment that their exposure to the transportation industry and enhanced STEM-related skills provided them additional options when considering future academic courses and career options. Many parents have stated their children speak positively about the summer program and its curriculum. In an email sent to Mr. Godazi on April 9, 2007, one of the parents she stated she felt she made the right decision by encouraging her child to participate in the program. (Melinda Neito, unpublished data)

Instructor Assessments

As part of the program evaluation process, comments from instructors and staff are solicited to ascertain their impressions as to those activities that worked and those that did not achieve their desired outcomes. The overall impression from the instructors involved in the 2012 program is their desire to implement more “hands-on” activities for the student participants while reducing the amount of classroom lectures. Further comments illustrated the belief that student participants were more engaged with the instructor and the learning process when they were able to see “real world” applications. Conversely, the instructors believed that extensive classroom lectures, while informative, did not capture the student participants’ imagination because they were unable to fully conceptualize the issues being discussed.

Student Placement and Alumni Activities

Based on telephone surveys conducted by the HNSTI staff, approximately 90 percent of the student participants eventually enrolled in college. Of those who entered a college program, approximately 35 percent choose a career in a STEM-related field with some type of emphasis on transportation. Every year the HNSTI program invites TSU HNSTI Alumni to participate in an internship program. So far we have had almost 10 students to accept internships at different agencies throughout Houston. Some of the HNSTI Alumni
return to the HNSTI program and enhance their leadership skills by serving as program mentors.

**Student Evaluations**

An evaluation instrument is used at the end of camp each year as a way for staff to get a clear indication of what students thought about the camp. Table 2 illustrates the evaluation results from all students for TSI in year 2012. From Table 2 it is seen that all evaluations receive answers of “Strongly Agree” and “Agree.” It is interesting to note that 90 percent of students stated they would consider a career in transportation in the future. In the future we will collect data from a broader perspective (through the US) to obtain good cross-sectional data.
<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>Evaluation Question</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Total</th>
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<td>Classroom</td>
<td>Class activities were well organized</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>20</td>
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<tr>
<td>Classroom</td>
<td>Class activities were logically sequenced such that simpler activities preceded more complex activities</td>
<td>18</td>
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<td>Classroom</td>
<td>Participants were able to ask questions &amp; discuss related issues during the course of class activities</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>20</td>
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<tr>
<td>Classroom</td>
<td>Subject and topics discussed in class were related to the purpose of the project</td>
<td>19</td>
<td>1</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Classroom</td>
<td>Faculty and presenters provided sufficient explanation of the concepts covered</td>
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<td>0</td>
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<td>0</td>
<td>20</td>
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<tr>
<td>Classroom</td>
<td>The classroom area(s) were adequate to carry out the activities</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>20</td>
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<tr>
<td>Classroom</td>
<td>Enough time was spent discussing the subjects and topics of the project activities</td>
<td>19</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Speakers</td>
<td>Activities were well organized</td>
<td>18</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Speakers</td>
<td>I was academically challenged by program activities</td>
<td>19</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Speakers</td>
<td>Computer training activities were very stimulating</td>
<td>17</td>
<td>3</td>
<td>0</td>
<td>0</td>
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<td>Speakers</td>
<td>Computer training activities were very enlightening</td>
<td>20</td>
<td>0</td>
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<td>Speakers</td>
<td>Adequate time was allotted for the activities</td>
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<td>Speakers</td>
<td>I felt free to ask questions</td>
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<td>Speakers</td>
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<td>3</td>
<td>0</td>
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<td>Staff</td>
<td>The staff was very interested in my career awareness</td>
<td>20</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Staff</td>
<td>The Staff was very helpful when I had problems</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Staff</td>
<td>The Staff encouraged students to strive for excellence in all their academic pursuits</td>
<td>18</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Staff</td>
<td>The Staff was always available when I had a question or needed assistance</td>
<td>19</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>20</td>
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<tr>
<td>Staff</td>
<td>The Staff was very friendly at all times</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Staff</td>
<td>The Staff was very knowledgeable on transportation related careers</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Staff</td>
<td>The Staff was very enthusiastic about transportation related careers</td>
<td>18</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Enhancement</td>
<td>Activities were well organized</td>
<td>17</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Enhancement</td>
<td>I was academically challenged by program activities</td>
<td>18</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Enhancement</td>
<td>Computer training activities were very stimulating</td>
<td>18</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Enhancement</td>
<td>Computer training activities were very enlightening</td>
<td>19</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Enhancement</td>
<td>Adequate time was allotted for the activities</td>
<td>19</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Enhancement</td>
<td>I felt free to ask questions</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Enhancement</td>
<td>All enhancement activities were educational and beneficial</td>
<td>17</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Field Trips</td>
<td>Field Trips were informative</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Field Trips</td>
<td>Concepts from the field trips were related to the field of transportation</td>
<td>17</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Field Trips</td>
<td>Field trip activities helped me understand transportation careers better than before</td>
<td>18</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Field Trips</td>
<td>Generally, adequate time was allotted for project activities</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>20</td>
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<tr>
<td>Field Trips</td>
<td>Adequate time was allotted for questions</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Field Trips</td>
<td>Transportation to and from the site was comfortable</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Field Trips</td>
<td>Transportation to and from the site was safe</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Field Trips</td>
<td>Transportation to and from the site was clean</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Field Trips</td>
<td>The number of field trips was appropriate</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>20</td>
</tr>
</tbody>
</table>
STUDENT DEMOGRAPHICS

Demographic Information
The CTTR’s summer educational programs have served a diverse population of student participants. Table 3 illustrates this diversity and the various locations hosting the CTTR’s summer educational programs from 2002 through 2012.

Table 3. Demographic Breakdown Over the Years (from 2002-2012).

<table>
<thead>
<tr>
<th>Name of Institution</th>
<th>Race/Ethnicity</th>
<th>Gender</th>
<th>Grade Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>African American</td>
<td>Caucasian</td>
<td>Hispanic</td>
</tr>
<tr>
<td>HNSTI</td>
<td>177</td>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>TCNSTI</td>
<td>27</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>BNSTI</td>
<td>24</td>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td>PANSTI</td>
<td>14</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>TSI</td>
<td>18</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Schools Represented

<table>
<thead>
<tr>
<th>Institution Name / Years</th>
<th>City, State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texas Southern University / 10</td>
<td>Houston, Texas</td>
</tr>
<tr>
<td>Lamar University / 2</td>
<td>Beaumont, Texas</td>
</tr>
<tr>
<td>College of the Mainland / 2</td>
<td>Texas City, Texas</td>
</tr>
<tr>
<td>Lamar State College / 1</td>
<td>Port Arthur, Texas</td>
</tr>
</tbody>
</table>

CLOSING AWARDS PROGRAM

At the end of every summer program there is a graduation program where faculty, staff, guest lecturers and parents celebrate with the student participants their completion of the program. The highlights of the graduation program include student presentations where they discuss and summarize their individual experiences and the awarding of certificates. During the presentations, students typically focus on the field trips while others on the hands-on classroom demonstrations. During the presentations, the student participants impress the audience with their poise and understanding of transportation concepts and their applicability in our present and future society.

CONCLUSION

This paper evaluates the summer programs hosted by the Center for Transportation Training and Research at Texas Southern University which have been conducted throughout the Texas Gulf Coast region during a 10 year period. The summer programs...
have been successful in introducing promising minority high school students to the transportation industry while simultaneously emphasizing the importance of mastering STEM-related skills as an entrée into the technical-career workforce. The following are some of the course highlights featured during the summer programs:

- Basic introduction to the various fields of the transportation industry;
- Exposure to the importance of transportation in the national and world economy; and
- An understanding of the relationship between successful application of STEM-related skills and career success.

Even with the successes of past summer programs, the faculty and staff recognize the need to continually strengthen existing partnerships with area transportation professionals to enhance future curriculum offerings. Furthermore, the faculty and staff plan to improve future summer programs through the following initiatives:

- Involve state and local officials in seeking grant-funding;
- Encourage members of local consulting companies, local offices of the state highway department, and local municipalities to become guest lecturers and develop internships for summer program graduates; and
- Develop a web page and an e-newsletter to maintain communications with summer program graduates.

We have concluded that in order to increase the number of minority students in Transportation and STEM-related fields, it would be greatly beneficial to continue the program while offering more hands-on activities. The results of our interaction with program participants; including students, lecturers, and parents strongly indicates the positive effect it has had in increasing the awareness of Transportation and STEM-related careers and meeting the needs of the 21st century economy. This report serves as an educational tool that shares the benefits and the avenues for improvement in our program, as well as provides a model for other programs seeking to prepare future Transportation and STEM-related career leaders and professionals.

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REFERENCE

