Introducing Sixth Grade Students to Transportation:

A Summary of Field Trip Activities

Report: ATLAS-2013-01

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August 2014

DISCLAIMER

ACKNOWLEDGEMENT

Support for this research was provided by a grant from the U.S. Department of Transportation, University Transportation Centers Program to the ATLAS Center. The authors would like to acknowledge the following individuals whose assistance made the field trip activities a success: Stacey Alejandro, Marcus Brewer, Colleen Dau, Chiara Silvestri Dobrovolny, Taylor Haby, Jeff Miles, Sandra Stone, Beverly Storey, LuAnn Theiss, Shawn Turner, Katie Womack, Robert Wunderlich, and the members of the Texas A&M Transportation Institute (TTI) Facilities, Safety, and Support Services program.

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
ATLAS-2013-01		

4. Title and Subtitle	5. Report Date
Introducing Sixth Grade Students to Transportation: A Summary of Field Trip Activities	August 2014
	6. Performing Organization Code

7. Author(s)	8. Performing Organization Report No.
Melisa D. Finley	

9. Performing Organization Name and Address	10. Work Unit no. (TRAIS)
Texas A&M Transportation Institute The Texas A&M University System College Station, Texas 77843-3135	11. Contract or Grant No. DTRT13-G-UTC54

12. Sponsoring Agency Name and Address	13. Type of Report and Period Covered
Advancing Transportation Leadership and Safety (ATLAS) Center 2901 Baxter Rd., Room 124, Ann Arbor, MI 48109-2150 U.S.A	14. Sponsoring Agency Code

15. Supplementary Notes

Supported by a grant from the U.S. Department of Transportation, OST-R, University Transportation Centers Program

16. Abstract

In May 2014, the Texas A&M Transportation Institute (TTI) hosted two field trips to its facilities at the Texas A&M University campus in College Station, Texas, to promote science, technology, engineering, and mathematics (STEM) fields and careers in transportation engineering and other transportation fields. In total, 70 sixth grade Advancement Via Individual Determination (AVID) students and 10 teachers participated. AVID is an in-school college readiness program for elementary through high school students, targeting underserved boys and girls of all ethnic backgrounds who fall in the academic middle, for college eligibility and success. Both field trips lasted approximately 4.5 hours.

During the field trip, students attended an introduction to the world of transportation and engineering presentation, a crash test presentation, and the following break-out sessions:

- Bikes are Vehicles Too! Safe and Smart Biking Skills.
- Being a Safe Passenger: Short Talk and Demonstration.
- Transportation and the Environment.
- Up Close with Traffic Control Devices.

For the break-out sessions, team members divided students into four groups. The break-out sessions were conducted simultaneously, with students rotating to a different session every 30 minutes. After the break-out sessions, the students ate lunch. After lunch, students constructed and raced puff mobiles.

TTI team members from the Advancing Transportation Leadership and Safety (ATLAS) Center coordinated and assisted with these field trips. They also incorporated transportation safety elements into the field trip program. The ATLAS Center funded the materials needed for activities, the students' lunch, and the lead TTI researcher's efforts to develop the agenda, coordinate activities, and host the event.

17. Key Words	18. Distribution Statement
Careers in Transportation, Careers in Engineering, Transportation Engineering Educational Outreach Programs, STEM	Unlimited

19. Security Classification (of this report)	20. Security Classification (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	10	

TABLE OF CONTENTS

LIST OF FIGURES

INTRODUCTION

The transportation industry, like every other profession that relies heavily on the science, technology, engineering, and mathematics (STEM) fields, faces a growing shortage of professional engineers. Under previous grants from the Southwest University Transportation Center and University Transportation Center for Mobility™, Texas A&M Transportation Institute (TTI) researchers developed presentations and activities that could be used when kindergarten through 12th grade students visited the TTI facilities on the Texas A&M University campus. In May 2014, TTI hosted two such field trips to promote STEM fields and careers in transportation engineering and other transportation fields. TTI team members from the Advancing Transportation Leadership and Safety (ATLAS) Center coordinated and assisted with these field trips. They also incorporated transportation safety elements into the field trip program. This report documents these efforts.

DESCRIPTION AND CONDUCT OF EVENTS

On May 2, 2014, 43 sixth grade Advancement Via Individual Determination (AVID) students and 6 teachers from Oakwood Intermediate School in College Station, Texas, visited TTI. On May 9, 2014, 27 sixth AVID students and 4 teachers from Cypress Grove Intermediate School, in College Station, Texas, visited TTI. AVID is an in-school college readiness program for elementary through high school students, targeting underserved boys and girls of all ethnic backgrounds who fall in the academic middle, for college eligibility and success. Both field trips lasted approximately 4.5 hours.

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After the break-out sessions, the students ate lunch. After lunch, students constructed and raced puff mobiles. The following sections describe the field trip activities in more detail. This project funded the materials needed for activities, the students' lunch, and the lead TTI researcher's efforts to develop the agenda, coordinate activities, and host the event.

Introduction to the World of Transportation and Engineering

Each field trip began with a TTI researcher making a 15-minute presentation to the entire group about the transportation industry and careers in engineering. Researchers designed the presentation to promote interaction between the researcher and students. Specifically, the presentation included information about the following:

- What is transportation?
- Transportation modes.
- Transportation system.
- What is an engineer?
- Why engineering?
- Engineering in transportation.
- What you need to be an engineer?
- Great civil engineering achievements.

The researcher began by telling the students that transportation is the safe and efficient movement of people and goods. The researcher asked the students what it meant to be safe and efficient. The researcher also had the students name some goods. After a short period of discussion, the researcher described how engineers balance safety and efficiency.

Next, the researcher explained that a transportation mode is a means by which we move people and goods. The researcher then had the students name transportation modes (i.e., surface, ports and waterways, air, and pipelines) and methods (car, train, boat, bike, etc.). The researcher used interactive slides in the presentation to show examples of all the types of transportation modes.

Next, the researcher led the students on a show trek (again using interactive slides). A pair of shoes needed to get from China to College Station. The students had to name transportation modes that could be used to get the shoes from China to California, from California to the mid-west, from the mid-west to Texas, and from Dallas to College Station. The students also had to name transportation modes they could use to travel to the store to purchase the shoes.

The researcher then provided examples of exciting careers in transportation. The researcher also described what an engineer is, why they should consider engineering, the different types of engineers in the transportation profession, and what they needed to do to become an engineer.

Last, the researcher showed great civil engineering achievements from all over the world (i.e., Egyptian pyramids, Eiffel Tower, Panama Canal, Hoover Dam, and the Interstate System). For each achievement, the researcher would show the group a picture, let the students try to identify it, and then provide a few quick facts about the achievement.

Crash Test Presentation

Next, a different TTI researcher discussed TTI's crash testing program. This 30-minute presentation included a video of past TTI crash tests. During the video, a researcher discussed the science behind crash tests and answered the students' questions.

Bikes are Vehicles Too! Safe and Smart Biking Skills

In this breakout session, a TTI researcher discussed planning and design of bicyclist and pedestrian facilities, while at the same time reinforcing good bicycle safety practices. The students were introduced to several types of data collection tools (like automatic people counters) as well as various manuals and online tools. Bicycle safety tips were provided to all students as a paper handout.

Being a Safe Passenger: Short Talk and Demonstration

In this breakout session, a TTI researcher first talked about the importance of buckling up correctly, describing a properly positioned seat belt and why position is important, then pointing out the height requirement for booster seat use as illustrated by a life-size vinyl poster. Students were invited to measure themselves against the poster while making their way to the AgriLife Extension Service distracted driving simulator. The simulator was a unit complete with accelerator, brake, steering, and driving apparatuses. Each student was allowed to drive in a simulated highway environment. The student was handed a phone during the drive and shortly thereafter received a text message. When students were distracted by the text message, they invariably crashed, creating an impactful experience for each student driver and their fellow classmates as they watched. Figure 1 shows a student driving while trying to read a text.

Figure 1. Texting and Driving Demonstration.

Transportation and the Environment

For this breakout session, a TTI researcher discussed the connection between transportation and the environment. Students watched a video about landscape architecture and the beautification of roads. The TTI researcher then discussed erosion and the need for mitigation actions during road construction and maintenance operations. The students got to see, attempt to identify, and touch samples of various materials used to prevent erosion and capture silt and other pollutants during storm water runoff (Figure 2).

Figure 2. Students Looking at Erosion Control Materials.

Up Close with Traffic Control Devices

For this breakout session, the students toured the TTI Traffic Control Device Visibility Research Laboratory and learned about driver visual needs at night and retroreflectivity (i.e., the ability of an object to redirect light back to its source). As Figure 3 shows, the students used handheld microscopes to examine pavement markings, sign sheeting, and raised reflective pavement markings.

Figure 3. Students Examining Pavement Markings and Sign Sheeting.

Puff Mobile Activity

The puff mobile is an activity that the American Society of Civil Engineers created for Public Broadcasting System Kids activities during National Engineers Week. The activity encourages students to be creative and to work as a team in designing a vehicle that can travel the farthest distance possible when a team member puffs or blows on it.

Researchers divided the students into two-person teams. Each team was given three non-bendable, plastic drinking straws, four Lifesavers™ candies, one piece of paper, two paper clips, a roll of tape, and scissors. The teams then had 20 minutes to build a working vehicle that functioned well mechanically (i.e., aerodynamic and the wheels moved freely). At the end of this activity, the teams raced their vehicles and discussed the advantages and disadvantages of the vehicles' designs. Figure 4 shows students building and racing their puff mobiles. Figure 5 shows some of the students puff mobile designs.

ASSESSMENT OF EVENTS

The team evaluated the effectiveness of the field trips based on feedback from the teachers and TTI team members. The teachers thought the field trip was a great opportunity for the students to see how professionals use science and math in their jobs. The teachers also felt that the program content was age appropriate, aroused the students' interest, and was a proper length. Team members felt that the duration of the field trip was appropriate and that sessions with more interactive aspects were better received. Also, team members liked the simultaneous format of the break-out activities since it divided the students into small groups, which facilitated more interaction between students and team members.



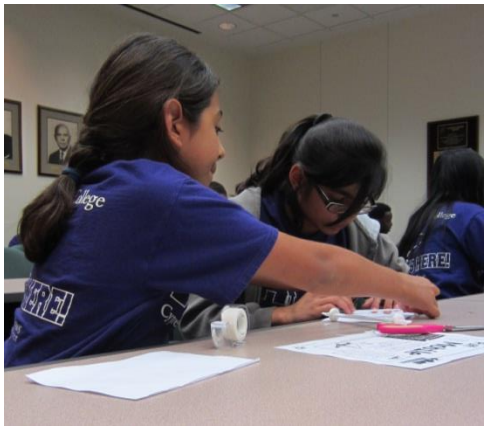
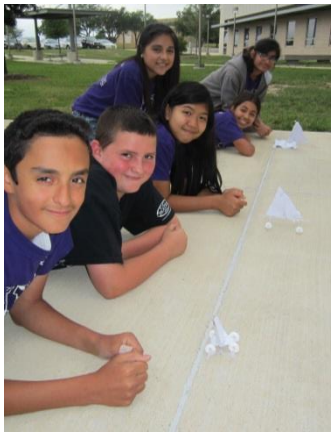
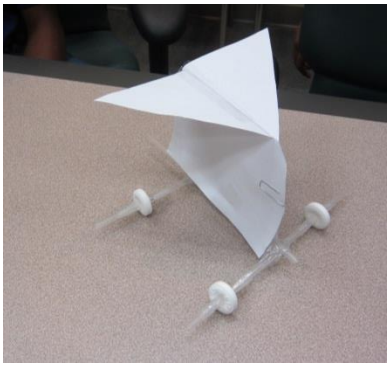



Figure 4. Students Building and Racing Puff Mobiles.



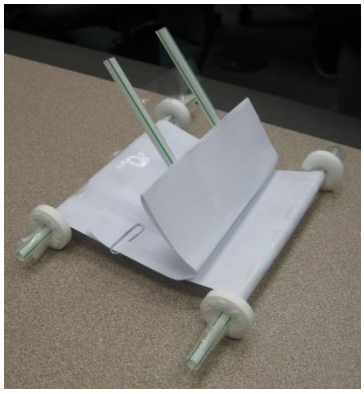
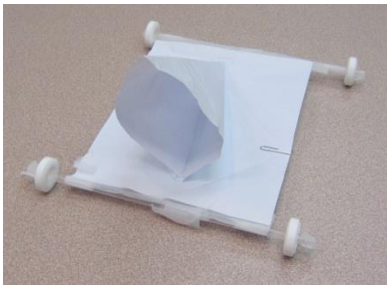
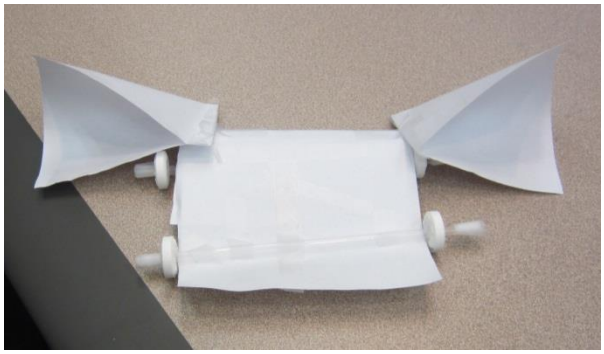




Figure 5. Examples of Puff Mobile Design.