2007 SUMMER TRANSPORTATION INSTITUTE

FHWA/MT-07-012/6439

Final Report

prepared for
THE STATE OF MONTANA
DEPARTMENT OF TRANSPORTATION

in cooperation with
THE U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

November 2007

prepared by
Susan Gallagher

Western Transportation Institute
Montana State University - Bozeman

RESEARCH PROGRAMS

Montana Department of Transportation
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2007 SUMMER TRANSPORTATION INSTITUTE

Final Project Report

by

Susan Gallagher

of the

Western Transportation Institute
College of Engineering
Montana State University – Bozeman

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Federal Highway Administration

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TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. FHWA/MT-07-012/6439	2. Government Access No.	3. Recipient's Catalog No.	
4. Title and Subtitle 2007 Summer Transportation Institute		5. Report Date November 2007 6. Performing Organization Code	
7. Author(s) Susan Gallagher		8. Performing Organization Report Code	
9. Performing Organization Name and Address Western Transportation Institute PO Box 174250 Montana State University – Bozeman Bozeman, Montana 59717-4250		10. Work Unit No. (TRAIS) 11. Contract or Grant No. MSU G&C #4W1536 MDT Project #6439	
12. Sponsoring Agency Name and Address Research Programs Montana Department of Transportation 2701 Prospect Avenue Helena, Montana 59620-1001		13. Type of Report and Period Covered Final Report March 2007 – November 2007 14. Sponsoring Agency Code 5401	
15. Supplementary Notes Program performed in cooperation with the Montana Department of Transportation and the U.S. Department of Transportation, Federal Highway Administration. This report can be found at http://www.mdt.mt.gov/research/projects/admin/summer.shtml.			
16. Abstract The Western Transportation Institute hosted a two-week residential Summer Transportation Institute for high school students on the Montana State University campus from June 17 to June 29, 2007. Fifteen high school students from cities across Montana and one student from Chicago, Illinois participated in the program. The students ranged in age from rising tenth to rising twelfth graders. They participated in a comprehensive academic program that introduced them to various modes of transportation and highlighted transportation safety issues. Team design/build activities encouraged leadership and problem-solving skills. Students learned about college and career opportunities in the transportation field. The STI enhancement and sports and recreation program promoted career and college survival skills and encouraged sportsmanship and collegiality among the STI cohort.			
17. Key Words Workforce development, K-12 outreach, transportation career		18. Distribution Statement Unrestricted. This document is available through the National Technical Information Service , Springfield VA, 21161.	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 28	22. Price

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ACKNOWLEDGMENTS

The authors gratefully acknowledge the efforts of members of the Intermodal Advisory Board. Acknowledgement of financial support and matching dollars for this program is extended to the Montana Department of Transportation, the Federal Highway Administration, as well as the Research and Innovative Technology Administration (RITA) at the United States Department of Transportation through the Western Transportation Institute at Montana State University.

EXECUTIVE SUMMARY

The Western Transportation Institute at Montana State University hosted a Summer Transportation Institute (STI) for fifteen secondary school students from June 18 to June 29, 2007. The STI recruited rising tenth, eleventh, and twelfth grade students from a mix of backgrounds and hometowns. The residential program hosted participants from ten different Montana towns and one out of state participant. Students lived on MSU campus while learning about career opportunities in transportation. The two-week program provided a comprehensive academic program, which included guest speaker presentations, field work, hands-on laboratories, and field trips. Students learned about all modes of transportation and gained leadership skills while working on team design-build projects. Highlights included a field trip to the Montana Department of Transportation headquarters in Helena and thirty minute discovery flights with flight school instructors from Summit Aviation. In addition, the participants learned about college preparation and career planning. A transportation career panel discussion was held with professionals from city, state, and federal government as well as private consulting and academia. During the evenings and weekend, STI students participated in a recreation and sports program. Student program evaluations were very positive about all aspects of the program.

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1 INTRODUCTION

The Summer Transportation Institute hosted by the Western Transportation Institute at Montana State University serves to attract high quality and diverse high school students to participate in an innovative summer educational program in transportation. The STI aims to address the nation's need for a diverse pool of transportation professionals capable of developing creative long-term solutions to a growing host of complex and intermodal transportation issues. In order to meet this goal, the STI serves to heighten pre-college student interest in transportation careers and to enhance the necessary skills of students from diverse backgrounds to achieve careers in the transportation field. WTI's recruitment strategy focuses on involving Native American students from regional high schools in the STI in order to increase the cultural diversity of students pursuing transportation-related degrees and careers.

The objectives of the STI are to:

- Increase students' awareness of the significance of land, air, and water transportation;
- Expose high school students to the variety of transportation careers available and demonstrate how transportation professionals work to identify and solve real-world issues that have society-wide impacts;
- Increase students' understanding of the importance and need for creative and innovative transportation solutions;
- Improve students' analytical skills and problem-solving skills;
- Develop communication, collaboration, and leadership skills;
- Increase student awareness of the importance of cultural diversity; and
- Bolster student confidence by improving academic skills and by providing college and career guidance.

To meet these objectives, the 2007 STI provided a well-balanced curriculum that included a comprehensive academic program, field trips and site visits, guest speakers, a career and college counseling component, and recreational activities. The participants were able to evaluate all aspects of the program through evaluation surveys. Results from evaluations are included in the *Evaluations* portion of this report.

The curriculum, guest speaker presentations, hands-on team activities, field trips, enhancement program, and athletic/recreation program were all designed to meet core outcomes for the STI host site. By program end, the students were able to:

- Apply analytical skills to basic transportation applications;
- Identify career opportunities in transportation;
- Explain topics in the core areas of surface transportation, aviation, and safety;
- Understand steps necessary to enter college;
- Describe continuing transportation-related educational opportunities;
- Work in teams;
- Understand the principles of effective leadership;
- Develop and use employability tools; and
- Recognize and appreciate the value of diversity in the workforce.

Detailed information on the curriculum, enhancement, and recreation programs is provided in Section 5.

2 INTERMODAL ADVISORY BOARD

An Intermodal Advisory Board (IAB) was formed with representatives from government, industry, and academia. The role of the IAB was to assist the STI in securing program funds, developing a well-balanced curriculum, planning activities and field trips, obtaining technical expertise, and conducting strategic planning. Members of the 2007 IAB are listed below in Table 1.

Table 1: Intermodal Advisory Board Members

Name	Contact & Affiliation
Susan Gallagher Education Program Coordinator STI Project Director	Western Transportation Institute Montana State University PO Box 174250 Bozeman, MT 59717-4250 Phone: 406-994-6559
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Scott Keller Design Supervisor & Adjunct Instructor	Montana Department of Transportation Design Unit Montana State University Cobleigh Hall 204 Bozeman, MT 59717 Phone: 406-994-1843
Sue Sillick MDT Research Programs Manager	Montana Department of Transportation Research Section 2701 Prospect Avenue Helena, Montana 59620-1001 Phone: 406-444-7693

The IAB met on April 20, 2007 to discuss the 2007 STI. The meeting began with an overview of the National Summer Transportation Institute (NSTI) program including its mission and goals and a review of the implementation plan submitted for the MSU STI. Feedback from IAB members was then solicited regarding student selection process, the proposed curriculum and field trips, technical and human resource support, financial support, and partnership building. The meeting agenda and minutes from the IAB meeting are provided in Appendix A.

IAB members provided recruitment support by making follow-up phone calls to high school counselors in the state to advertise the program. They also provided in-kind support by making presentations during the STI and by participating on the Transportation Careers Panel. The Montana Department of Transportation (MDT) additionally provided a three-hour presentation and tour of their headquarters in Helena and lunch in Helena for participants. The MDT Design Unit also hosted a barbecue in Bozeman for STI students, undergraduate MDT interns, and Transportation Career panelists.

3 PROGRAM FACULTY AND STAFF

In addition to the Project Director, a full-time Academic Program Coordinator and a full-time Teaching Assistant were hired for the duration of the 2007 STI. The Academic Program Coordinator, Larry Lucero, is a high school teacher and administrator from Harrison Public Schools. The Teaching Assistant, Rebecca Heyward, is a current undergraduate student in Industrial Engineering. Teaching staff were responsible for assisting with the development of classroom activities and hands-on activities that demonstrated the use of science and math in transportation-related applications, for leading classroom activities, and for assisting guest instructors with classroom management.

Two Residence Hall/Recreation Program Advisors were hired to supervise students during weekends and evenings and to plan and lead the sports and recreation program. These advisors, Duncan Adams (male RA) and Casey Cummings (female RA), are both current undergraduates at Montana State University and served as dormitory Residence Assistants during the 2006-2007 academic year.

A number of full-time research staff from the Western Transportation Institute as well as faculty from several academic departments and staff from MSU administrative offices contributed to the development of the STI curriculum. The academic staff designed and conducted various modules covering different transportation topics and modes. Modules included instruction and hands-on activities. Administrative staff developed enhancement modules on career and college preparation. Teaching staff are listed in Table 2 below.

Table 2: STI Teaching Staff

Name/Affiliation	Specialty Area	STI Curriculum Component
Eli Cuelho, WTI Research Associate	Infrastructure Maintenance and Design	Concrete design and testing
David Kack, WTI Research Associate	Public Transportation & Transit / Aviation	Air transportation/Aviation careers

Name/Affiliation	Specialty Area	STI Curriculum Component
Mike Kelly, WTI Research Scientist	Human Factors; Driving Simulation Laboratory	Safety/Human Factors
Angela Kociolek, WTI Research Ecologist	Road Ecology	Road Ecology; Animal Detection Systems and Data Collection
Jerry Stephens, Associate Professor, Civil Engineering	Structures/ Commercial Vehicle Operations	Bridges and Commercial Vehicle Operations
Robert Mokwa Assistant Professor, Civil Engineering	Geotechnical Engineering	Soils
Scott Keller Supervisor, MDT Design Unit	Geometric Design	Wetlands and MDT field trip
Brett Gunnink Department Head, Civil Engineering Department	Materials	Introduction to degrees & careers in Civil & Construction Engineering
Ahmed Al-Kaisy Assistant Professor, Civil Engineering	Transportation Engineering	Traffic Engineering; Traffic Simulation and Speed Analysis
Casey Schreiner Admissions & New Student Services	College Recruitment	College 101 presentation
Alyce Maas Counselor, Career Services	Career Planning	Strong Interest Inventory and Career Planning session
Robb Larsson Adjunct Professor, Mechanical Engineering	Mechanics	Mobile Lab demonstration; SAE Formula Racer demonstration/presentation

3.1 Partners/Sponsors

A number of university departments and personnel provided in-kind support to the STI program. The Department of Civil Engineering provided in-kind support to the STI program through usage of their classrooms, laboratories and lab equipment, conference room, and the Tait Computer Laboratory. The Western Transportation Institute provided access to the Driving Simulation Laboratory, Materials Lab, as well as use of the Conference Room and equipment for classroom activities. WTI provided additional salary support for guest instructors. The Montana Department of Transportation provided staff time during several activities as well as sponsored lunch for the STI cohort during a tour of MDT headquarters. Private sponsors also contributed to the program. Summit Aviation provided a number of "discovery flights" for students in its training Cessna aircraft and a tour of its facilities at the airport. Cost share for the 2007 program is estimated to total $7,200.

4 2007 PARTICIPANTS

Posters, announcements, and applications about the program were sent in March 2007 to principals, guidance counselors, and math and science teachers at Montana high schools. Program coordinators from programs that serve Native American students and other underrepresented or underserved groups including Upward Bound, Gear Up, and Talent Search also received STI information. Students entering the 10th, 11th, or 12th grade were encouraged to apply for the program. Follow-up calls were made to guidance counselors to encourage participation in the program. Sixteen applications were received by the final deadline date. The project director and several members of the Intermodal Advisory Board reviewed applications and selected participants. Applicants were scored on the basis of their school performance (GPA), activities, honors, and interests as well as on their written essay. Selection letters were sent out to applicants together with detailed information about the planned STI and scheduled parent/student orientation session. Several forms were also enclosed in the information packet, which included a student/parent agreement, certificate of health, housing regulations, permission to tape or photograph form, permission to allow Internet research, and permission to use data. Fifteen accepted applicants confirmed attendance and returned the requisite permission forms and requested information. All participants received a full scholarship to attend the program. The scholarship covered all room and board expenses for the two-week program as well as any laboratory or student fees and field trip expenses. A demographic summary of 2007 STI participants is provided in Table 3.

Table 3: Demographic Summary

	Number of Participants
Ethnic Background	
Native American	3
Caucasian	11
African American	1
Gender	
Male	11
Female	4
Geographic representation	
Number of Cities	11

5 ACADEMIC PROGRAM

The 2007 Summer Transportation Institute at MSU involved students in a comprehensive academic program that introduced STI participants to various modes of transportation and highlighted transportation safety concerns. Students received instruction and participated in hands-on activities related to traffic engineering, infrastructure design and maintenance, road ecology, urban planning, automotive engineering, and human factors. A number of transportation professionals shared their expertise with the students during a Transportation Career Panel and STI participants had the opportunity to visit the Montana Department of

Transportation headquarters in Helena where they received a first-hand view of how transportation professionals contribute to transportation operations.

In addition to classroom activities, students participated in a number of team design/build projects, including a glider activity and balsa wood bridge competition. Students gained experience in teamwork and learned leadership skills through these projects.

Various components of the academic program are outlined in detail below and a detailed schedule provided in Appendix B.

Road Ecology

Angela Kociolek, Ecologist at the Western Transportation Institute, discussed green transportation systems with STI participants. She introduced basic concepts in ecology and how they relate to the way the transportation system interacts with its surrounding environment. The group discussed the impacts that transportation systems have on the environment and what can be done to mitigate the negative effects. The students then learned about specific mitigation measures in use to protect wildlife and passengers from animal-vehicle collisions, which include highway fencing, overpasses, underpasses, and driver warning systems. The students viewed a demonstration of an animal-detection system and then went out into the field to test a GPS unit designed for roadkill data collection as shown in Figure 1.

Urban Planning

Students were able to experience being an urban planner using the computer game SimCity. The students were asked to design a workable city transportation infrastructure without bankrupting the treasury. Prizes were given to the best designed city.

Traffic Engineering

Ahmed Al-Kaisy, Assistant Professor of Civil Engineering at MSU, facilitated a number of activities designed to introduce students to the field of transportation engineering. Through classroom presentations, students learned about the purpose of the road system, its users, various road classifications, and how roads relate to land use.

Students also discussed the concept of carrying capacity and issues of congestion and explored the impact speeds had on congestion. They collected speed data in the field using a radar gun, entered the data into Excel in order to obtain mean speeds, and then populated a traffic simulation model with this data. By manipulating the speed data in the simulation software, they could compare how different speeds impacted road capacity and congestion. The combination of classroom, computer, and field exercises provided the students with a robust overview of traffic engineering concepts.

Geotechnical Engineering

Robert Mokwa, Assistant Professor of Civil Engineering, introduced STI participants to the field of geotechnical engineering. After learning basic concepts, various soil properties were demonstrated, including soil liquefaction using a “California House” model. The importance of soils as foundations for structures, including roadways, was emphasized.

Students were able to demonstrate their acquired knowledge of soil properties in a laboratory competition. Teams of three were each asked to design and build a reinforced soil retaining wall. Weights were added to determine the maximum load the walls could withstand without collapsing.

Figure 1: Road Ecology Field Demonstration of ROCS

Concrete

STI participants were introduced to concrete, a frequently used material for construction of transportation infrastructure. They learned the various components that make up concrete and concepts behind concrete mix design. The students then made concrete in the laboratory using different water/cement ratios. The batches of concrete were poured into separate cylinder molds and cured. Cured concrete cylinders representing a variety of mixes were then tested using laboratory equipment to demonstrate the differences in concrete strength that resulted. Eli Cuelho, Research Engineer at the Western Transportation Institute, facilitated the activities.

Bridge Design

Civil Engineering Professor Jerry Stephens introduced students to bridge design and demonstrated a number of basic mechanics principles using foam and reinforced and non-reinforced concrete sticks. Once students were comfortable with bridge design concepts, they formed two-person teams for a design/build challenge. Each team was charged with designing

and building a balsa wood truss bridge. The activity was facilitated by the STI teaching staff, which first reviewed the various forces acting on a bridge and then demonstrated potential failures using several pre-built models. Each design team then brainstormed various design ideas and chose a team design. They then had to sketch both a top and side view of their chosen bridge design. Once complete, they drew their design to scale using graph paper and pinned the drawing to foam board. The design was used as a guide for actually constructing the balsa wood bridge. Each team received an identical kit of materials for their bridge construction, which included balsa wood pieces, wood glue, stick pins, wax paper, masking tape, ruler, and "timber cutter" knife.

When the bridges were complete and dry, a competition was staged. Each team had to present their design and describe how much weight they expected the bridge to hold and where they thought their bridge might fail. Each bridge was first weighed and then placed on a testing table. A bucket was attached to it and water added until the bridge failed. The efficiency of the bridge was judged on how much weight the bridge held versus how much the bridge itself weighed. Awards were given based on efficiency, durability, aesthetics, and craftsmanship.

Aviation

David Kack, Research Associate at the Western Transportation Institute and licensed pilot, introduced students to aviation careers and airline regulation. The students made a field trip to the Gallatin Field airport and toured a number of facilities there. They spoke to professionals in security, fire and rescue operations, and airplane maintenance and were able to examine a variety of aircraft and gliders in the hanger.

As part of the aviation module, the students met flight instructors at Summit Aviation, viewed the school's state-of-the-art flight simulator, and were treated to a "discovery flight" in the school's small training aircraft (Figure 2).

Figure 2: Discovery Flight with Summit Aviation

Students gained hands-on experience with aircraft weight and balance during a team glider design/build activity. Team gliders were designed and built by teams of two using knowledge gained during flight trials that experimented with wing placement and nose weight. Final team glider designs were tested and reviewed in a competition. Awards were given for aesthetics and engineering.

Traffic Safety and Human Factors

Students learned about roadside barriers and how crash attenuators are designed to prevent injuries and deaths when vehicles leave the roadway. Students then designed their own crash attenuators using paper bags, cotton balls, Ziploc bags, paper clips, tape, straws and bubble wrap. The students were asked to design the cheapest crash attenuator that could still protect the passenger (an egg) of a toy truck. Cost was calculated using time spent in construction of the attenuator (labor cost) and weight of the attenuator (materials cost). The attenuators were then placed in front of a cinderblock at the bottom of a steep ramp. The student with the most cost-effective crash attenuator that successfully protected the egg from breaking won a prize. The activity emphasized the importance of breakaway devices and guardrails on roadsides for vehicle passenger safety.

Human responses to roadway signage, traffic, and driving environment are also a key element in safety. Students were introduced to the study of human factors in traffic safety studies. They learned how researchers use driving simulation laboratories to safely conduct human factors research and were able to drive WTI's state-of-the-art driving simulator. The driving simulator recorded changes in driver behavior, including collisions, near-collisions, speed, and divergence from traffic lanes. The students were able to see how driving behavior could be monitored and studied in the "safe" environment of the lab.

Automotive Engineering

Mechanical Engineer Robb Larsson presented information on automotive engineering and demonstrated a student-built formula racer. The racer was designed and built from scratch by undergraduate students at MSU and members of the MSU student chapter of the Society of Automotive Engineers, who had recently traveled to California to compete in the SAE student automotive design competition "SAE Formula West."

Robb Larsson also described how Mechanical Engineering students had been instrumental in building a mobile research laboratory for the Western Transportation Institute, which is used for off-site data collection and analysis. The students were able to tour the Mobile Lab and learn how the different sensors could be used in collecting useful transportation-related data.

Field Trips

An important element of the STI academic program was to supplement classroom and laboratory activities with site visits so that students could meet and speak with transportation professionals working in the field. Six site visits were made during the STI. Each one is outlined below.

Montana Department of Transportation

STI participants visited the headquarters of the Montana Department of Transportation (MDT) located in Helena, Montana. MDT staff introduced the students to the variety of careers

available in the agency and provided an overview of the history of transportation in Montana, including land and water transportation. STI students were treated to tours of both the photogrammetry unit and the CAD unit at MDT. The tour concluded with a question and answer session.

Gallatin Field Airport
STI participants toured airport fire and rescue, the airport terminal and baggage claim area, aircraft maintenance operations, and Summit Aviation flight school during a field trip to the airport (described above as part of the aviation module).

Guest Speakers
Scott Keller, from the Montana Department of Transportation Design Unit, introduced students to the concept of conservation banking and presented a wetlands mitigation project that the MDT Design Unit is conducting with assistance from undergraduate student interns. Jerry Stephens, Civil Engineering, discussed commercial vehicle operations during a presentation to STI participants.

Enhancement Program
The enhancement program was designed to prepare students for college and to promote career self-awareness.

College Preparation
Casey Schreiner from the Office of New Student Services spoke with STI participants about college entrance exams, college preparatory coursework, choosing an academic major, obtaining financial aid, and academic support services available for college students.

Brett Gunnink, Civil Engineering Department Head, provided an overview to STI participants on the different subfields within Civil and Construction Engineering, including transportation. He outlined the required coursework and high school courses that would be especially helpful for students interested in enrolling in an engineering program. He also provided information about careers available in the Civil Engineering field.

STI participants were also able to interact with current college students to gain a better understanding of college life. MDT hosted a barbecue for STI participants and undergraduate student interns from the Montana Department of Transportation on-campus Design Unit. Through conversations with MDT student interns, STI participants were able to gain a better understanding of internship and career opportunities available to them in transportation.

Career Awareness
STI students participated in a number of workshops designed to enhance their career awareness and employability skills. First, students took an on-line "Strong Interest Inventory," a test designed to highlight a person's strengths and interests in relation to potential career fields. Alyce Maas from the Career Services Office met with students to distribute the results of the Strong Interest Inventory and to help the students put them into context. She outlined some steps students could take to narrow their career choices and provided some basic career statistics. She

also helped students to understand the importance of developing a good resume and honing their interviewing skills.

A Transportation Career Panel was held with transportation professionals from industry, government, and academia. Panelists described their career paths, how they got interested in transportation, what they saw as the benefits and disadvantages to their current jobs, and what educational background was required for their current position. Students had an opportunity to ask questions during the panel and to meet with panelists informally afterwards during the MDT Design Unit picnic.

Figure 3: Transportation Career Panel

Sports and Recreation Program

The sports and recreation program allowed students additional experience working in teams and promoted a spirit of collegiality and good sportsmanship among the STI participants. Each evening, the Resident Advisors organized ice-breakers, team-building activities, and sports or recreational activities. Students participated in movie nights, outings, hikes, and team games such as Ultimate Frisbee and kick ball. The sports and recreation program was designed to cater to the variety of tastes within the group. Students were extremely positive about the sports and recreation program as well as about the work of the residence advisors in building a positive team spirit in the group.

Orientation and Closing Awards Program
STI participants arrived to campus on Sunday, June 17 and moved into their dormitory rooms with the assistance of the RAs and teaching staff. After the new arrivals were situated, an orientation was held for the students and parents. All staff members were introduced and an overview of planned STI activities provided. STI rules, regulations, and expectations were reviewed in detail as well as consequences for non-compliance. Both students and parents signed a contract indicating their understanding of these obligations. All permission forms previously mailed out in the information packet were collected and any questions or concerns addressed. The parents then departed and the students played a number of ice-breaker games and had a pizza party.

The following day, students received an orientation to the academic program. The students took a pre-program survey and WTI Director, Steve Albert, provided an interactive overview of the transportation field. Students also participated in a tour of the Montana State University campus during orientation.

Family members of STI participants as well as STI instructors, sponsors, and IAB members were invited to the STI Closing Ceremony held on June 29, 2007. The closing ceremony was completely planned by the participating students. They chose decorations for the room and organized the agenda. The ceremony opened with a slideshow presentation produced by the students. Participants also presented STI instructors with certificates of appreciation. Student awards were then presented followed by a banquet lunch.

6 EVALUATIONS

STI students completed periodic evaluations during the camp in order for program staff to gain feedback on the curriculum, team projects, enhancement program, sports and recreation program, STI staff, and field trips. The evaluations were used to gauge whether program objectives were being met and to make improvements. In addition to eliciting open-ended responses regarding each course module, students indicated their level of agreement to specific questions using the following scale:

4 = Strongly agree
3 = Agree
2 = Disagree
1 = Strongly Disagree

Average scores for questions on classroom activities are summarized in Table 4 at the end of this section. Scores ranged in values from 3.27 to 4.00.

STI participants also evaluated the various team projects they worked on, which included the balsa wood bridge and the glider activity. All of the students agreed that the competitions were fun and challenging.

The team projects demanded that students learn to work together. All but one student agreed that they learned leadership skills through the activities and learned to work in teams better. Some

students found this easy, while other students were challenged by group work. Student comments regarding working in teams included:

- *I learned how to work with different people each time.*
- *Compromise.*
- *You need to take advice from all team mates to build a good product.*
- *I gained a lot of confidence.*
- *You have to listen and talk.*
- *You have to listen to the other person but make sure you are heard.*

Enhancement Program evaluations on career and college planning activities revealed that this program was very successful in meeting program objectives. All students either "agreed" or "strongly agreed" that the STI workshops helped them to feel more knowledgeable about the process of applying for college and that they felt more confident about making career choices.

Evaluations of STI staff were also conducted. All participants strongly agreed that the Residence Advisors helped to build group atmosphere through team projects and games and that they planned fun recreational activities. As one participant commented, "Casey and Duncan were the best! They became our friends. They helped build teamwork and ultimately friendships with other people. I'm going to miss them!" All of the students agreed that the STI teaching staff were friendly, enthusiastic, explained assignments well and provided assistance when necessary, and were available for questions. Comments regarding teaching staff included:

- *"Beez and Becky were really good. They helped when people needed it. I was thankful of that."*
- *"Beez and Becky were great teachers. They planned fun activities and kept the 2 weeks fun for all."*
- *"Great people. Should hire them next year."*

A summary of the overall program evaluation administered at the end is provided in Table 5 at the end of this section. Student responses to a variety of evaluation criteria from staff attitude to the quality of food served in the dormitory ranged from 2.5 to 2.9 on a scale of 3.

Table 4: Student Classroom Evaluation Summary Scores

Question	Classroom Module						
	Bridges / Structures	Concrete Design	Soils / Geotech	Safety	Traffic Engineering	Aviation	Road Ecology
Class activities were well organized	3.6	3.93	3.93	3.93	3.73	3.86	3.92
Class activities were logically sequenced such that simpler activities preceded more complex activities.	3.73	3.93	3.79	3.93	3.67	3.86	3.77
Students were able to ask questions and discuss related issues during the course of class activities.	3.73	3.93	3.86	3.86	3.6	3.93	3.69
Subjects discussed in class were related to the projects and activities.	3.93	3.86	3.86	3.79	3.47	4.0	3.62
Presenters provided sufficient explanation of the concepts covered.	3.79	3.93	3.93	3.79	3.64	3.86	3.77
Presenters provided valuable assistance to participants.	3.47	3.93	3.93	3.93	3.53	3.86	3.92
The classroom area/lab was adequate to carry out the activities.	3.53	3.93	3.93	3.86	3.8	3.93	3.92
Enough time was spent discussing the subjects and topics of the project activities.	3.87	3.93	3.93	3.86	3.8	3.86	3.85
The number of projects/activities was appropriate.	3.53	3.86	3.93	3.71	3.27	3.86	3.54
Enough time was allowed for most students to adequately understand what was being taught.	3.87	3.86	3.86	3.86	3.67	3.93	3.77

Table 5: 2007 Overall STI Evaluation Summary

Question	Number of Responses			Average Score
	Strongly Agree (3)	Agree (2)	Disagree (1)	
SPEAKERS				
1. Speakers were well organized.	10	3		2.8
2. I was academically challenged by the activities the speakers provided.	7	6		2.5
3. Speakers responded well to the questions posed to them.	10	3		2.8
STAFF				
1. The staff was very interested in my career awareness.	10	3		2.8
2. The staff was very helpful when I had problems.	12	1		2.9
3. The staff encouraged students to strive for excellence in all their academic pursuits.	10	3		2.8
4. The staff was always available when I had a question or needed assistance.	12	1		2.9
5. The staff was very friendly at all times.	10	3		2.8
6. The staff was knowledgeable about transportation-related careers.	11	2		2.8
7. The staff was enthusiastic about transportation-related careers.	11	2		2.8
8. Counselors were helpful in the dormitories.	10	3		2.8
ACTIVITIES				
1. Project activities helped me understand transportation careers better than before.	12	1		2.9

Question	Number of Responses			Average Score
	Strongly Agree (3)	Agree (2)	Disagree (1)	
2. Generally, adequate time was allotted for project activities	11	2		2.8
3. Generally, adequate time was allotted for audience participation.	9	4		2.7
4. Project activities gave me some practical experience related to transportation.	12	1		2.9
5. The number of projects was appropriate.	10	2	1	2.7
6. Enhancement activities were beneficial.	12	1		2.9
OTHER				
1. Life in the dormitory was fun.	9	3	1	2.6
2. The food in the dining hall was good.	10	3		2.8
3. The number of speakers was appropriate.	8	5		2.6
4. The number of field trips was appropriate.	10	3		2.8
5. The number of projects was appropriate.	11	2		2.8
6. Enhancement activities were beneficial.	12	1		2.9
7. Sports/recreation activities were fun and worthwhile.	12	1		2.9

Additional Comments:

- *"It was fun! I wanna do another two weeks!!"*

- *"Great job guys, this was a good camp."*

- *"I had a lot of fun with the activities. This camp was worthwhile to me. Everybody was really nice."*

7 RESULTS AND CONCLUSIONS

The 2007 Summer Transportation Institute at Montana State University provided 15 secondary school students with an exposure to the field of transportation, an opportunity to learn about the variety of transportation careers available and to gain college preparatory and career planning experience. The 2007 participants were a demographically diverse group. Student feedback and evaluations show that the participants were very positive about the academic, enhancement, and sports and recreation aspects of the program. The academic program was made up of a variety of activities catering to different learning styles and interests. Students especially enjoyed hands-on activities such as those provided in the concrete, geotechnical, and safety modules. The aviation module, including a tour of the Bozeman airport and discovery flights with Summit Aviation, was also very popular.

The majority of participants confirmed that their skills with teamwork improved during team design-build activities. They also felt better prepared for dealing with the college application process and more confident in making career choices following enhancement activities.

The after hours sports and recreation program was well-received and the Residence Hall Advisors received high marks for planning a program that brought the group together and built team spirit. Academic program staff were also highly rated for providing adequate assistance throughout the program.

Overall the program was very successful in meeting its stated objectives and the curriculum and activities developed for the 2007 Summer Transportation Institute will be used as a template for future STI programs at MSU.

APPENDIX A

SUMMER TRANSPORTATION INSTITUTE
INTERMODAL ADVISORY BOARD MEETING
April 20, 2007

MEETING MINUTES
Present: Susan Gallagher, Scott Keller,
Danielle Reagor (teleconference), Sue Sillick (teleconference) and Lloyd Rue (teleconference)

I. Review of STI Mission and Goals. Susan Gallagher began with an overview of the STI's national goal of developing a diverse, well-qualified workforce for the transportation industry by encouraging secondary school students to pursue transportation careers. She also emphasized the importance of building partnerships with stakeholders from the transportation industry to receive input and expertise from them that will strengthen and build the program.

II. MSU Implementation Plan

a. Overview:
   i. Two-week program from June 17-June 29
   ii. Target audience is 9-11th grade students
   iii. STI will be residential
   iv. No cost to the participants beyond initial travel to and from STI
b. Programs:
   i. Academic Program
      1. Activities: hands-on projects, guest speakers, field trips, design/build, and individual research papers.
      2. Enhancement: career guidance, major selection, college preparation.
   ii. Evening/Weekend Recreation
      1. 2 RA's will be hired to design, plan, and implement after-hours and weekend activities.
c. Work plan: Items concluded to date include: contract signed with MDT, recruitment materials sent to schools, staff openings posted, contract with MSU Conference Services completed for room and board, group insurance obtained, classroom space reserved, and initial preparation and planning for curriculum/schedule begun.

III. Discussion

a. Susan reviewed the role of the advisory board to assist the STI secure program funds and partnerships, assist in recruitment efforts, develop a well-balanced curriculum, plan activities and field trips, provide technical expertise, and assist with strategic planning for the STI.

b. The make-up of the current IAB was discussed and the need to obtain a representative from the school system. Susan solicited suggestions for possible new members.
c. Sue Sillick and Lloyd Rue discussed the administrative and management changes of the national STI program. FHWA was unhappy with the previous model using SCSU as a national resource center and manager for the program. The current approach is for each State DOT to take responsibility for managing the STI within its state, although this may again change in future. A national teleconference with FHWA and STI host sites/managers is planned for April 21 at noon. Susan will forward details to board members who might be interested in tuning in. Sue Sillick commented that the 2007 program will be run in the same manner as a research project through MDT. Chris Christenson, Jennifer Jenson, Sue Sillick, and Lloyd Rue will serve on the technical panel and Sue will act as project manager.

d. Susan discussed student recruitment issues and the current lack of applications. Board members agreed to contact specific schools to follow-up.
    i. Daniell Reagor will forward a list of schools that she currently works with through the Billings Engineers Club and shadow program. Scott Keller offered to split the list of schools with her to help with calling.
    ii. Lloyd recommended sending a packet of recruitment materials to MACO (Montana Association of County Officials), MCA (Montana Contractors Association), and the ASCE Montana section. He will forward contact information to Susan for this.
    iii. Sue Sillick will check on the current status of the MDT TAP program to see if we may obtain recruitment assistance from the TAP program coordinator. She also suggested trying to get STI announcements posted to high school newsletters early on next year.

e. Curriculum
    i. Suggestions for activities:
        1. Scott Keller will organize/schedule the field trip to MDT headquarters in Helena. Lloyd Rue suggested that the FHWA Division Administrator, Kevin McClurry, also be included in the MDT presentation. He suggested Zia Kazimi as another map resource.
        2. Lloyd Rue will contact the Yellowstone Institute about the possibility of organizing a short course on wildlife and roads.
        3. The idea of a transportation career panel was discussed to highlight the differences between careers at public agencies and in private sector consulting. Scott Keller suggested the career panel be scheduled for the same day as the MDT BBQ to give panelists time to interact informally with STI participants (and as an added bonus for them traveling to MSU).
f. Financial support/Partnerships:

1. The Board discussed the need for extra funds to help either with recruitment (as stipends) or at least for scholarships for students who it will be a financial hardship for to get transportation to and from MSU. Lloyd recommended looking into the establishment of an endowment fund for the STI. Scott will forward contact information to Susan for the MSU Foundation endowment person so that she can get more information on the process.
2. Danielle Reagor will provide information/solicitation of sponsorships at the ITE meeting in Jackson Hole for the STI program.

APPENDIX B

2007 Summer Transportation Institute at Montana State University
Weekly Calendar of Events: June 18-July 29

Week 1: June 18 – June 24

Monday, June 18	Thursday, June 21
8:30am-10:30am: [WTI Conference Room] STI Orientation & Future of Transportation presentation (Steve Albert) **10:30-noon:** Traffic Engineering Activity (Ahmed Al-Kaisy) **Noon-1pm:** Lunch (Miller Dining Hall) **1-2pm:** Campus Tour **2-4pm:** [CB Soils Lab 202] Geotechnical Engineering introduction and demonstration lab (Bob Mokwa)	**9-11am:** [CB 202] Soils lab (Bob Mokwa) **11-noon**: [CB 202] Introduction to Civil & Construction Engineering (Brett Gunnink) **Noon-1pm:** Lunch (Miller Dining Hall) **1-2:30pm:** [CB 429] Test Concrete Cylinders (Eli Cuelho) **3-5pm**: Transportation Career Panel **5:30pm**: MDT Design Unit BBQ at Lindley Park
Tuesday, June 19	Friday, June 22
8:30am-9:00am: [Tait Lab] Career Strong Interest Inventory **9:00-10:30am:** [Tait Lab] SimCity transportation/urban planning activity **10:30-noon:** [CB 202 & Tait Lab] Bridge Design (Jerry Stephens) **Noon-1pm:** Lunch (Miller Dining Hall) **1-3:00pm**: [WTI Conference Room] Balsa wood bridge team design activity **3-5pm**:[WTI Conference Room] Mobile Lab and SAE Formula One Racer competition demonstration (Robb Larson)	**7am:** Depart for Tour of Montana Department of Transportation Headquarters (Helena) **2pm:** Gates of the Mountain ferry ride (2pm)
Wednesday, June 20	Saturday/Sunday June 23-24
8-9am: [WTI Conference Room] Balsa wood bridge work **9-10am:** [WTI Conference Room] Career Planning (Alyce Maas) **10-noon:** [WTI Conference Room] Human factors/driving simulator (Mike Kelly) **Noon-1pm:** Lunch (Miller Dining Hall) **1-3pm:** Traffic Engineering Activity (Ahmed Al-Kaisy) **3-4pm:** [CB 429] Concrete Introduction (Eli Cuelho) **4-5pm:** Concrete Laboratory	- Sports and Recreation activities

Week 2: June 25 – June 29

Monday, June 25	Thursday, June 28
8am-1pm: Field trip to Gallatin Field Airport and discovery flights with Summit Aviation (Picnic lunch at Gallatin Recreation Area) **1-2 pm:** [WTI Conference Room] Intro to Aviation (David Kack) **2-5pm**: [WTI Conference Room] Complete balsa wood bridges	**9am-10am:** [WTI Conference Room] Team glider design tests/presentations **10am - noon:** Final evaluations; transportation knowledge post-test (Jeopardy); Closing ceremony preparation **Noon-1pm:** Lunch (Miller Dining Hall) **1-5pm:** Closing ceremony preparation
Tuesday, June 26	Friday, June 29
9-10am: [WTI Conference Room] MDT Wetlands Mitigation Project (Scott Keller) **10-11am:** [WTI Conference Room] Intro to highway safety/crash attenuators **11am-noon:** Balsa wood bridge competition **Noon-1pm:** Lunch (Miller Dining Hall) **1-3:00pm**: [CB 202] Crash attenuators/egg ramp activity **3-5pm:** [CB 202] College Entrance & Preparation (Casey Schreiner)	**Morning:** Packing and Dorm Check Out **Noon (WTI Conference Room):** STI Closing Ceremony, Banquet and Farewells
Wednesday, June 27	
9-10am: [WTI Conference Room] Trucking/Freight (Jerry Stephens) **10am-noon:** Team Glider project **Noon-1pm**: Lunch (Miller Dining Hall) **1pm-3pm:** Road Ecology (Angie Kociolek) **3-5pm**: Complete glider project	