

2008 SUMMER TRANSPORTATION INSTITUTE

FHWA/MT-08-011/6439-801

Final Report

prepared for
THE STATE OF MONTANA
DEPARTMENT OF TRANSPORTATION

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

September 2008

prepared by
Susan Gallagher

Western Transportation Institute
Montana State University - Bozeman



RESEARCH PROGRAMS

Montana Department of Transportation



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Final Project Report

by

Susan Gallagher

of the

Western Transportation Institute
College of Engineering
Montana State University – Bozeman

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State of Montana
Department of Transportation
Research Programs

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U.S. Department of Transportation
Federal Highway Administration

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16. Abstract The Western Transportation Institute hosted a two-week residential Summer Transportation Institute for eleven high school students on the Montana State University campus from June 15 to June 27, 2008. Participants included Montana residents, one student from California, and two students from Oklahoma. The students ranged 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.			
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EXECUTIVE SUMMARY

The Western Transportation Institute at Montana State University hosted a Summer Transportation Institute (STI) for eleven secondary school students from June 15 to June 27, 2008. The STI recruited rising tenth, eleventh, and twelfth grade students from a mix of backgrounds and hometowns. The residential program hosted participants from five different Montana towns and three out of state participants (representing California and Oklahoma). 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 private consulting, academia, and the Montana Department of Transportation. During the evenings and weekend, STI students participated in a recreation and sports program.

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1 INTRODUCTION

The Summer Transportation Institute (STI) hosted by the Western Transportation Institute at Montana State University serves to attract 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.

The objectives of the STI are to:

- Increase students' awareness of the significance of transportation in their daily lives;
- 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 2008 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 team-building 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 evening/weekend program were all designed to meet core outcomes for the STI host site. Core outcomes included the ability to:

- Apply analytical skills to basic transportation problems;
- 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 and enhancement activities is provided in Section 5.

2 INTERMODAL ADVISORY BOARD

An Intermodal Advisory Board (IAB) for the STI program is made up of representatives from government, industry, and academia. The role of the IAB is 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 2008 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
Danielle Reagor, EI Consultant	Engineering, Inc. 1300 North Transtech Way Billings, MT 59102 Phone: (406) 656-5255
Lloyd Rue Safety/Traffic/Design Engineer	Federal Highway Administration Montana Division 2880 Skyway Drive Helena, MT 59602 Phone: 406-449-5302 x232
Dr. Ahmed Al-Kaisy Assistant Professor	Department of Civil Engineering Montana State University Cobleigh Hall 230 Bozeman, MT 59717 Phone: 406-994-6116
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 together with the Montana Department of Transportation (MDT) Technical Advisory Committee on April 17, 2008 to discuss the 2008 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 the student recruitment 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 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 PARTNERS/SPONSORS

A number of university departments and personnel provided in-kind support to the STI program. The Department of Civil Engineering provided access to classrooms, laboratories and laboratory equipment, conference room, and the Tait Computer Laboratory. The Western Transportation Institute provided usage of the Driving Simulation, TRAIL, and Materials Laboratories, as well as use of a conference room and equipment for classroom activities. The Montana Department of Transportation provided staff time during several activities and 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. The Montana Institute of Transportation Engineers (ITE) Chapter contributed \$150 to the program to cover travel costs for students with financial need. Cost share for the 2008 program is estimated to total \$7,200.

4 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 2008 STI. The Academic Program Coordinator, Larry Lucero, is a high school teacher and administrator from Harrison Public Schools. The Teaching Assistant, Patricia Navarro, is a recent graduate from the Industrial Engineering program at MSU. Teaching staff were responsible for assisting with the development of classroom and hands-on activities that demonstrated the scientific process 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 leadership and team-building activities. These advisors, Duncan Adams (male RA) and Sarah Mehl (female RA), are both current undergraduates at Montana State University and served as dormitory Residence Assistants during the 2006-2008 academic years.

A number of full-time research staff from the Western Transportation Institute as well as faculty from the Civil and Industrial Engineering 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
Nicholas Ward, Professor Industrial Engineering	Human Factors; Driving Simulation Laboratory	Safety/Human Factors
Suzy Lassacher, WTI Research Scientist	Driving Simulation Laboratory; TRAIL lab	TRAIL and Driving Simulator tour
Angela Kociolek, WTI Research Ecologist	Road Ecology	Road Ecology; Animal Detection Systems and Data Collection
Jerry Stephens, Professor, Civil Engineering	Structures/ Commercial Vehicle Operations	Bridges and Commercial Vehicle Operations
Robert Mokwa Associate Professor, Civil Engineering	Geotechnical Engineering	Soils
Pat McGowen Assistant Professor, Civil Engineering	Transportation Engineering	Transportation Planning; SimCity; Traffic Simulation
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 Associate Professor, Civil Engineering	Transportation Engineering	Traffic Engineering; Traffic Simulation and Speed Analysis
Tyler Cegler Admissions & New Student Services	College Recruitment	College 101 presentation
Alyce Maas Counselor, Career Services	Career Planning	Strong Interest Inventory and Career Planning session

5 2008 PARTICIPANTS

Posters, announcements, and applications about the program were sent in April 2008 to principals, guidance counselors, and math and science teachers at Montana high schools. Information was additionally distributed via the WTI website, MDT, and the Montana ITE Chapter. 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. Fifteen applications were received. 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. Eleven accepted applicants confirmed attendance and returned the requisite permission forms and requested information. Three selected applicants declined to participate in the program and one application was received from an out of state student just days before the start of the STI, too late for travel arrangements to be made. The eleven confirmed participants all 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. Two students with financial aid received travel assistance to attend the program. A demographic summary of 2008 STI participants is provided in Table 3.

Table 3: Demographic Summary

	Number of Participants
Ethnic Background	
Hispanic	2
African American	2
Native American	1
White/Non-Hispanic	6
Gender	
Male	6
Female	5
Geographic representation	
Number of Cities	7

6 ACADEMIC PROGRAM

The 2008 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, and human factors. A number of transportation professionals shared their expertise with the students during a Transportation Career Panel, and STI participants

visited 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 and a 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 daily schedule is 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 travelers 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.

Urban Planning

Pat McGowen, Assistant Professor of Civil Engineering at MSU, discussed urban transportation planning and introduced the students to traffic simulation programs Synchro and TrafficSim. The participants used the software to redesign an intersection in Bozeman.

Students then experienced being urban planners 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, Associate 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, Associate Professor of Civil Engineering, introduced STI participants to the field of geotechnical engineering. After learning basic concepts, various soil properties were

physically demonstrated. The importance of soils as foundations for structures, including roadways, was emphasized.

Students demonstrated their acquired knowledge of soil properties in a laboratory competition. Student teams designed and built small scale, reinforced soil retaining walls. The walls were subjected to increasing loads until they collapsed.

Concrete

STI participants were introduced to concrete, a frequently used material for construction of transportation infrastructure. They learned about the various components that make up concrete and concepts behind concrete mix design. The students then made trial concrete batches in the laboratory using different mix designs. Samples were cast and cured from each trial batch for material property testing. These samples were subsequently tested in the laboratory to demonstrate the differences in concrete strength that resulted. Eli Cuelho, Research Engineer at the Western Transportation Institute, facilitated these activities.

Bridge Design

Civil Engineering Professor Jerry Stephens introduced students to bridge design and demonstrated a number of basic mechanics principles using foam, balsa wood, and reinforced and unreinforced concrete beams. 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 small scale, 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 typical failures using several pre-built models. Each design team then brainstormed various design ideas, ultimately selecting one idea to pursue. They then sketched plan and elevation views of their chosen design. Once complete, they carefully drew their design to scale, and used this drawing as a guide in constructing their bridge. Each team received an identical kit of materials for their bridge construction, which included balsa wood pieces, glue, stick pins, wax paper, masking tape, ruler, and cutting knife.

A formal competition was held between the student teams when the bridges were completed. Each team presented their design and described how much weight they expected their bridge would hold and where they thought their bridge would fail. Each bridge was weighed prior to testing. The bridges were then supported at each end and loaded in the center using a bucket that was incrementally filled with water until the bridge failed. The efficiency of the bridge was determined based on how much weight the bridge held and 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 visited 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 examined a variety of aircraft and gliders. The students met flight instructors at Summit Aviation, viewed the school's state-of-the-art flight simulator, and were treated to a thirty minute "discovery flight" in the school's small training aircraft.

As part of the aviation module, students also participated in a hands-on glider design/build exercise. Working in teams of two, gliders were designed and built based on knowledge gained during flight trials that experimented with wing placement and nose weight. Final glider designs were reviewed and tested in a competition. Awards were given for aesthetics and engineering (Figure 1).



Figure 1: Students test glider designs

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 and built their own small scale crash attenuators using paper bags, cotton balls, Ziploc bags, paper clips, tape, straws and bubble wrap. The students were tasked with designing the least expensive attenuator that would successfully protect the passenger (an egg) in a toy truck. Cost was calculated using time spent in construction of the attenuator (labor cost) and weight of the attenuator (materials cost). The completed attenuators were placed in front of a concrete block at the bottom of an approximately 1 meter high ramp. The student with the most cost-effective crash attenuator that protected the egg from breaking won a prize.

Human responses to roadway signage, traffic, and driving environment are also a key element in safety, and students were introduced to human factors research as a critical component of traffic safety studies. They learned how researchers use driving simulation laboratories to safely conduct human factors research, and they “drove” WTI’s state-of-the-art driving simulator.

Field Trips

Field trips supplemented classroom and laboratory activities, providing students with an opportunity to meet and speak with practicing transportation professionals. The two field trips made during the 2008 program are described below.

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 (Figure 2) during a field trip to the airport (described above as part of the aviation module).



Figure 2: Tour at Summit Aviation Flight School

Montana Department of Transportation

STI participants visited MDT headquarters in Helena, Montana. MDT staff introduced the students to the variety of careers available at MDT 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.

Gates of the Mountain

Following the tour of MDT, the students took a boat ride on the Missouri River through the Gates of the Mountains just north of Helena (Figure 3). The boat tour covered the history of water transportation on the Missouri, beginning with Lewis and Clark's historic journey. The guide described the natural history of this region and covered major historic events in the area.



Figure 3: Boat ride on the Missouri River

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, with the Civil Engineering Department at MSU, 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

Tyler Cegler from the MSU Admissions Office 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 that relate to 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's on-campus Design Unit and the Western Transportation Institute.

Career Awareness

STI students participated in a number of workshops designed to enhance their career awareness and employability skills. First, students took the 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 MSU Career Services Office met with students to distribute and discuss the results of the Strong Interest Inventory and to help students put the information 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.

Evening/Weekend Program

The objectives of planned weekend and evening activities were to allow students additional experience working in teams and to promote 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, ice cream socials, hikes, and team games such as volley ball and kick ball. Activities were varied to cater to the variety of interests within the group.

Orientation and Closing Awards Program

STI participants arrived to campus on Sunday, June 15 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 and concerns addressed. The parents then departed and the students played a number of ice-breaker games before dinner.

The following day, students received an orientation to the academic program. The students took a pre-program survey and WTI Research Director, Jerry Stephens, provided an 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 27, 2008. The closing ceremony was completely planned by the STI students. They chose decorations for the room and organized the agenda. The participants organized into teams of two; each team selected a topic covered during the STI to present to the audience during a banquet lunch. They designed posters and props to demonstrate activities and topics. Participants also presented STI instructors with certificates of appreciation. Each student received a certificate of completion from STI staff. Winning design teams received special recognition.

7 EVALUATIONS

STI students completed periodic evaluations during the camp to provide program staff feedback on the curriculum, team projects, enhancement program, evening/weekend 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:

- 5 = Strongly agree
- 4 = Agree
- 3 = Neutral
- 2 = Disagree
- 1 = Strongly Disagree

Average scores for questions on classroom activities are summarized in Table 4 at the end of this section. Student responses were generally positive, with average scores ranging from 3.9 to 4.82.

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 and that they enjoyed the creative design process. The majority of the group also felt that they learned to work in teams better and that they gained some leadership skills in the process.

The students were very positive about the two field trips they took during the program. One student commented that “everything was spectacular” and a second stated that they “enjoyed every bit” on their field trip to Helena. Summary scores for field trip evaluations are given in Table 5 at the end of this section.

Enhancement Program evaluations on career and college planning activities revealed that this program was very successful in meeting program objectives. All but one student 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. Evaluations of the Residence Hall Advisors and the evening/weekend program were mixed. All but two participants agreed that the evening activities encouraged teamwork and spirit, and that they generally enjoyed the activities. Suggestions for improvement included a wider range of activity choices, a greater variety of games, and allowing participants more freedom to choose activities. The group was made up of students with particularly diverse interests, which made it difficult for the RAs to please everyone with a single group activity. Evaluations of Residence Hall Advisors repeated requests for “more freedom.” To address this in future programs, RAs may need to incorporate more blocks of unstructured free time into the schedule. The parent/student orientation will also need to emphasize university requirements regarding adult supervision on campus so that participants will have realistic expectations about how much “freedom” they can expect in organizing their evening activities.

Evaluations of the teaching staff, on the other hand, were uniformly positive. All eleven students “strongly agreed” or “agreed” with the following evaluation criteria:

1. The staff was available when I had a question or needed assistance.
2. The staff was friendly and considerate.
3. The staff was enthusiastic and knowledgeable about program topics and activities.
4. The staff encouraged students to strive for excellence in camp projects and activities.
5. The staff explained assignments well and provided assistance when necessary.
6. The teaching staff treated everyone fairly.

Although the evaluation was on a five-point scale, several students commented that they would have given them higher points if possible. Additional comments regarding teaching staff included:

- *“Patty was very nice and understanding. Very professional.”*
- *“They were spectacular! They’re the greatest TA’s ever!”*
- *“Beez and Patty are awesome.”*
- *“Some of the best people I ever met.”*
- *“Keep them.”*

An end of program survey was administered to gauge how students’ attitudes toward college preparatory courses, engineering, and MSU, may have been changed by the program. The survey also queried participants’ program expectations and perceptions. Observations based on these survey results include:

- 1) Participants felt more knowledgeable about careers in transportation following the STI;
- 2) Projects helped participants to better understand transportation careers;
- 3) Participant goals relative to pursuing engineering careers were similar before and after the STI experience;
- 4) The STI curriculum was consistent with participant expectations;
- 5) The students enjoyed the speakers and enhancement activities offered during the program.

.A summary of the survey results is in Table 6 at the end of this section.

Table 4: Student Classroom Evaluation Summary Scores

	Module					
	Concrete Design	Soils / Geotech	Driving Sim	Traffic Engineering	Urban Planning	Road Ecology
Class activities were well organized	4.64	4.73	4.45	4.45	4.64	4.3
Class activities were logically sequenced such that simpler activities preceded more complex activities.	4.55	4.55	4.09	4.55	4.64	4.1
Students were able to ask questions and discuss related issues during the course of class activities.	4.82	4.36	4.45	4.73	4.36	4.5
Presenters provided sufficient explanation of the concepts covered.	4.82	4.55	4.64	4.55	4.36	4.3
Presenters provided adequate assistance to participants during activities.	4.36	4.64	4.18	4.27	4.09	4.1
Enough time was allowed for you to adequately understand what was being taught.	4.64	4.73	4.27	4.55	3.55	4.3
The presentation sparked by interest in learning more about the topic.	4.18	4.64	4.36	4.09	4.18	3.9
I enjoyed the activity.	4.82	4.82	4.55	4.27	4.55	3.9

Table 5: Field Trip Evaluation Summary Scores

Question	Module	
	MDT Headquarters	Airport/Summit Aviation
The field trip was informative.	4.18	4.64
Field trip activities helped me understand transportation careers better than before.	4.0	4.64
Enough time was allotted for questions.	4.18	4.55
Enough time was spent at each site/point of interest.	4.09	4.64

Table 6: 2008 End of Program Survey Summary

	Number of Responses				
	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)
STI Participant Goals					
1. I was able to meet other students with interests similar to mine.	4	6	1		
2. I was able to design and build projects.	4	7			
3. I was able to learn more about careers in transportation.	5	4	2		
4. I was able to learn more about engineering.	5	3	3		
5. I was able to learn more about Montana State University.	6	5			
6. Before the STI, I was interested in majoring in engineering.	1	5	2	1	2
7. After the STI, I would consider majoring in engineering.	1	4	2	2	2
8. Before the STI, I was interested in attending MSU.	1	1	2	5	2
9. After the STI, I would consider attending MSU.	2	1	4	3	1
10. I will take different classes in high school after attending STI.		3	4	2	2

	Number of Responses				
	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)
Speakers					
1. The speakers aligned with what you expected out of the camp.	1	6	4		
2. I enjoyed the speakers.	3	7	1		
3. The speakers led me to consider majoring in engineering.	2	2	7		
4. The speakers led me to consider attending MSU.	1	6	3		1
Projects					
1. The projects helped me understand transportation careers better than before.	3	7	1		
2. In general, the projects gave me some practical experience related to transportation.	2	7	2		
3. Enhancement activities were beneficial.	2	7	2		

8 RESULTS AND CONCLUSIONS

The 2008 Summer Transportation Institute at Montana State University provided a demographically diverse group of 11 secondary school students with exposure to the field of transportation, opportunities to learn about the variety of transportation careers available, and college preparatory and career planning experience. Student feedback and evaluations show that the participants were very positive about the academic, career development, and college preparatory aspects of the program. A large majority of the students felt better prepared for dealing with the college application process and more confident in making career choices after 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 and geotechnical modules. The aviation module, including a tour of the Bozeman airport and discovery flights with Summit Aviation, was also very popular.

Participants were uniformly enthusiastic about team design-build activities, which included a balsa wood bridge competition and glider competition. The majority of participants confirmed that their skills with teamwork improved during these team design-build activities. Academic program staff members 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 2008 Summer Transportation Institute will be used as a template for future STI programs at MSU.

9 APPENDIX A: IAB MEETING MINUTES

Summer Transportation Institute
Intermodal Advisory Board Meeting Minutes
April 17, 2008

Attendees: Susan Gallagher, Scott Keller, Danielle Reagor (teleconference), Sue Sillick (teleconference), Lloyd Rue (teleconference), Ahmed Al-Kaisy (teleconference), Kris Christensen (teleconference)

1. Overview

Susan Gallagher provided a brief overview of the STI's national goal of developing a diverse workforce for the transportation industry. She then reviewed the planned 2008 program. The program will run from June 15 to June 27, 2008 and activities will be based on last year's successful program.

2. Action Items completed to date:

- Contract signed with MDT for funding.
- 250 letters/applications/brochures/posters sent out to Montana schools and education program coordinators (Talent Search, Indian Education offices, tribal schools). Application deadline set for April 30.
- STI website completed with updated photos, information, and application materials.
www.wti.montana.edu/Education/SummerTransportationInstitute.aspx
- Job openings for RAs and TA posted. Program Coordinator and male RA from 2007 will be returning to posts. A new Teaching Assistant and female RA have now been hired.
- Contract completed with MSU Conference Services (includes meal plan, dorm room reservations, MSU OneCards).
- Group coverage organized for program through American Life Insurance.
- Beginning preparation of preliminary curriculum/schedule.

3. Discussion

Recruitment

- Expected recruitment issues were discussed. Danielle forwarded announcement to MT – ITE chapter listserv and Terry Smith has sent information to ITE officers outside of Montana. Scott Keller will put item in MDT newsletter. Susan will forward by email school call lists to IAB members who agreed to follow-up with school counselors in their areas.
- Funding timelines and issues related to recruitment/fundraising were raised. Several opportunities to recruit at reservation schools were missed this year because funding was not allocated in time. Sue and Lloyd agreed that recruitment for 2009 program could begin before funding contract for '09 in place as long as applicants were aware the program would be offered pending funding approval.

Activities

- Scott Keller will work on coordinating a tour of MDT HQ for the 2008 group. The date will be Friday, June 20. Susan will coordinate with David Kack to plan an airport tour as was done last year.
- There was general agreement that the Transportation Career Panel was a useful activity last year. Lloyd, Danielle, and Scott were tentatively available to participate. Danielle will be out June 19-20, so a more suitable date will be arranged. Scott will organize the MDT Design Unit picnic for the same day.
- The Gallatin Canyon project was mentioned as a potentially interesting field trip as it involves blasting and highway widening. However, the work may not begin by the STI dates. Scott will check with project managers about potential summer construction projects to tour.

Administrative

- For the 2009 implementation plan, it was suggested that Project Director tasks be broken down for pre and post STI, with a specific timeframe for each task. This may help avoid the Project Director salary allocation issues of this year. The evening program will also be outlined in more detail with better justification of activities.
- All invoices should be sent from OSP directly to Sue Sillick for processing.
- Susan will email the existing program evaluation questions to the IAB for feedback. Ahmed asked about evaluation of other STI programs and of the program overall. Susan will check with FHWA about their current assessment strategies.

Partnership

- The ITE Montana Chapter agreed to pay \$100-150 to the STI for participant travel stipends (or other legitimate program expenses).
- Lloyd suggested making the STI an agenda item during the business meeting at the Joint Engineers Conference. Participant organizations may be willing to sponsor the STI by allocating their conference fee distributions to the STI program.
- Danielle also mentioned the Spring Engineering Festival at MSU. Presentations on the STI could be made at the ITE and ASCE chapter meetings.

10 APPENDIX B: STI SCHEDULE

2008 Summer Transportation Institute at Montana State University

Week 1: June 16 – June 20

<p>Monday, June 16</p> <p>9:00am-10:30am: [WTI Conference Room] STI Orientation (Transportation knowledge pre-test; Program overview-schedule & expectations) (STI Staff)</p> <p>10:30-noon: [WTI] Traffic Engineering Activity (Ahmed Al-Kaisy)</p> <p>Noon-1pm: Lunch (Miller Dining Hall)</p> <p>1-2pm: Campus Tour (Meet at Admissions Office)</p> <p>2-4pm: [CB Soils Lab 202] Geotechnical Engineering introduction and demonstration lab (Mokwa)</p>	<p>Thursday, June 19</p> <p>8-9am: [CB 202] Intro to highway safety/crash attenuators (Staff)</p> <p>9-11am: [CB 202] Crash attenuators/egg ramp activity (Staff)</p> <p>11-noon: [Dodge Conference Room CB 201] Introduction to Civil & Construction Engineering (Gunnink)</p> <p>Noon-1pm: Lunch (Miller Dining Hall)</p> <p>1-2:30pm: [CB 104] Test Concrete Cylinders (Cuelho)</p> <p>2:30-3:30pm: [RH 218] Trucking and freight (Jerry Stephens)</p> <p>3:30-4:30: [SUB]College Entrance & Preparation (Tyler Cegler)</p>
<p>Tuesday, June 17</p> <p>8:30am-9:00am: [Tait Lab; CB 200] Strong Interest Inventory (STI staff)</p> <p>9:00-noon: [Tait lab] SimCity transportation/urban planning (Pat McGowen)</p> <p>Noon-1pm: Lunch (Miller Dining Hall)</p> <p>1-3pm: [WTI Conference Room] Bridge Design (Stephens)</p> <p>3-5pm: [WTI Conference Room] Balsa wood bridge team design activity (STI Staff)</p>	<p>Friday, June 20</p> <p>6:30am: Breakfast and pick up sack lunches</p> <p>7am: Depart for Tour of Montana Department of Transportation Headquarters (Helena)</p> <p>2pm: Gates of the Mountain ferry ride</p>
<p>Wednesday, June 18</p> <p>8-10am: [WTI] Balsa wood bridge work</p> <p>10-11am: [WTI Conference Room] Career Planning (Alyce Maas)</p> <p>11-noon: Police Driving Safety Presentation (Mike Stanley—Campus Police)</p> <p>Noon-1pm: Lunch (Miller Dining Hall)</p> <p>1-3pm: [Transportation Lab CB 426] Traffic Engineering Activity (Al-Kaisy)</p> <p>3-4pm: [RH 218] Concrete Introduction (Cuelho)</p> <p>4-5pm: Concrete Laboratory (bulk materials lab CB 109)</p>	<p>Saturday/Sunday June 21-22</p> <p style="text-align: center;">- Sports and Recreation activities</p>

Week 2: June 23 – June 27

<p>Monday, June 23</p> <p>9-10am: [WTI conference room] Human Factors (Nic Ward)</p> <p>10-11am: [WTI] Driving Simulator lab (Suzy Lassacher)</p> <p>11-noon: [WTI] TRAIL lab demo (Suzy Lassacher)</p> <p>Noon-1pm: Lunch (Miller Dining Hall)</p> <p>1-3pm: Balsa bridge completion</p> <p>3-5pm: Transportation Career Panel (Scott Keller-MDT; Danielle Reagor – Engineering, Inc.; Pat McGowen – MSU Civil Engineering Dept.)</p> <p>5:30pm: MDT Design Unit BBQ (Lindley Park)</p>	<p>Thursday, June 26</p> <p>9am-10am: Team glider design tests/presentations (STI staff—WTI Conference Room)</p> <p>10am - noon: Final evaluations; transportation knowledge post-test (Jeopardy); Closing ceremony preparation (STI staff—WTI Conference Room)</p> <p>Noon-1pm: Lunch (Miller Dining Hall)</p> <p>1-5pm: Closing ceremony preparation (STI staff-WTI Conference Room)</p>
<p>Tuesday, June 24</p> <p>9-10am: [WTI Conference Room] MDT Wetlands Mitigation (Keller)</p> <p>10am-noon: Balsa wood bridge competition (Staff)</p> <p>Noon-1pm: Lunch (Miller Dining Hall)</p> <p>1-3pm: Road Ecology [WTI Conference room] (Kociolek)</p> <p>3-5pm: Glider Activity [Staff—WTI conference room]</p>	<p>Friday, June 27</p> <p>Morning: Packing and Dorm Check Out</p> <p>Noon (WTI Conference Room): STI Closing Ceremony, Banquet and Farewells</p>
<p>Wednesday, June 25</p> <p>[Pick up David Kack at WTI at 8:15am]</p> <p>9am-1pm: Field trip to Gallatin Field Airport and discovery flights with Summit Aviation (Picnic lunches)</p> <p>1-2 pm: [WTI Conference Room] Intro to Aviation (Kack)</p> <p>2-5pm: [WTI Conference room] Team Glider project (STI staff)</p>	

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