

# 2011 MONTANA SUMMER TRANSPORTATION INSTITUTE

FHWA/MT-11-004/6439-088

Final Report

prepared for  
THE STATE OF MONTANA  
DEPARTMENT OF TRANSPORTATION

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

September 2011

prepared by  
Susan Gallagher

Western Transportation Institute  
Montana State University - Bozeman



RESEARCH PROGRAMS

**MDT**★

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# 2011 MONTANA 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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State of Montana  
Department of Transportation  
Research Programs

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U.S. Department of Transportation  
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September 2011

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16. Abstract 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. 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. Eighteen secondary school students participated in the residential program at MSU from June 12 to June 24, 2011. The STI recruited rising tenth, eleventh, and twelfth grade students from a mix of backgrounds and hometowns. Students lived on MSU campus while learning about career opportunities in transportation. The two-week program provided a multidisciplinary academic curriculum, which included guest speaker presentations, 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 discovery flights with Summit Aviation. In addition, the participants learned about college preparation and career planning. During the evenings and weekend, STI students participated in educational, sports, and team-building activities.			
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## **PROGRAM ADMINISTRATION**

1. Host Site: Western Transportation Institute, Montana State University
2. Address: PO Box 174250, Bozeman, MT 59717-4250
3. Project Director: Susan Gallagher
4. Length of Program: 2 Weeks
5. Type of Program: Residential
6. Grade Level(s): Entering 10th, 11th, and 12th grades
7. Number of Students per Grade: 10<sup>th</sup> grade (5), 11<sup>th</sup> grade (6), 12<sup>th</sup> grade (7)
8. Number of Student Applications Received: 22
9. Number of Students Selected for Program: 21
10. Number of Students to Complete Program: 18

## **ABSTRACT**

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. 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. Eighteen secondary school students participated in the residential program at MSU from June 12 to June 24, 2011. The STI recruited rising tenth, eleventh, and twelfth grade students from a mix of backgrounds and hometowns. Students lived on MSU campus while learning about career opportunities in transportation. The two-week program provided a multidisciplinary academic curriculum, which included guest speaker presentations, 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 discovery flights with Summit Aviation. In addition, the participants learned about college preparation and career planning. During the evenings and weekend, STI students participated in educational, sports, and team-building activities.

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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 by heightening pre-college student interest in transportation careers. Program activities are designed to enhance participants' problem-solving, communication, and critical thinking skills and to introduce them to the broad array of opportunities available in the transportation field. The 2011 STI hosted eighteen high school students on the Montana State University campus for two weeks during June. The curriculum included presentations and activities related to various transportation modes with an overarching focus on transportation safety. Academic activities were enhanced by field trips and hands-on design/build activities. The program also provided a career and college counseling component, and team-building activities.

## 2 COMMITTEE, PARTNERS, AND STAFF INFORMATION

### 2.1 Intermodal Advisory Committee

An Intermodal Advisory Committee (IAC), made up of representatives from government, industry, and academia, was formed to assist the STI program in developing a well-balanced curriculum, planning activities and field trips, obtaining technical expertise, and conducting strategic planning. Members of the 2011 IAC are listed in the Section I Attachment provided in Appendix A.

The IAC met on May 9, 2011 to discuss the program. The meeting began with an overview of what had been accomplished to date. Feedback from IAC members was solicited regarding revising survey instruments used to evaluate the program's success. Kris Christensen of MDT suggested using MDT Human Resources personnel to conduct exit interviews of participants. This suggestion was implemented. IAC members also were instrumental in obtaining financial support from ASCE and ITE chapters for the program (as discussed in Section 2.2 below). IAC member Scott Keller volunteered to make arrangements for the participants' field trip to MDT headquarters in Helena and to host a networking barbecue for STI participants, MDT Design Unit interns, and STI instructors.

### 2.2 Partners/Sponsors

IAC member Lloyd Rue of FHWA was instrumental in obtaining sponsorship from the Montana Chapter of the American Society of Civil Engineers (ASCE). ASCE contributed \$350 toward STI program activities. IAC members Scott Keller and Danielle Scharf acquired program support from the Montana Chapter of the Institute of Transportation Engineers (ITE), which contributed \$250 to supplement the STI budget. In addition, the MSU Department of Civil Engineering provided access to the bulk materials and transportation laboratories and laboratory equipment, and the Tait Computer Laboratory. The Western Transportation Institute (WTI) made its Driving Simulation Laboratory available to students and provided use of its classroom and A/V equipment for classroom activities. The Montana Department of Transportation provided

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staff time during the field trip to Helena. IAC member Scott Keller (MDT Design Unit) escorted students on the Helena field trip and served as a guest speaker during the program, introducing STI participants to a wetland reconstruction project completed by the MDT Design Unit on campus. Ryan Haskins, flight instructor from Summit Aviation and Director of Aviation Technology at the College of Technology, provided an overview of aviation careers to the students and set up tours at the airport. Partners are listed in the Section I Attachment in Appendix A.

### **2.3 Program Staff**

Full-time program staff included the Project Director, an Academic Program Coordinator, a Teaching Assistant, and two Residence Hall Advisors (RAs). Teaching staff were responsible for assisting with the development of classroom and hands-on activities, leading classroom activities, and assisting guest instructors with classroom management. The RAs were hired to supervise students during weekends and evenings and to plan and lead leadership, recreation, and team-building activities.

A number of full-time research staff from the Western Transportation Institute as well as faculty from the Civil Engineering Department contributed to the development of the STI curriculum. Guest speakers also included staff from program partners Summit Aviation and MDT. All teaching and program staff are listed in the Section I Attachment in Appendix A. The STI topic presented by each instructor is given in parentheses after the person's title.

## **3 PROGRAM OBJECTIVES**

The objectives of the MSU Summer Transportation Institute 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;
- Develop communication and collaboration skills; and
- Provide college and career guidance.

The success of the program in meeting these objectives was evaluated based on 1) an assessment of the program curriculum in covering all relevant topics; 2) student responses to program evaluations administered after each activity; and 3) exit interview of participants conducted by MDT Human Resources personnel. Results from evaluations are included in the *Evaluations* portion of this report.

## **4 MARKETING & STUDENT SELECTION PROCESS**

Posters, announcements, and applications about the program were sent in February 2011 to principals and guidance counselors at Montana high schools. Program information was additionally distributed to approximately 75 teachers from Gallatin, Madison and Park Counties who attended the annual MSU Teacher Resource Fair on campus in October 2010. Students

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entering the 10<sup>th</sup>, 11<sup>th</sup>, or 12<sup>th</sup> grade were encouraged to apply for the program. The STI program especially seeks to attract Native American student participants. A number of recruitment strategies were deployed to reach this population. STI applications and program information were sent to program coordinators from programs that serve Native American students and other underrepresented or underserved groups including Upward Bound, Gear Up, and Talent Search. In addition, representatives from MSU distributed information about the STI program at college fairs held at seven different reservation high schools in Montana.

Twenty-two applications were received for the program. One applicant was not accepted because the application was received after the deadline and the program was already full. Selection letters were sent out to the remaining twenty-one applicants together with a detailed information packet and permission forms. Nineteen of the accepted applicants elected to attend the program. One student became ill with stomach flu on the first day of the program and had to go home. The remaining eighteen participants completed the two-week program. The Demographic Data Summary for 2011 STI participants is provided in Appendix B.

## **5 PROGRAM CURRICULUM**

### **5.1 Academic Program**

The 2011 Summer Transportation Institute at MSU involved students in a comprehensive academic program. Topics covered included traffic engineering, infrastructure design, road ecology, urban planning, aviation, safety and human factors. STI participants learned about career opportunities from professionals representing public and private sector transportation organizations as well as academia. Hands-on activities related to each topic helped to develop students' problem-solving skills and reinforced what they had learned. In addition to classroom activities, students participated in a number of team design/build projects, including crash attenuator, glider, and balsa wood bridge competitions. The team projects served to build teamwork and communication skills while fostering creative problem solving.

Components of the academic program are outlined in detail below, and a daily schedule is provided in Appendix D.

#### Road Ecology

Rob Ament, Road Ecology Program Manager at the Western Transportation Institute, discussed environmental impacts of transportation networks with the STI students. The concept of road ecology was introduced and participants learned about various projects aimed at mitigating the negative impacts of roads on wildlife.

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. The students were able to visit the site following his presentation.

#### Urban Planning

Pat McGowen, Assistant Professor in 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

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experienced being urban planners using the computer game SimCity. The students were asked to design a workable city transportation infrastructure without bankrupting the treasury.

### 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 traffic 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 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. Equivalent samples that had been previously cast and cured were then subjected to material property testing using compression equipment in the lab. The compression tests demonstrated the differences in concrete strength that resulted from different design mixes. Mike Berry, Assistant Professor of Civil Engineering, 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. Students also worked in teams of two to design and build a small scale, balsa wood truss bridge. The teams competed in a formal competition where loads were added to the bridges until they failed. Awards were given based on efficiency, aesthetics, and craftsmanship.

### Aviation

Ryan Haskins, Director of Aviation Technology and licensed flight instructor, introduced students to aviation careers and airline regulation. The students visited the Gallatin Field Airport and toured a number of its facilities. They spoke to professionals in security, fire and rescue operations, air traffic control and airplane maintenance. The students met flight instructors at

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Summit Aviation, and experienced a thirty-minute “discovery flight” in the school’s small training aircraft. Students also participated in a hands-on glider design/build challenge. 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.

#### Traffic Safety and Human Factors

STI participants 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 developed and “drove” scenarios using WTI’s state-of-the-art driving simulator. Participants were additionally able to experiment with texting while driving in a safe environment and to experience how differing levels of driver distraction impact driver performance. WTI Human Factors Research Assistants Maria Angelica Velazquez, Jessica Mueller, Tawny Hoyt, and Kaysha Young facilitated these activities.

The Montana Department of Transportation’s traveling exhibit “Respect the Cage” emphasized the importance of seat belts for passenger safety. Students watched a film and then were able to explore the exhibit’s Rollover Simulator, which demonstrates the impact of a rollover accident on a crash-test dummy.

Participants additionally learned about roadside hazards and crash attenuators. They then formed engineering teams and were challenged to design and build a crash attenuator as economically as possible out of provided materials (plastic bags, cotton balls, straws, etc.). The team able to build the cheapest and most efficient crash attenuator won an award. The attenuators were tested using a ramp, a toy truck, and an egg (as passenger).

#### Alternative Modes of Transportation

WTI Research Associate Rebecca Gleason gave a presentation on alternative modes of transportation, focusing on transit and biking. She discussed what some urban communities are doing to promote biking and transit ridership.

#### Field Trips

Field trips supplemented classroom and laboratory activities, providing students with an opportunity to meet and speak with practicing transportation professionals. Students participated in two field trips during the 2011 program as described below.

##### *Gallatin Field Airport*

STI participants toured airport fire and rescue, air traffic control tower, aircraft maintenance operations, and Summit Aviation flight school during a field trip to the airport (described above as part of the aviation module).

##### *Montana Department of Transportation*

STI participants visited MDT headquarters in Helena, Montana. MDT Director, Jim Lynch, met with STI participants to discuss transportation issues and careers. The MDT historian provided an overview of the history of transportation in Montana, including land and water transportation.

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STI students were treated to tours of both the Photogrammetry Section and the CADD unit at MDT.

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, MT. The ferry tour covered the history of water transportation on the Missouri, beginning with Lewis and Clark's historic journey.

## **5.2 Enhancement Program**

The enhancement program was designed to prepare students for college and to promote career self-awareness. The desired outcomes for the enhancement program were for students to:

- Understand steps necessary to enter college;
- Develop and use employability tools; and
- Recognize and appreciate the value of diversity in the workforce.

Heather Wofford 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. STI participants also interacted with current college students to gain a better understanding of college life during a barbecue for STI participants and undergraduate student interns from MDT's on-campus Design Unit and the Western Transportation Institute.

In order to enhance students' career awareness, participants took the on-line "Strong Interest Inventory," a test designed to highlight a person's strengths and interests in relation to potential career fields. Erin McCormick 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. To develop participants' employability tools, she helped students to understand the importance of developing a good resume and honing their interviewing skills.

## **5.3 Sports and Recreation Program**

The objectives of planned weekend and evening activities were to provide 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 (RAs) organized ice-breakers, team-building activities, and team sports. Activities were varied to cater to the variety of interests within the group. Activities included: Frisbee, volleyball, hikes, game and movie nights, a group bonfire and hike, and a visit to the Museum of the Rockies.

## **5.4 Orientation and Closing Awards Program**

STI participants arrived on campus on Sunday, June 12 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

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overview of planned STI activities provided. STI rules, regulations, and expectations were reviewed in detail as well as consequences for non-compliance. The following day, students received an orientation to the academic program and participated in a tour of the Montana State University campus.

Family members of STI participants as well as STI instructors, sponsors, and IAC members were invited to the STI Closing Ceremony held on June 24, 2011. The closing ceremony was completely planned by the STI students. The participants prepared a photo slide show and presented each topic covered during the STI to their parents. Each student received a certificate of completion from STI staff. Winning design teams received special recognition and three pairs of students received special bonuses for participation and performance over the course of the program.

## **6 EVALUATIONS**

### **6.1 Classroom Session Evaluations**

In order to better evaluate projected outcomes, new survey instruments were developed for the 2011 STI program. Daily evaluations were administered to the students. The evaluations encouraged greater narrative input from the students in the form of a daily journal. In addition to quantitative questions, the daily journals asked questions more specifically focused on knowledge gained from each course module. The questions were designed to foster reflection on each day's activities.

The quantitative portion of daily evaluations allowed students to indicate their level of agreement with a specific statement using the following scale:

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

These questions were used to gauge whether the students received adequate assistance and sufficient explanation for each topic covered.

Average scores for agreement with statements on classroom activities are summarized in Table 1. Student responses were very positive, with average scores ranging from 4.47 to 4.89.

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**Table 1: Student Classroom Evaluation Summary Scores**

Statement	Concrete Design	Soils / Geotech	Human Factors	Traffic Engineering	Road Ecology	Sim City
Students were able to ask questions and discuss related issues during the course of the activity.	4.89	4.76	4.83	4.56	4.89	4.67
The presentation related well to the laboratory or field activity that followed.	4.72	4.61	4.39	4.56	N/A	4.78
The instructor provided sufficient explanation of the concepts covered.	4.67	4.47	4.72	4.61	4.83	4.78

Reflective questions focused on knowledge gained during each module. For example, on the first day of the program, students attended a presentation on geotechnical engineering followed by a laboratory activity in which they built soil retaining walls. In their journals, participants were asked to list three reasons knowledge of soil properties is essential for transportation professionals. Following the driving simulator activity, students were asked to consider what type of study they might undertake to improve safety if they were a researcher in the driving simulator laboratory. They were also asked to consider and list the pros and cons of using a simulator versus the “real world” for their proposed study.

A sample of student comments provided in response to reflective questions is given below:

- *I had never heard of geotechnical engineering before the presentation. What I found most interesting was the amount of weight our small scale walls could handle.*
- *I learned it is important to get internships in the fields you are interested in. The internships often lead to job opportunities. It is a lot cheaper to get an internship than taking college courses and find out you are not interested in that field.*
- *Two of the most interesting concepts was how the stress is distributed through the bridge and the strengths and weaknesses of the different materials. Concrete can't hold tension and steel corrodes. Also concrete protects against corrosion and steel is very strong.*
- *The two most interesting things were the parts about suspension bridges and the materials used along with pre-stressed concrete used in bridges. Concrete does not stretch and is very heavy but it is cheap and can hold a lot of weight. Steel is expensive and rusts but it can take tension and is a lighter material.*
- *After working with the demo traffic simulator, I grasped the struggles that engineers deal with when choosing types of intersections.*
- *My favorite was when we were having the career planning discussion. I liked it because I got to know a lot better what I want to be in the future.*
- *I did not realize so much time went into the design of guard rails. They look simple but are actually complex in the way they stop cars. I learned that expensive doesn't always mean better. But expensive can also be better in certain situations.*
- *I enjoyed both competitions. I liked that we could work in a team rather than alone. I learned that with enough cooperation you can work with almost anyone.*



## 6.2 Team Design-Build Project Evaluations

STI participants also evaluated the balsa wood bridge and glider team projects they completed (see Table 2). The team design-build activities were intended to meet the objective of improving students' communication and collaboration skills.

**Table 2: Team Design-Build Projects**

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The team design/build activities were well organized.	11	5	2		
Adequate time was allotted for the design/build projects.	9	7	1	1	
I was challenged by the projects.	9	8	1		
I learned to work in a team better.	8	1	8	1	
I learned some new leadership skills.	8	2	8		
I received adequate instruction.	8	6	2	2	
I enjoyed the creative design process.	14	3			1
Competitions were fun and challenging.	12	5	1		

\* Number of respondents. N=18

## 6.3 Enhancement Program Evaluations

The STI program aimed to provide participants with career and college guidance. The Enhancement Program evaluations show that the program was largely successful in meeting this objective. As shown in Table 3, students felt more knowledgeable about applying to college and more confident about making college and career choices.

**Table 3: Enhancement Program Summary Evaluations**

Statement	2011 Summary Score
I feel more confident about making career choices.	4.33
I understand my career preferences better.	4.5

Scale: 5=Strongly agree; 1= Strongly disagree

## 6.4 2011 STI Overall Program Evaluation

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. Table 4 below provides an outline of student responses to these questions.

**Table 4: End of Program Survey Summary**

	Number of Responses				
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
<b>STI Participant Goals</b>					
1. I was able to meet other students with interests similar to mine.	12	6			
2. I was able to design and build projects.	16	2			
3. I was able to learn more about careers in transportation.	13	4	1		
4. I had fun while attending STI.	11	6	1		
5. STI helped me prepare for college.	10	6	2		
6. I was able to learn more about engineering.	12	6			
7. I would recommend the STI to other students.	12	3	3		
8. I was able to learn more about Montana State University.	12	4			
9. Before the STI, I was interested in majoring in engineering.	9	2	2	4	1
10. After the STI I would consider majoring in engineering.	10	2	5	1	
11. Before the STI, I was interested in attending MSU.	5	2	5	2	4
12. After the STI, I would consider attending MSU.	6	4	6	2	
13. The camp helped me to understand better the importance of college preparatory class work.	8	9		1	

	Number of Responses				
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
14. I feel more confident now about making future college and career choices.	12	3	3		
15. I feel better able to work on a team project.	7	6	5		
16. I feel more confident that I can handle college courses.	11	3	4		
<b>Speakers</b>					
1. The speakers aligned with what I expected out of the camp.	5	9	3	1	
2. I enjoyed the speakers.	6	8	3	1	
3. The speakers led me to consider majoring in engineering.	3	7	8		
4. The speakers led me to consider attending MSU.	4	5	6	3	
5. I learned about the importance of different modes of transportation.	7	7	4		
6. I understand better how transportation professionals identify and solve problems that impact me in everyday life.	10	6	2		
7. I understand better how important innovation is for transportation.	8	9	1		
8. Camp presentations and activities helped me to develop my problem-solving skills.	8	6	3	1	

## 6.5 MDT Exit Interview Data

Human Resources personnel from the Montana Department of Transportation interviewed the STI participants at the end of the program to gauge program satisfaction and outcomes. Student responses indicated that the majority learned about the program on-line, from a school counselor, or from a parent. They felt the application process was easy to navigate and did not require substantial time. Camp topics and activities were applicable and the length of the camp was perfect. The STI met everyone's expectations and participants stated that they got a lot out of the time they spent at the camp.

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In response to queries about program content, participants indicated that they preferred hands on activities to lectures and would have liked more hands on tasks. The students found the structural and geotechnical components the most interesting in addition to field trips.

Responses to questions about program outcomes showed that participants learned that there was a lot more that goes into building a bridge or making a road than they previously thought. They learned about the various components that create a department of transportation and that departments of transportation offer a lot of different kinds of jobs than they had known about previously. Many students expressed being more interested in jobs at transportation departments after attending STI. Participants were especially interested in the civil and structural engineering field as well as roadside ecology.

## **7 PRELIMINARY FINANCIAL REPORT**

The 2011 STI received a budget of \$38,762.19. A total of \$38,745.40 was spent out of the grant to support program activities. A detailed preliminary financial report (Section III Attachment) is presented in Appendix C.

## **8 SENIOR SURVEY DATA**

In order to gauge the impact that the Summer Transportation Institute had on participants' career and college choices after high school, a survey was emailed and mailed to former STI participants the summer following the completion of their senior year in high school. In total, forty-one participants from the 2007, 2008, 2009, and 2010 programs had graduated high school by summer 2011. Of the forty-one graduates, twenty students responded to the survey (a 49% survey success rate). Data from eleven respondents was incorporated into the 2009 and 2010 annual reports. Nine additional responses were received in 2011. A breakdown of 2011 survey responses is provided in Table 5 below.

**Table 5: Senior Survey Responses**

<b>Survey Question</b>	<b>Yes</b>	<b>No</b>
Did you apply to college?	9	
Are you currently enrolled in college?	9	
Did the STI experience impact your decision?	4	5
Did your STI experience help you in choosing a major?	7	2
Did your STI experience help prepare you for college entrance?	5	4

All nine respondents had applied to and were enrolled in four-year institutions of higher education. Eight of the past participants had enrolled in Engineering programs (two in Electrical Engineering, one in Civil Engineering, one in Industrial Engineering, two in Mechanical Engineering, one in Computer Science, and one in general Engineering). Of the eight Engineering students, seven were attending Montana State University and one Williams College. One participant was enrolled in the Sociology program at the University of Montana.

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The senior survey asked respondents for narrative comments on how the STI affected their choices after high school. Many of the comments highlighted the impact the program had on helping students narrow down their choices of college major:

- *One of the greatest impacts that the Summer Transportation Institute had on me was showing me what I was interested in and what I was not. Before I went to that camp, I thought I might want to be a chemical engineer of some sort; after leaving, I wasn't so sure. I had found numerous other things at that camp that were more "my style." So, by exposing me to all sorts of different careers and ways of pursuing those careers, this camp helped me expand my worldview and expand the choices that I saw before me in college.*
- *[STI] helped me decide to go to MSU for engineering.*
- *It was a great experience which helped me realize how enjoyable engineering can be. Helped me decide to attend MSU for engineering.*
- *Although the camp was fun and informative, it showed that I did not wish to enter the field of engineering.*

Other comments highlighted the ways in which the STI gave participants new insight on college life and expanded their college and career choices:

- *The Summer Transportation Institute was a fun way to explore the different aspects and areas of transportation related engineering, while also getting an inside view of campus life and MSU Bozeman. I believe the camp was a major factor contributing why I wanted to go to school in Bozeman as well as create an interest in transportation, especially in the area of aeronautics.*
- *Attending the Summer Transportation Institute enhanced my knowledge of the broad engineering spectrum. I was exposed to transportation-related career fields that I could be involved with if I earned a degree in civil, environmental, or chemical engineering, among others. Before STI, my knowledge of a transportation-related career was limited, but afterwards, I had a much greater understanding. I thoroughly enjoyed the STI program, and my participation allowed me to make a more informed decision on potential careers to pursue. Furthermore, being involved in STI exposed me to the MSU-Bozeman campus. I found I loved the location, facilities, and after exploration, the educational programs. STI allowed me to make a more informed decision on attending MSU for my college education.*
- *STI gave me a great opportunity to explore MSU's campus and also to explore the engineering department. This really helped me in deciding where to attend school.*
- *STI helped me decide on what college to go to. I loved being on campus at Montana State University.*
- *Enjoyed the opportunity very much. The participation helped me to understand more of the different engineering fields even though I was already planning on going into Electrical Engineering. Was very helpful in allowing me to see MSU-Bozeman's campus before I was to attend. This was a wonderful opportunity that I would recommend to anyone looking at engineering as a chosen path.*

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## 9 RECOMMENDATIONS

The 2011 Summer Transportation Institute at Montana State University provided eighteen 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 positive about the STI classroom activities, design-build team projects, and enhancement activities that were incorporated into the program curriculum.

In response to STI staff feedback from 2010, an “incentives program” was additionally incorporated into this year’s program to promote active participation in classroom and recreational activities. Points were awarded throughout the two-week program for various achievements and the highest scoring teams were awarded gift cards at the Closing Ceremony. The program was successful and staff recommended that it be continued in subsequent years. The Project Director will continue to seek additional program sponsorships from non-federal sources to implement this recommendation.

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## 10 APPENDIX A: SECTION 1 ATTACHMENTS

### **NATIONAL SUMMER TRANSPORTATION INSTITUTE PROGRAM - ANNUAL REPORT**

#### **SECTION I: INTER-MODAL ADVISORY COMMITTEE (IAC)**

<b>State: Montana</b>	<b>Host Site: Montana State University</b>
<b>Fiscal Year: 2011</b>	

<b>Name:</b>	Dr. Ahmed Al-Kaisy
<b>Title:</b>	Associate Professor, Civil Engineering
<b>Organization:</b>	Montana State University

<b>Name:</b>	Kris Christensen
<b>Title:</b>	MDT Project Manager for STI
<b>Organization:</b>	Montana Department of Transportation, Research

<b>Name:</b>	Scott Keller
<b>Title:</b>	Design Supervisor
<b>Organization:</b>	Montana Department of Transportation Design Unit

<b>Name:</b>	Lloyd Rue
<b>Title:</b>	Program Development Engineer
<b>Organization:</b>	Federal Highway Administration, Montana Division

<b>Name:</b>	Danielle Scharf
<b>Title:</b>	Associate/Senior Engineer
<b>Organization:</b>	Sanderson Stewart

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**NATIONAL SUMMER TRANSPORTATION INSTITUTE PROGRAM - ANNUAL REPORT**

**SECTION I: PARTNERS/SPONSORS**

State: Montana	<b>Host Site: Montana State University</b>
Fiscal Year: 2011	

Name:	Ryan Haskins
Title:	Director, Aviation Technology
Organization:	College of Technology/Summit Aviation
Role/Contribution:	Aviation presentation to students/Airport tour

Name:	Montana ASCE Chapter
Title:	Treasurer
Organization:	Montana ASCE Chapter
Role/Contribution:	Monetary support

Name:	Montana Institute of Transportation Engineers (ITE) Chapter
Title:	Treasurer
Organization:	Montana Institute of Transportation Engineers (ITE) Chapter
Role/Contribution:	Monetary support



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**NATIONAL SUMMER TRANSPORTATION INSTITUTE PROGRAM - ANNUAL REPORT****SECTION I: SUMMER TRANSPORTATION INSTITUTE PROGRAM STAFF**

State: Montana	<b>Host Site: MSU Western Transportation Institute</b>
Fiscal Year: 2011	

Name:	Dr. Ahmed Al-Kaisy
Position Title:	Associate Professor (Transportation Engineering)
Affiliation:	Civil Engineering Department, Montana State University

Name:	Dr. Michael Berry
Position Title:	Assistant Professor (Infrastructure Materials)
Affiliation:	Civil Engineering Department, Montana State University

Name:	Dr. Patrick McGowen
Position Title:	Assistant Professor (Transportation Planning)
Affiliation:	Civil Engineering Department, Montana State University

Name:	Dr. Robert Mokwa
Position Title:	Associate Professor (Geotechnical Engineering)
Affiliation:	Civil Engineering Department, Montana State University

Name:	Dr. Jerry Stephens
Position Title:	Professor (Structures)
Affiliation:	Civil Engineering Department, Montana State University

Name:	Maria Angelica Velazquez
Position Title:	Post Doctoral Researcher (Human Factors)
Affiliation:	Western Transportation Institute

Name:	Tawny Hoyt
Position Title:	Graduate Research Associate (Human Factors)
Affiliation:	Western Transportation Institute

Name:	Rebecca Gleason
Position Title:	Research Engineer (Alternative Transportation Modes)
Affiliation:	Western Transportation Institute

Name:	Rob Ament
Position Title:	Program Manager (Road Ecology)
Affiliation:	Western Transportation Institute

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**NATIONAL SUMMER TRANSPORTATION INSTITUTE PROGRAM - ANNUAL REPORT****SECTION I: SUMMER TRANSPORTATION INSTITUTE PROGRAM STAFF**

State: Montana	<b>Host Site: MSU Western Transportation Institute</b>
Fiscal Year: 2011	
Name:	Susan Gallagher
Position Title:	STI Project Director
Affiliation:	Western Transportation Institute

Name:	Beez Lucero
Position Title:	STI Academic Program Coordinator
Affiliation:	Western Transportation Institute

Name:	Nicholas Pfister
Position Title:	STI Teaching Assistant
Affiliation:	Western Transportation Institute

Name:	Michael McKenzie
Position Title:	Residence Hall Advisor (STI)
Affiliation:	Western Transportation Institute

Name:	Erin Ryan
Position Title:	Residence Hall Advisor (STI)
Affiliation:	Western Transportation Institute

## 11 APPENDIX B: DEMOGRAPHIC SUMMARY REPORT

<b>FY 2011</b> <b>National Summer Transportation Institute Program - Demographics Data Sheet</b>
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State:	Montana	Project Director:	Susan Gallagher
Host Site:	Western Transportation Institute	Program Dates:	June 12-24, 2011
		Program Length:	2 weeks

Select Grade Level		Applicant Data			
High School	X	Number of Applications Received:		22	
Middle School		Number of Participants Selected:		21	
Select Program Classification		Number of Participants that Completed the Program:		18	
Residential	X	Geographic Representation			
Non-Residential		Number of Cities: 13	Number of Counties: 11	Congressional District Number(s): Montana 1 At-large	

	Race/Ethnicity							Gender		Disability	Grade Level					
	African American	Caucasian	Hispanic American	Native American	Asian American	Pacific Islander	Other	Male	Female	Targeted Disabilities*	7	8	9	10	11	12
Number Of Participants:		16		1	1			11	7					5	6	7
Provide Type(s) of *Targeted Disabilities: N/A																

Schools Represented	
Name/City/State	Name/City/State
Plains Public School/Plains/MT	Choteau High School/Choteau/MT
Charlo High School/Charlo/MT	Augusta High School/Augusta/MT
Beaverhead County High School/Dillon/MT	
Butte High School/Butte/MT	
Bozeman High School/Bozeman/MT	
Stevensville High School/Stevensville/MT	
Billings West High School/Billings/MT	
Polson High School/Polson/MT	
Helena High School/Helena/MT	
Home schooled/Park City/MT	
Cascade High School/Cascade/MT	

## 12 APPENDIX C: PRELIMINARY FINANCIAL REPORT

### NATIONAL SUMMER TRANSPORTATION INSTITUTE PROGRAM

#### SECTION III: PRELIMINARY FINANCIAL REPORT

State:	Montana	<b>Budget</b>			
		<b>Categories</b>	<b>Approved</b>	<b>Expended</b>	<b>Unexpended</b>
Host Site:	WTI	Personnel	\$13,885.00	\$14,306.47	-\$421.47
Fiscal Year:	2011	Fringe Benefits	\$3,471.25	\$2,744.74	\$726.51
		Recruitment	\$800.00	\$660.26	\$139.74
		Contractual Services	\$916.00	\$1,046.00	-\$130.00
		Food	\$300.00	\$182.02	\$117.98
		Travel	\$3,300.00	\$2,339.41	\$960.59
		Supplies	\$200.00	\$230.55	-\$30.55
		Room & Board	\$10,834.00	\$12,196.81	-\$1,362.81
		Stipends			\$0.00
		Indirect Cost	\$5,055.94	\$5,039.14	\$16.80
		Totals	\$38,762.19	\$38,745.40	\$16.79
<b>Balance</b>		<b>\$16.79</b>			

**Note:** Expended Funds should include all expenditures whether invoiced or not.

## 13 APPENDIX D: STI SCHEDULE

### 2011 Summer Transportation Institute at Montana State University Week 1: June 13 – June 19

Monday, June 13	Thursday, June 16
<p><b>8:30-11am:</b> [WTI Classroom, Rm 333] STI Orientation (Transportation knowledge pre-test; Program overview, schedule &amp; expectations; small group activity) (STI Staff)</p> <p><b>11-11:30am:</b> [WTI 204] Trail Lab demo (Lassacher)</p> <p><b>Noon-1pm:</b> Lunch (Miller Dining Hall)</p> <p><b>1-2pm:</b> Campus Tour (Meet at Admissions Office in SUB second floor)</p> <p><b>2-4pm:</b> [Cobleigh Hall, Rm 202] Soil Reinforcement and Retaining Walls (Mokwa)</p>	<p><b>6:30am:</b> Breakfast and pick up sack lunches</p> <p><b>7am:</b> Depart for Tour of Montana Department of Transportation Headquarters (Helena)</p> <p><b>2pm:</b> Gates of the Mountain ferry ride</p>
Tuesday, June 14	Friday, June 17
<p><b>8-9am:</b> Daily journals. Safety obstacle course (Beer goggles)</p> <p><b>9am-noon:</b> Human Factors/Driving Simulator Demo (Maria Angelica Velazquez, Tawny Hoyt)</p> <p><b>Noon-1pm:</b> Lunch (Miller Dining Hall)</p> <p><b>1-2pm:</b> [CB 429] Intro to Civil and Construction Engineering (Gunnink)</p> <p><b>2-5pm:</b> [CB bulk materials lab] Concrete Introduction and lab; concrete testing (Berry)</p>	<p><b>9am-noon:</b> : [Cobleigh 429] Speed study/Transportation simulation lab (Al-Kaisy)</p> <p><b>Noon-1pm:</b> Lunch (Miller Dining Hall)</p> <p><b>1-4pm:</b> Wetlands presentation &amp; site visit (Keller)</p>
Wednesday, June 15	Saturday/Sunday June 18-19
<p><b>8:30am-9am:</b> Feedback evals/journals</p> <p><b>9-10am:</b> Road Ecology (Ament)</p> <p><b>10-11am:</b> MDT Respect the Cage exhibit</p> <p><b>11am-noon:</b> Traffic Engineering (Al-Kaisy) [WTI Classroom]</p> <p><b>Noon-1pm:</b> Lunch (Miller Dining Hall)</p> <p><b>1-2pm:</b> College prep/admissions process (Heather Wofford) [WTI Classroom]</p> <p><b>2-5pm:</b> Balsa bridges</p>	<p>- Sports and Enhancement activities. Museum of the Rockies; Lewis and Clark Caverns</p>

**Week 2: June 20 – June 24**

Monday, June 20	Thursday, June 23
<p><b>8am-9am:</b> Strong Interest Inventory-2<sup>nd</sup> floor computer lab (STI staff)  <b>9am-noon:</b> [Tait Lab] Sim City transportation/urban planning activity (McGowen)  <b>Noon-1pm:</b> Lunch (Miller Dining Hall)  <b>1-3pm:</b> [WTI Classroom] Structures/Bridge Design (Stephens)  <b>3-5pm:</b> Balsa bridges</p>	<p><b>8am-10am:</b> Career Planning [Erin McCormick]  <b>10am - noon:</b> Final evaluations; transportation knowledge post-test (Jeopardy); Closing ceremony preparation (STI staff)  <b>Noon-1pm:</b> Lunch (Miller Dining Hall)  <b>1-5pm:</b> Closing ceremony preparation (STI staff-WTI Classroom)</p>
Tuesday, June 21	Friday, June 24
<p><b>7am:</b> Pick up picnic lunches at Miller  <b>8:15am:</b> Depart for Gallatin Field Airport  <b>8:30am-1pm:</b> Field trip to Gallatin Field Airport and discovery flights with Summit Aviation (Picnic lunches)  <b>1-2pm:</b> Aviation Careers (Ryan Haskins)  <b>2-5pm:</b> Team Glider project; Balsa bridges [WTI Classroom, Rm 333] (STI staff)  <b>6pm:</b> MDT Design Unit BBQ (Lindley Park)</p>	<p><b>Morning:</b> Packing and Dorm Check Out   <b>11am-Noon</b> (WTI Classroom) STI Closing Ceremony and Farewells</p>
Wednesday, June 22	
<p><b>9am-noon:</b> Crash attenuators  <b>Noon-1pm:</b> Lunch (Miller Dining Hall)  <b>1-2pm:</b> Team glider tests/presentation  <b>2-3pm:</b> [WTI Classroom] Trucking/Freight (Stephens)  <b>3-4pm:</b> Test balsa bridges  <b>4-5pm:</b> Alternative modes/biking (Gleason)</p>	

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