

2013 MONTANA SUMMER TRANSPORTATION INSTITUTE

FHWA/MT-13-008/6439-220

Final Report

prepared for

THE STATE OF MONTANA
DEPARTMENT OF TRANSPORTATION

in cooperation with

THE U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

October 2013

prepared by

Susan Gallagher

Western Transportation Institute
Montana State University - Bozeman



RESEARCH PROGRAMS

MDT★

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by

Susan Gallagher

of the

Western Transportation Institute
College of Engineering
Montana State University – Bozeman

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Department of Transportation
Research Programs

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October 2013

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16. Abstract The Summer Transportation Institute (STI) hosted by the Western Transportation Institute (WTI) at Montana State University (MSU) aims to heighten student interest in transportation careers at the pre-college level. The program recruits high school students to participate in a two-week educational program on the MSU campus. The residential program introduces participants to all modes of transportation, seeks to build creative problem-solving skills, and supports college and career planning activities. The 2013 STI program was comprised of rising tenth, eleventh, and twelfth grade students from 10 different counties in Montana and three additional states. Students lived on the MSU campus while participating in a multidisciplinary academic curriculum, which included guest speaker presentations, hands-on laboratories, and field trips. Students gained leadership skills while working on team design-build projects. During the evenings and weekend, STI students participated in educational, sports, and team-building activities. Eighteen secondary school students participated in the 2013 Summer Transportation Institute, which ran from June 16 to June 28, 2013.			
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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: 10th grade (6), 11th grade (7), 12th grade (5)
8. Number of Student Applications Received: 20
9. Number of Students Selected for Program: 20
10. Number of Students to Complete Program: 18

ABSTRACT

The Summer Transportation Institute (STI) hosted by the Western Transportation Institute (WTI) at Montana State University (MSU) aims to heighten student interest in transportation careers at the pre-college level. The program recruits high school students to participate in a two-week educational program on MSU campus. The residential program introduces participants to all modes of transportation, seeks to build creative problem-solving skills, and supports college and career planning activities. STI participants comprised rising tenth, eleventh, and twelfth grade students from 10 different counties in Montana and three additional states. Students lived on MSU campus while participating in a multidisciplinary academic curriculum, which included guest speaker presentations, hands-on laboratories, and field trips. Students were exposed to an array of transportation careers and gained leadership skills while working on team design-build projects. During the evenings and weekend, STI students participated in educational, sports, and team-building activities. Eighteen secondary school students participated in the 2013 Summer Transportation Institute, which ran from June 16 to June 28, 2013.

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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 2013 STI hosted eighteen high school students on the Montana State University (MSU) 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 IAC are listed in the Section I Attachment provided in Appendix A.

A teleconference was held with IAC members on May 15, 2013 to discuss the program. The meeting began with an overview of what had been accomplished to date. At the time of the teleconference, 16 program participants had already confirmed and three teaching and RA staff members from the previous year had agreed to return for the 2013 program. Planned field trips for the program were discussed. IAC member Scott Keller volunteered to make arrangements for the participants' field trip to the Montana Department of Transportation (MDT) headquarters in Helena as well as a site visit to a wetlands reconstruction site near Bozeman. An additional field trip to Holcim cement factory and to a gravel pit, concrete mix plant, and asphalt mix plant at Knife River was discussed. IAC members Danielle Scharf and Scott Keller discussed networking at the upcoming ITE Montana chapter meeting to ensure continued financial support for the program from the Montana Chapter of the Institute of Transportation Engineers (ITE) (as discussed in Section 2.2 below).

2.2 Partners/Sponsors

The Montana Chapter of the Institute of Transportation Engineers (ITE) contributed \$300 to supplement the STI budget. IAC (and ITE Chapter) members Scott Keller and Danielle Scharf have successfully advocated for the continuing financial support ITE annually provides to the STI program. 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 staff time during the field trip to Helena. Chad Welbourne (MDT Design Unit) and IAC member Scott Keller escorted students on the Helena field trip and Scott additionally 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 Gallatin College, 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) student responses on evaluations administered at the end of the program, which requested an overall assessment of all program aspects. 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 January 2013 to principals and guidance counselors at Montana high schools. Program information and application forms were also posted on the WTI website. MSU representatives distributed

information about the STI program at college fairs held on Montana reservations and application packets were sent separately to programs that serve Native American students and other underrepresented or underserved groups including Upward Bound, Gear Up, and Talent Search. Students entering the 10th, 11th, or 12th grade were encouraged to apply for the program.

Twenty applications were received and all twenty applicants were accepted into the program. One selected participant declined to participate before the program began. A second student became sick after two days and chose to leave the program early. Eighteen students completed the two week program. The Demographic Data Summary for 2013 STI participants is provided in Appendix B.

5 PROGRAM CURRICULUM

5.1 Academic Program

The 2013 Summer Transportation Institute at MSU involved students in a comprehensive academic program. Topics covered included traffic engineering and planning, infrastructure design, road ecology and environmental engineering, 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.

Roads and the Environment

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 conducted with assistance from undergraduate student interns. The students were able to visit the site following his presentation.

Cathy Costakis, Professor of Health and Human Development at MSU, provided an overview of the concept of Complete Streets and how it seeks to join transportation planning with human health and well-being.

Students toured the MSU Subzero Laboratory, a cold room used for research on snow, ice, and winter conditions. The laboratory is used for transportation research related to infrastructure materials, freeze/thaw, frost heave, deicers and avalanches. Students were able to experience snow falling in June and to hear about research efforts currently being undertaken in the lab.

Traffic Engineering and Planning

Civil Engineering Professor Pat McGowen discussed transportation planning and introduced the students to the traffic simulation programs Synchro and TrafficSim. Participants learned about carrying capacity, congestion, and forecasting. They then experienced being transportation engineers through a hands-on activity that explored the impact road design has on congestion.

Participants used intersection counters to "map" a local intersection by counting the cars that were traveling certain directions. They then determined how the intersection would be able to handle forecasted traffic loads in the future using traffic simulation programs. Using the software, they were able to explore various redesigns of the intersection to improve traffic movement.

Geotechnical Engineering

Nick Pfister, STI Teaching Assistant and Civil Engineer, 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. Tim White, a structural engineer with Morrison-Maerle, 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

The students visited the Gallatin Field Airport and toured a number of its facilities. They spoke to professionals in security, fire and rescue operations, and airplane maintenance. The students met flight instructors at Summit Aviation, and experienced a thirty-minute "discovery flight" in the school's small training aircraft. David Kack, a researcher at the Western Transportation Institute and licensed pilot, introduced students to aviation careers and airline regulation. 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 Graduate Research Assistant Jessica Mueller facilitated these activities.

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).

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 three field trips during the program as described below.

Gallatin Field Airport

STI participants toured airport fire and rescue, 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 the headquarters of the Montana Department of Transportation (MDT) in Helena, Montana. MDT staff 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. STI students were treated to tours of both the Photogrammetry Section and the Computer-aided Design 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, Montana. The ferry tour covered the history of water transportation on the Missouri, beginning with Lewis and Clark’s historic journey.

Holcim and Knife River

Participants visited the Holcim cement plant and quarry and learned how raw materials are mined and processed to produce Portland cement. They also took a tour of an asphalt plant, concrete mix plant, and gravel pit at Knife River, a local construction contracting company.

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: 1) better understand the steps necessary to enter college; 2) better understand what college majors are available and coursework requirements for those majors; 3) develop employability tools; and 4) better understand potential career paths.

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 undergraduate student interns from MDT's on-campus Design Unit and the Western Transportation Institute during the field trip to Helena, which allowed them to gain a better understanding of college life and expectations.

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.

The Department Head in Civil Engineering, Dr. Jerry Stephens, provided the students with an overview of the Civil and Construction Engineering program at MSU and career development in these fields. His presentation included course requirements for Civil Engineering majors, licensing requirements for engineers after graduation, and professional certifications and continuing education for practicing professionals.

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: basketball, soccer, board games, and hikes. Students attended a free outdoor Shakespeare play on campus, and visited the Museum of the Rockies and local farmer's market.

5.4 Orientation and Closing Awards Program

STI participants arrived on campus on Sunday, June 16 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. 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 28, 2013. 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 teams of students received special bonuses for participation and performance over the course of the program.

6 EVALUATIONS

6.1 Classroom Session Evaluations

Daily evaluations, which encouraged narrative input from the students in the form of a daily journal, were administered to the students. In addition to quantitative questions, the daily journals asked questions specifically focused on knowledge gained from each course module. The questions were designed to foster reflection on each day's activities. For example, on one 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 learned that sometimes you have to use less materials that are expensive rather than many cheap materials that aren't as effective [crash attenuator activity].*
- *I was not aware of how much design actually went into guard rails and other protective roadside devices. I could probably think of other devices like speed cones or more animal crossing signs that could help make the road safer by allowing people to take more caution.*
- *The tour of the subzero lab was very interesting. It showed me some interesting things, such as how the lab could grow ice crystals and simulate freezing weather. It was surprising how sophisticated it all was.*
- *The MDT tour was very informative and well-organized. I found the information useful, especially knowing that many different fields of engineering are involved within MDT.*
- *I was surprised by how simple flying an aircraft was and how intuitive most of the dials were for me on the Discovery Flight.*
- *Replacing wetlands is a good idea and it saves a lot of money by filtering [water] naturally rather than at a treatment plant.*
- *The wetlands presentation emphasized the impacts of the transportation system. It is a good idea to replace wetlands because they are basically natural scrubbers of the water system.*
- *I found it interesting that the amount of water in the concrete mix controls the strength of the concrete. The lab activity was very interesting to see. We were able to see how concrete fails and the strength to which it holds.*
- *Knowledge of soil properties is essential for transportation professionals because they need to know how the soil will perform when lots of pressure is being applied to the soil. They also need to know how much water is in the soil, so if liquefaction occurs, it won't happen underneath a structure (depending where it is placed). Also, the soil properties*

are different wherever you go, so it's good to test it whenever you're going to build a structure.

- *You need to know if the soil is stable enough to build a bridge or building on it. You need to know what materials to use to stabilize the building in the ground such as concrete or steel. You need to know what the different layers are in the soil so you know how deep to pound your piles into the ground.*
- *I had not heard of human factors before today. The most interesting thing about the driving simulator was that you can design and use something to make you feel like you're in a vehicle. I would want to undertake a study to see how people drive when distracted, inebriated, or tired. It makes more sense to study this in a simulator. The simulator has fewer risks involved with it, but it is expensive, while the real world is more dangerous, but less expensive.*
- *It was interesting to test growth rates and see how they affect intersections in the future and what we can do to improve it.*

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 4.18 to 4.72.

Table 1: Student Classroom Evaluation Summary Scores

Statement	Concrete Design	Soils / Geotech	Human Factors	Traffic Engineering
Students were able to ask questions and discuss related issues during the course of the activity.	4.72	4.72	4.53	4.61
The presentation related well to the laboratory or field activity that followed.	4.72	4.61	4.18	4.72
The instructor provided sufficient explanation of the concepts covered.	4.61	4.67	4.53	4.67

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. Most of the participants agreed that they learned to work on teams better and learned some new leadership skills. The majority (17 out of 18) found the competitions fun and challenging.

Table 2: Team Design-Build Projects

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The team design/build activities were well organized.	12	5	1		
I was challenged by the projects.	12	5			1
Enough time was allotted for the design/build projects.	12	6			
I felt free to ask questions.	14	3	1		
I learned to work in a team better.	7	5	6		
I learned some new leadership skills.	8	8	2		
I enjoyed the creative design process.	14	2	2		
I received adequate instruction.	12	4	2		
Competitions were fun and challenging.	13	4			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	Summary Score
I feel more confident about making career choices.	4.33
I understand my career preferences better.	4.44

Scale: 5=Strongly agree; 1= Strongly disagree

Student narrative comments on daily journals underline the impact the STI program had on participants' perspectives regarding college and careers.

- *What I found most interesting about [the Strong Interest Inventory] is that not only did it show you your strongest interests but it also gave examples of individual careers.*
- *Internships are very important because you gain a lot of experience through internships, more than you would if you went straight into a job without experience.*
- *It is very important for college students to get experience in their area of study for getting a job after school.*
- *It made me rethink why I want to be what I want to be.*
- *I am 95% sure that I will come to MSU for Civil Engineering.*
- *I have gained knowledge of what I want to do as a career.*
- *I did not know that so many aviation careers existed. I definitely received a good overview of the different careers.*
- *I want to go into engineering, but I am unsure of what field I want to go into. I was unaware of the different focus areas within Civil Engineering.*

6.4 2013 STI Overall Program Evaluation

An end of program survey was administered to gauge how students' attitudes toward college and career choices, engineering, and MSU, may have been changed by the program. The survey also evaluated the success of the program in meeting its objectives to: 1) increase participants' awareness of the significance of transportation; 2) expose participants to the variety of transportation careers available; 3) improve participants' understanding of the society-wide impacts made by transportation professionals; and 4) increase students' understanding of the need for innovation in transportation.

Seventeen participants completed the overall program evaluation. Fifteen participants agreed that the STI helped them prepare for college. Sixteen participants reported increased understanding of the importance of various transportation modes, fifteen agreed they better understood the significance of transportation professionals' impacts on society, and fifteen understood the

importance of innovation in transportation. All seventeen agreed they learned more about transportation careers, MSU, and engineering as a field.

In terms of skill development, fifteen participants agreed that the STI improved their problem-solving skills, thirteen reported increased confidence in handling college courses, and thirteen agreed that they improved their ability to work on team projects. Sixteen participants reported increased confidence in making college and career choices. Overall, the majority of participants agreed that the program was meeting its objectives.

Table 4 below provides a breakdown of student responses to end of program evaluation questions.

Table 4: End of Program Survey Summary

	Number of Responses				
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
STI Participant Goals					
1. I was able to meet other students with interests similar to mine.	8	8		1	
2. I was able to design and build projects.	12	5			
3. I was able to learn more about careers in transportation.	13	4			
4. I had fun while attending STI.	10	6	1		
5. STI helped me prepare for college.	10	5	1	1	
6. I was able to learn more about engineering.	12	5			
7. I would recommend the STI to other students.	10	6	1		
8. I was able to learn more about Montana State University.	14	3			
9. Before the STI, I was interested in majoring in engineering.	11	4	1	1	
10. After the STI I would consider majoring in engineering.	10	4	1	2	
11. Before the STI, I was interested in attending MSU.	7	1	3	4	2
12. After the STI, I would consider attending MSU.	9	3	4	1	

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

7 PRELIMINARY FINANCIAL REPORT

The 2013 STI received a budget of \$40,029.49. A detailed 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, ninety-three participants from the 2007-2012 programs had graduated high school by summer 2013. Of the 93 graduates, thirty-three students responded to the survey (a 35% survey success rate). Data from twenty-five respondents was incorporated into the 2009-2012 annual reports. Eight additional responses were received in 2013. A breakdown of 2013 survey responses is provided in Table 5 below.

Table 5: Senior Survey Responses

Survey Question	Yes	No
Did you apply to college?	8	
Are you currently enrolled in college?	8	
Did the STI experience impact your decision to attend college?	1	7
Did your STI experience help you in choosing a major?	7	1
Did your STI experience help prepare you for college entrance?	6	2

All eight respondents had applied to and were enrolled in four-year institutions of higher education. Four respondents had enrolled in engineering programs (one in Mechanical Engineering, one in Civil Engineering, one in Mining Engineering, and one in Electrical Engineering). The other four respondents were enrolled in various programs (accounting, university studies, and physics) and one remained undecided on a major. Two program alumni were attending Montana State University. Other universities included Brigham Young, Montana Tech, Princeton, University of Wyoming, and Wheaton).

The senior survey asked respondents for narrative comments on how the STI affected their choices after high school. The responses highlight the impact the program had on helping students: appreciate the opportunities they have in college; explore engineering and transportation fields; and select a college.

- *I had learned a whole lot during my time in STI, it was truly a privilege. I have learned many aspects of engineering that I was not aware of before attending and it has helped me greatly in deciding whether the field interested me or not. Although my major in college is undecided, the attractions of the field and work have a lot of impact on the choices of my education and later goals. STI encouraged me to look into majors that include problem solving aspects and research.*
- *I always knew I was going to go to college, but I didn't know where or for what. My experience at MSU broadened my horizons and made me aware of opportunities that I could take that I hadn't thought of before.*
- *By participating, I found that I had no interest in engineering or transportation studies. This was really good for me, because it helped me to narrow down my possible majors. So even though the program did not focus on a field that I enjoy, I still greatly appreciate all that I learned and experienced.*

-
- *STI really helped open my eyes to the whole engineering aspect. It also helped me narrow down what major I may declare my second or third semester.*
 - *The Summer Transportation Institute helped me to decide on a college and to discover what type of degree I'm most interested in.*
 - *My participation helped me to get a better feel for what college life is like and what kind of jobs are out there. This institute helped me decide I want to pursue a career in Engineering.*
 - *It helped me decide what kind of engineering I would like to pursue.*
 - *This program strongly influenced my choice to major in engineering. It helped me realize how much I enjoy doing that sort of thing and solidified my interest in engineering. However it made it more difficult to decide which specific engineering I wanted to go into. It showed me the cool possibilities of transportation and civil engineering. I had always wanted to be mechanical, but this made me less sure and to this day I am not entirely positive that I will stay mechanical or switch to civil. It also made it difficult to decide which college I wanted to attend. It showed me how great a school MSU-Bozeman is and even though I decided a long time ago that I was going to go to BYU, this made me consider applying to MSU. Despite that, this program was awesome and I have recommended it to my younger friends. Thank you so much for such a great experience.*

9 RECOMMENDATIONS

The 2013 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.

The most common negative feedback received was to provide more variety of evening recreational activities and more off-campus activities. The Project Director will work with STI staff in future years to implement this recommendation.

10 APPENDIX A: SECTION 1 ATTACHMENTS

NATIONAL SUMMER TRANSPORTATION INSTITUTE PROGRAM - ANNUAL REPORT

SECTION I: INTER-MODAL ADVISORY COMMITTEE (IAC)

State: Montana	Host Site: Montana State University
Fiscal Year: 2013	

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

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

Name:	Scott Keller
Title:	Design Supervisor
Organization:	Montana Department of Transportation Design Unit

Name:	Lloyd Rue
Title:	Program Development Engineer
Organization:	Federal Highway Administration, Montana Division

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

NATIONAL SUMMER TRANSPORTATION INSTITUTE PROGRAM - ANNUAL REPORT**SECTION I: PARTNERS/SPONSORS**

State: Montana	Host Site: Montana State University
Fiscal Year: 2013	

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

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

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

State: Montana	Host Site: MSU Western Transportation Institute
Fiscal Year: 2013	

Name:	Scott Keller
Position Title:	Adjunct Instructor (Wetlands mitigation)
Affiliation:	Civil Engineering Department, Montana State University

Name:	Tim White
Position Title:	Engineer (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:	Nick Pfister
Position Title:	Engineer (Geotechnical Engineering)
Affiliation:	Western Transportation Institute, Montana State University

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

Name:	Jessica Mueller
Position Title:	Graduate Research Assistant (Human Factors)
Affiliation:	Western Transportation Institute

Name:	Cathy Costakis
Position Title:	Researcher (Complete Streets)
Affiliation:	MSU Health and Human Development

Name:	David Kack
Position Title:	Program Manager (Aviation)
Affiliation:	Western Transportation Institute

Name:	Kaysha Young
Position Title:	Graduate Research Assistant (Human Factors)
Affiliation:	Western Transportation Institute

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

State: Montana	
Fiscal Year: 2013	Host Site: MSU Western Transportation Institute
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:	Beker Cuelho
Position Title:	Residence Hall Advisor (STI)
Affiliation:	Western Transportation Institute

Name:	Danae Bray
Position Title:	Residence Hall Advisor (STI)
Affiliation:	Western Transportation Institute

11 APPENDIX B: DEMOGRAPHIC SUMMARY REPORT

FY 2013 National Summer Transportation Institute Program - Demographics Data Sheet

State:	Montana	Project Director:	Susan Gallagher
Host Site:	Western Transportation Institute	Program Dates:	June 16-28, 2013
		Program Length:	2 weeks

Select Grade Level		Applicant Data			
High School	X			Number of Applications Received:	20
Middle School				Number of Participants Selected:	20
Select Program Classification				Number of Participants that Completed the Program:	18
Residential	X	Geographic Representation			
Non-Residential		Number of Cities: 17	Number of Counties: 13	Congressional District Number(s): Montana 1 At-large, Idaho 2 nd , Colorado 2 nd , CA 11 th District	

	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:		15		1	1		1	13	5					6	7	5	
Provide Type(s) of *Targeted Disabilities: N/A																	

Schools Represented	
Name/City/State	Name/City/State
Park High School/Livingston/MT	Peak to Peak Charter School/Lafayette/CO
Roberts High School/Roberts/MT	Skyline High School/Idaho Falls/ID
Flathead High School/Flathead/MT	Miramonte High School/Orinda/CA
Darby High School/Darby/MT	
Bozeman High School/Bozeman/MT	
St. Regis High School/St. Regis/MT	
Frenchtown High School/Frenchtown/MT	
Absarokee High School/Absarokee/MT	
Helena High School/Helena/MT	
St. Andrew/Helena/MT	
Manhattan Yeshiva Jewish Day School/Manhattan/MT	

12 APPENDIX C: PRELIMINARY FINANCIAL REPORT

NATIONAL SUMMER TRANSPORTATION INSTITUTE PROGRAM

SECTION III: PRELIMINARY FINANCIAL REPORT

State:	Montana	Budget			
		Categories	Approved	Expended	Unexpended
Host Site:	WTI	Personnel	\$13,885.00	\$13,796.48	\$88.52
Fiscal Year:	2013	Fringe Benefits	\$3,471.25	\$2,395.46	\$1,075.79
		Recruitment	\$800.00	\$611.90	\$188.10
		Contractual Services	\$1,102.00	\$1,351.10	-\$249.10
		Food	\$300.00	\$203.29	\$96.71
		Travel	\$2,800.00	\$3,539.38	-\$739.38
		Supplies	\$250.00	\$104.68	\$145.32
		Room & Board	\$12,200.00	\$12,821.50	-\$621.50
		Stipends			\$0.00
		Indirect Cost	\$5,221.24	\$5,205.70	\$15.54
		Totals	\$40,029.49	\$40,029.49	\$0.00

Balance **\$0**

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

13 APPENDIX D: STI SCHEDULE

2013 Summer Transportation Institute at Montana State University

Week 1: June 17 – June 28

<p>Monday, June 17</p> <p>9:00-11:30am: STI Orientation (Transportation knowledge pre-test; Program overview, schedule & expectations; small group activity) (STI Staff) [WTI Classroom, Rm 333]</p> <p>Noon-1pm: Lunch (Miller Dining Hall)</p> <p>1:00-2:00: Campus Tour</p> <p>2:00-4:00pm: [CB202] Structures/Bridge Design-(Stephens)</p> <p>4:00-5:00pm: [Tait lab] West Point Bridge design</p>	<p>Thursday, June 20</p> <p>8-11am: Crash attenuators (STI staff) [CB202]</p> <p>11-noon: Sub Zero lab tour [Ladean McKittrick]</p> <p>Noon-1pm: Lunch (Miller Dining Hall)</p> <p>1-2pm: Engineers Without Borders (Stein) [WTI classroom]</p> <p>2-5pm: Balsa bridge work (STI staff) [WTI classroom, Rm 333]</p>
<p>Tuesday, June 18</p> <p>8-noon: Balsa bridge design competition introduction [WTI classroom]</p> <p>Noon-1pm: Lunch (Miller Dining Hall)</p> <p>1-4pm: Concrete Introduction and lab; concrete testing (White) [CB202/CB bulk materials lab]</p> <p>4-5pm: Commercial vehicles (Stephens) [CB202]</p>	<p>Friday, June 21</p> <p>6:30am: Breakfast and pick up sack lunches Pick up sack lunches at breakfast</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 19</p> <p>7:50am: Depart for Knife River. Tour of asphalt & concrete mix plants.</p> <p>10:30am: Tour of Holcim cement factory in Trident <i>Picnic lunch at Headwaters State Park</i></p> <p>2-3pm: Introduction to Civil and Construction Engineering (Stephens) [CB202]</p> <p>3-5pm: Soil Reinforcement and Retaining Walls (Pfister) [CB202]</p>	<p>Saturday/Sunday June 22-23</p> <p>Sports and Enhancement Activities</p>

Week 2: June 24 – June 28

<p>Monday, June 24</p> <p>8am-9am: Strong Interest Inventory- [CB Tait Lab] (STI staff)</p> <p>9am-noon: Intersection counting and traffic study (McGowen) [Tait Lab]</p> <p>Noon-1pm: Lunch (Miller Dining Hall)</p> <p>1-3pm: Driving Simulator/Human Factors (Mueller) [CFT2-Sim lab]</p> <p>3-4pm: Complete Streets--Cathy Costakis-WTI Classroom</p> <p>4-5: Balsawood bridges</p>	<p>Thursday, June 27</p> <p>8am-10am: Final evaluations; transportation knowledge post-test (Jeopardy) [WTI classroom]</p> <p>10am-noon: Test balsa bridges</p> <p>Noon-1pm: Lunch (Miller Dining Hall)</p> <p>1-5pm: Closing ceremony preparation (STI staff-WTI Classroom)</p>
<p>Tuesday, June 25</p> <p>7am: Pick up picnic lunches at Miller</p> <p>8:15am: Depart for Gallatin Field Airport</p> <p>8:30am-1pm: Field trip to Gallatin Field Airport and discovery flights with Summit Aviation (Picnic lunches)</p> <p>2:00-3:00: Aviation Presentation (Kack) [WTI classroom]</p> <p>3:00-5pm: Glider team design/build project [WTI classroom]</p>	<p>Friday, June 28</p> <p>Morning: Packing and Dorm Check Out</p> <p>11am-Noon (WTI Classroom) STI Closing Ceremony and Farewells</p>
<p>Wednesday, June 26</p> <p>8am-11am: Wetlands presentation & site visit (Keller) [WTI Classroom]</p> <p>11-noon: Final glider/bridge completion</p> <p>Noon-1pm: Lunch (Miller Dining Hall)</p> <p>1-3pm: Glider Testing</p> <p>3-4pm: Career Planning (Erin McCormick)</p>	

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