

2014 MONTANA SUMMER TRANSPORTATION INSTITUTE

FHWA/MT-14-004/6439-299

Final Report

prepared for
THE STATE OF MONTANA
DEPARTMENT OF TRANSPORTATION

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

October 2014

prepared by
Susan Gallagher

Western Transportation Institute
Montana State University - Bozeman



RESEARCH PROGRAMS

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2014 MONTANA SUMMER TRANSPORTATION INSTITUTE

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by

Susan Gallagher

of the

Western Transportation Institute
College of Engineering
Montana State University – Bozeman

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State of Montana
Department of Transportation
Research Programs

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U.S. Department of Transportation
Federal Highway Administration

October 2014

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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 2014 STI program was comprised of rising tenth, eleventh, and twelfth grade students from 7 different counties in Montana and 3 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. Twelve secondary school students completed the program, which ran from June 15 to June 27, 2014.			
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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: 15
9. Number of Students Selected for Program: 15
10. Number of Students to Complete Program: 12

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 2014 STI program was comprised of rising tenth, eleventh, and twelfth grade students from 7 different counties in Montana and 3 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. Twelve secondary school students completed the program, which ran from June 15 to June 27, 2014.

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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 2014 STI hosted twelve 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 IAC are listed in the Section I Attachment provided in Appendix A.

A teleconference was held with IAC members on May 27, 2014 to discuss the program. The meeting began with an overview of what had been accomplished to date. At the time of the teleconference, 15 program participants had already confirmed that they would be attending the STI. Two staff members from the previous year had agreed to return for the 2014 program, and two new staff had been hired. Planned field trips for the program were discussed. IAC member Chad Welborn confirmed that he had made arrangements for the participants' field trip to the Montana Department of Transportation (MDT) headquarters in Helena. In addition to an introduction and welcome by the Director, students would visit the photogrammetry unit, CAD unit, and the MDT Environmental Services Bureau, which would cover environmental topics, including archeology and historical preservation projects. Lloyd Rue, of FHWA, confirmed that a representative from FHWA would also be present at the tour. Scott Keller volunteered to co-chaperone the MDT tour in Helena and to additionally lead a site visit to a wetlands reconstruction project near Bozeman for the students. 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 member Danielle Scharf planned to follow up with the Montana Chapter of the Institute of Transportation Engineers (ITE) regarding financial support from the Chapter for the STI (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 Welborn (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, set up tours and discovery flights 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 2014 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.

Fifteen applications were received and all fifteen applicants were accepted into the program. Two applicants confirmed their intent to participate and returned all permission forms and paperwork as required, but then failed to show up. Neither could be reached to ascertain the reason for their absence. A third student elected to leave the program early. Twelve students completed the two week program. The Demographic Data Summary for 2014 STI participants is provided in Appendix B.

5 PROGRAM CURRICULUM

5.1 Academic Program

The 2014 Summer Transportation Institute at MSU involved students in a comprehensive academic program. Topics covered included traffic engineering and planning, infrastructure design, 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.

Matt Blank, a research associate at WTI, presented information about culverts and fish passage under roads and led a hands-on hydrology activity at a nearby stream.

Traffic Engineering and Planning

WTI researcher, 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

Erin Hafla, Graduate Research Assistant in 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, a Professor in 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

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 Assistants Jessica Mueller and Kaysha Young 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).

Students also participated in a multi-day “Peer to Peer” project in which they researched a safety issue related to teen drivers and then presented their findings and recommendations to the group and to their parents at the Closing Ceremony.

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 Research Unit provided an overview of the history of transportation in Montana, including land and water transportation, and environmental concerns. 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 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. Steve Enoch 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. He outlined some steps students could take to narrow their career choices and provided some basic career statistics. To develop participants' employability tools, he 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 15 and moved into their dormitory rooms with the assistance of the RAs and teaching staff. After the new arrivals were situated, an orientation was held for the students and parents. All staff members were introduced and an overview of planned STI activities provided. STI rules, regulations, and expectations were reviewed in detail as well as consequences for non-compliance. 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 27, 2014. The closing ceremony was completely planned by the STI students. The participants presented each topic covered during the STI as well as their Peer to Peer projects to their parents and other attendees. 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.

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

- *You have to know how weight will affect the roadbed [geotech activity].*
- *I learned a lot about the process of making concrete from the lab, but Knife River showed the industrial scale. Also, it showed the making of asphalt. Before, I had limited knowledge of it.*
- *I thought that the most interesting concepts from the bridge presentation was how a compressional load works on a horizontal beam and bracing to prevent buckling.*
- *Ships and trains provide cheaper means to move goods. Both trains and ships however are restricted to a medium of travel (water, rails).*
- *It was cool to learn about concrete and even how to make it. I also now know the difference between concrete and cement.*
- *I've always known about guard rails but I didn't know about how much design went into them. In order to design a better attenuator, you need to make it as cost efficient as possible.*

- *The subzero lab was awesome. I had no idea that they used a subzero lab for so many different things. I was so surprised when they showed us the lab that they make it snow in.*
- *Before the wetlands presentation, I did not know that wetlands had to be replaced or that wetlands filtered water. Given these facts though, I agree that wetland replacement is a good idea. Replacing wetlands lost before the law was implemented would not be beneficial as it would mean spending billions.*

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. Average scores for student responses ranged from 3.86 to 4.64.

Table 1: Student Classroom Evaluation Summary Scores

Statement	Concrete Design	Soils / Geotech	Human Factors	Traffic Engineering	Structural Engineering
Students were able to ask questions and discuss related issues during the course of the activity.	4.55	4.5	3.86	4.29	4.55
The presentation related well to the laboratory or field activity that followed.	4.55	4.3	4.29	4.43	4.45
The instructor provided sufficient explanation of the concepts covered.	4.64	4.2	4.29	4.57	4.64

6.2 Field Trip Evaluations

STI participants also evaluated the field trips to the Montana Department of Transportation in Helena and to the Gallatin Field Airport in Bozeman (see Table 2). The field trips were designed to introduce participants to the variety of transportation careers available. Most of the participants agreed that they gained a greater understanding of transportation careers. The scores used the same 1-5 scale as for the classroom evaluation.

Table 2: Field Trip Evaluation Scores

Statement	Summary Score
The field trip to Helena was informative.	4.42
Field trip activities helped me understand transportation careers better	4.33

than before.	
Enough time was allotted for questions.	4.42
Enough time was spent at each site/point of interest.	4.25
I understand more about careers available at departments of transportation.	4.33
The field trip to Gallatin Field Airport was informative.	4.75
Field trip activities helped me understand aviation careers better than before.	4.33
Enough time was allotted for questions.	4.83
Enough time was spent at each site/point of interest.	4.75

Scale: 5=Strongly agree; 1= Strongly disagree

6.3 Staff Evaluations

Two STI teaching staff led the design-build and Peer to Peer activities, coordinated guest speakers and hands-on activities, and ensured continuity for the academic program. In the evenings, two Residence Hall/Recreation Advisors were responsible for designing and leading team-building and sports and recreational activities for the participants. STI staff evaluations were very positive. As shown in Table 3, students felt that STI staff were friendly and approachable, and were there for them if they had questions or problems during the camp.

Table 3: STI Staff Summary Evaluations

Statement	Average Score
The teaching staff was available when I had a question or needed assistance	4.82
The teaching staff was friendly and considerate	4.45
The teaching staff encouraged students to strive for excellence in camp projects and activities	4.55
The teaching staff explained assignments well and provided assistance when necessary	4.55
The RA staff was helpful when I had problems	4.83
The RAs were available when I had a question or needed assistance	4.83
The RA staff planned fun recreational and sports activities that were inclusive	4.67
The RAs helped to build group atmosphere through team projects and games	4.83
Sports and recreation activities encouraged team work and spirit	4.75

Scale: 5=Strongly agree; 1= Strongly disagree

6.4 2014 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.

All twelve participants completed the overall program evaluation. The program was very successful in meeting its stated objectives in that all twelve participants agreed that they learned more about transportation careers, understood better how transportation professionals identify and solve problems that impact people in everyday life, and understood better how important innovation is for transportation. In addition, all twelve participants were able to learn more about Montana State University and several indicated an increased interest in either attending MSU or pursuing engineering in college.

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.	7	4		1	
2. I was able to design and build projects.	8	4			
3. I was able to learn more about careers in transportation.	8	4			
4. I had fun while attending STI.	3	6	3		
5. STI helped me prepare for college.	5	5	2		
6. I was able to learn more about engineering.	7	4	1		
7. I would recommend the STI to other students.	5	3	4		
8. I was able to learn more about Montana State University.	8	4			

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

	Number of Responses				
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
8. Camp presentations and activities helped me to develop my problem-solving skills.	4	6	2		

7 FINANCIAL REPORT

The 2014 STI received a budget of \$40,029.49. In addition to expending the grant amount, the program received funds and in-kind support from a number of sources. The Montana ITE Chapter contributed \$250, which allowed the program to purchase end-of-program awards for student teams that excelled in all areas. It also covered recreational activities (pool/bowling night) and additional food expenses for the group. The Montana Department of Transportation Design Unit provided the equivalent of \$520 in in-kind support. Design Unit staff helped with project set-up (for the crash attenuator) and organized and chaperoned the MDT headquarters field trip to Helena. The Civil Engineering Department at MSU contributed an additional 13.5 hours of staff time (or the equivalent of \$540) to lead STI activities. Civil Engineering adjunct instructor, Scott Keller, led a workshop on environmental considerations in transportation and a field trip to a wetlands reclamation site. He also attended the MDT-Helena field trip as a co-chaperone. 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, 108 participants from the 2007-2013 programs had graduated high school by summer 2014. Of the 108 graduates, thirty-nine students responded to the survey (a 36% survey success rate). Data from thirty-three respondents was incorporated into the 2009-2013 annual reports. Six additional responses were received in 2014. A breakdown of 2014 survey responses is provided in Table 5 below.

Table 5: Senior Survey Responses

Survey Question	Yes	No
Did you apply to college?	6	0
Are you currently enrolled in college?	6	0
Did the STI experience impact your decision to attend college?	3	3
Did your STI experience help you in choosing a major?	4	2
Did your STI experience help prepare you for college entrance?	4	2

Five respondents had applied to and were enrolled in four-year institutions of higher education. One respondent was enrolled at a two-year technology college with plans to transfer to a four-year college at a later date. Five respondents had enrolled in engineering programs (three in Mechanical Engineering, one in Civil Engineering, and one in Chemical Engineering). One respondent was enrolled in a Business program. Three program alumni were attending Montana State University. The two-year college enrollee planned to transfer to MSU. One was attending the South Dakota School of Mines and Technology and another, the University of Central Florida.

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 to explore engineering as a field and to select a college.

- *I had already decided to attend college and to study engineering at the time I attended STI, but the experience was very inspirational and encouraging to me. I found that I got along with all the people who attended STI and that I extremely enjoyed being around others of an engineering mind set. It is the only program that I have attended that I felt like I truly belonged in. Attending STI was one of the best experiences in my life. I strongly support this program and would be glad to return and help others experience the same joy I did.*
- *At the STI I was introduced to all the various fields of engineering (with the possible exception of ocean engineering). At the time I attended I knew that I wanted to study engineering, but did not know which branch I wanted to pursue. STI helped me select mechanical engineering as the best fit for me. This field offers some of the most generalized engineering applications, and is not limited to certain special applications or operational fields (like aeronautical engineering for example). Not wishing to shrink my horizons I selected the course of study that I thought would allow me the greatest abilities as an engineer in a broad range of applications.*
- *The program helped me to realize that engineering was the route I wanted to take, and helped me to find the kind of engineering that I would want to pursue.*
- *[STI] gave me the idea of attending Montana State. I liked the campus of MSU so I decided to go there.*
- *It introduced a field of engineering to me and made the engineering fun with the activities. It helped me decide what field of engineering I want to major in.*
- *The state universities in the state of Florida are becoming increasingly competitive in their admissions. I chose to stay in-state for financial reasons. Attending STI, I believe, demonstrated my desire to explore academic areas and a college environment. This certainly made my applications more competitive.*

9 RECOMMENDATIONS

The 2014 Summer Transportation Institute at Montana State University provided twelve 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, field trips, and program staff. The Project Director worked with another program on campus to proactively recruit Native American high school students from Montana

reservations. Unfortunately, two of these applicants clearly had a last-minute change of heart about attending. In future years, it is recommended that STI staff make personal contact (by phone) with applicants from rural reservation areas to ensure there are no financial, logistical, or other barriers to prevent them from attending the camp and to answer any questions they may have about the program.

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: 2014	

Name:	Chad Welborn
Title:	Design Supervisor
Organization:	MDT Design Unit

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

Name:	Scott Keller
Title:	Adjunct Instructor
Organization:	MSU Civil Engineering Department

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: 2014	

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
Name:	Chad Welborn
Title:	Design Unit Supervisor
Organization:	MDT Design Unit
Role/Contribution:	MDT tour arrangements

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

State: Montana	Host Site: MSU Western Transportation Institute
Fiscal Year: 2014	

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

Name:	Mike Berry
Position Title:	Professor (Infrastructure materials)
Affiliation:	Civil Engineering Department, Montana State University

Name:	Dr. Patrick McGowen
Position Title:	Research Associate (Transportation Planning)
Affiliation:	Western Transportation Institute, Montana State University

Name:	Erin Hafla
Position Title:	Graduate Research Assistant (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:	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:	Matt Blank
Position Title:	Research Associate (Hydrology/Fish Passage)
Affiliation:	Western Transportation Institute

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

State: Montana	
Fiscal Year: 2014	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:	Sara Lucero
Position Title:	STI Teaching Assistant
Affiliation:	Western Transportation Institute

Name:	Beker Cuelho
Position Title:	Residence Hall Advisor (STI)
Affiliation:	Western Transportation Institute

Name:	Alissa Bleem
Position Title:	Residence Hall Advisor (STI)
Affiliation:	Western Transportation Institute

11 APPENDIX B: DEMOGRAPHIC SUMMARY REPORT

FY 2014 _____
National Summer Transportation Institute Program - Demographics Data Sheet

State:	Montana	Project Director:	Susan Gallagher
Host Site:	Western Transportation Institute	Program Dates:	June 15-27, 2014
		Program Length:	2 weeks

Select Grade Level		Applicant Data			
High School	X			Number of Applications Received:	15
Middle School				Number of Participants Selected:	15
Select Program Classification				Number of Participants that Completed the Program:	12
Residential	X	Geographic Representation			
Non-Residential		Number of Cities: 14	Number of Counties: 14	Congressional District Number(s): Montana 1 At-large, Virginia 1 st , Maryland 5 th , Wyoming 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:	1	10		1				9	3					3	5	4	
Provide Type(s) of *Targeted Disabilities: N/A																	

Schools Represented	
Name/City/State	Name/City/State
Park High School/Livingston/MT	
Billings West High School/Billings/MT	
Ronan High School/Ronan/MT	
Darby High School/Darby/MT	
Laramie High School/Laramie/WY	
Grafton High School/Yorktown/VA	
Lima High School/Lima/MT	
Poplar High School/Poplar/MT	
Capital High School/Helena/MT	
St. Andrews/Helena/MT	
Holton Arms School/Bethesda/MD	

12 APPENDIX C: FINANCIAL REPORT

NATIONAL SUMMER TRANSPORTATION INSTITUTE PROGRAM

SECTION III: FINANCIAL REPORT

State:	Montana
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Host Site:	WTI
Fiscal Year:	2014

Categories	FHWA Funds Requested	Expended	In-Kind Contribution(s)
Personnel	\$13,885.00	\$15,174.30	\$1,060.00
Fringe Benefits	\$3,471.25	\$4,073.85	
Recruitment	\$800.00	\$812.25	
Contractual Services	\$1,102.00	\$1,189.00	
Food	\$300.00	\$374.21	\$146.60
Travel	\$2,800.00	\$3,419.32	
Supplies	\$250.00	\$217.99	
Room & Board	\$12,200.00	\$9,542.33	
Stipends			\$121.99
Direct Cost	\$34,808.25	\$34,841.27	\$1,328.59
Indirect Cost	\$5,221.24	\$5,226.24	
Totals	\$40,029.49	\$40,029.49	\$1,328.59

13 APPENDIX D: STI SCHEDULE

2014 Summer Transportation Institute at Montana State University

Week 1: June 16 – June 28

Monday, June 16	Thursday, June 19
<p>9:00-11:30am: STI Orientation) [WTI Classroom, Rm 333]</p> <p>Noon-1pm: Lunch (Harrison Dining Hall)</p> <p>1:00-2:00: Campus Tour (Admissions Office, SUB, 2nd fl.)</p> <p>2:00-4:00pm: [CB202] Structures/Bridge Design</p> <p>4:00-5:00pm: [Tait lab] West Point Bridge design</p>	<p>8-11am: Crash attenuators [CB202]</p> <p>11-noon: Sub Zero lab tour</p> <p>Noon-1pm: Lunch (Harrison Dining Hall)</p> <p>1-2pm: College Prep</p> <p>2-5pm: Balsa bridge work</p>
Tuesday, June 17	Friday, June 20
<p>8-10am: Balsa bridge design competition introduction [WTI classroom]</p> <p>10-11am: Cathy Costakis/Complete Streets [WTI Classroom]</p> <p>11-noon: Peer to Peer project (WTI Classroom)</p> <p>Noon-1pm: Lunch (Harrison Dining Hall)</p> <p>1-4pm: Concrete Introduction and lab; concrete testing [CB202/CB bulk materials lab]</p> <p>4-5pm: Commercial vehicles [CB202]</p>	<p>6:30am: Breakfast and pick up sack lunches</p> <p>7am: Depart for Tour of Montana Department of Transportation Headquarters (Helena)</p> <p>2pm: Gates of the Mountain ferry ride</p>
Wednesday, June 18	Saturday/Sunday June 21-22
<p>7:50am: Depart for Knife River. Tour of asphalt & concrete mix plants.</p> <p>10:30am: Tour of Holcim cement factory in Trident</p> <p>2-3pm: Introduction to Civil and Construction Engineering [CB202]</p> <p>3-5pm: Soil Reinforcement and Retaining Walls [CB202]</p>	<p>Sports and Enhancement Activities</p> <p>Lewis and Clark Caverns-Saturday</p> <p>Museum of the Rockies-Sunday</p>

Week 2: June 23 – June 27

Monday, June 23	Thursday, June 26
<p>8am-9am: Strong Interest Inventory- [CB Tait Lab]</p> <p>9am-noon: Intersection counting and traffic study [Tait Lab]</p> <p>Noon-1pm: Lunch (Harrison Dining Hall)</p> <p>1-3pm: Driving Simulator/Human Factors [CFT2-Sim lab]</p> <p>3-5pm: Fish Passage/Hydrology [WTI classroom]</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 (Harrison Dining Hall)</p> <p>1-2pm: Glider Testing</p> <p>2-5pm: Closing ceremony preparation</p>
Tuesday, June 24	Friday, June 27
<p>8am-11am: Wetlands presentation & site visit (Scott Keller, scottk@coe.montana.edu) [WTI Classroom]</p> <p>11-noon: Bridge completion</p> <p>Noon-1pm: Lunch (Harrison Dining Hall)</p> <p>1-2pm: Career Planning [WTI classroom, Rm 333]</p> <p>2-5pm: Peer to Peer project (WTI Classroom Rm 333)</p>	<p>Morning: Packing and Dorm Check Out</p> <p>11am-Noon (WTI Classroom) STI Closing Ceremony and Farewells</p>
Wednesday, June 25	
<p>7am: Pick up picnic lunches at Harrison</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</p> <p>2:00-3:00: Aviation Presentation [WTI classroom]</p> <p>3:00-5pm: Glider team design/build project [WTI classroom]</p>	

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