Karen Glitman
University of Vermont
Transportation Research Center
210 Colchester Road
Burlington, VT 05401
(802) 656-8868
Fax (802) 656-9892
Karen.Glitman@uvm.edu

Corresponding Author:
Karen Glitman

Submitted to the Transportation Research Board
For the 90th Annual Meeting
January, 2011

TRB 2011 Annual Meeting

Paper revised from original submittal.
The University of Vermont’s Transportation Research Center (UVM TRC) was awarded a Transportation Education Development Pilot Program (TEDPP) grant by the US DOT to develop innovative programs to attract and retain skilled transportation workers in Vermont, New Hampshire and Maine; four new programs were funded:

1. **Transportation Systems Institute (TSI)**: Focuses on maintaining and motivating talent, and transferring knowledge in the DOT workforce.
2. **Transportation Systems Academy (TSA)**: Provides hands-on training for transportation industry jobs to students.
3. **Second Careers in Transportation (SCT)**: Focuses on attracting retirees from other industries to bring their skills to the 21st century challenges in transportation.
4. **Community Colleges**: Worked with the American Association of Community Colleges (AACC) to collect information about what community colleges are doing now and what they could do to prepare the next generation of transportation workers.

This paper will give overviews and results for two of the four programs and will not address the SCT as it is still in the early planning stages and will be addressed in future papers. The work of the Community Colleges program with the AACC is complete and results will be explained briefly. The goal of the grant is to pilot new innovative methods that will attract and retain employees in the transportation sector and could serve as national models for other states or regions to adopt.

**INTRODUCTION**

Programs of the UVM TRC Transportation Education Development Pilot Program (TEDPP) grant were influenced by the following factors:

- 40-50 % of the transportation workforce will retire in the next 10 years.
- Fewer people are going into key transportation fields.
- Competition for workers from other industries.
- Challenge of reaching women and minorities and creating a workforce that represents our nation’s diversity.
- The need for different and more complex skill sets for the next generation of transportation professionals.
- The critical shortage of maintenance and operations workers, which can be overlooked when universities focus workforce development programs on other professional positions that students might fill.

With demographic changes and the dynamic nature of our 21st century transportation system, the transportation sector needs comprehensive workforce development plans and programs that can be used nationwide to attract and retain skilled workers. To date, two of the programs including the Transportation Systems Institute (TSI) and Transportation Systems Academy (TSA) were piloted in partnership with the University of Vermont Transportation Research Center (UVM TRC), Technology Division of Vermont Technical College (TED VTC), the state Department of Transportation in Maine, New Hampshire and Vermont, the Community High School of Vermont (CHSVT) and the Vermont and New Hampshire Local Technical Assistance Programs (LTAP).

**TRANSPORTATION SYSTEMS INSTITUTE (TSI)**

The focus of the TSI is professional development, mentoring, retention and knowledge transfer. Fifteen state DOT management-level workers were chosen by DOT Human Resources departments from Vermont, New Hampshire and Maine. They participated in thirteen days of training over six months as part of the Transportation Systems Institute. The UVM TRC partnered with the TED VTC to help facilitate the Institute.
TSI Needs Assessment:
As a first step, a needs assessment was conducted at the Vermont, New Hampshire and Maine DOTs. The interviews were designed to elicit opinions on:

- Organizational Culture & Challenges
- Training & Knowledge Transfer
- Gaps in Skills & Abilities

Forty-one interviews were conducted across Vermont, New Hampshire and Maine. Interviewees represented a cross-section of managers and professionals who gave the following feedback:

- When addressing the Training questions, there was a strong need and desire for interpersonal skills development especially in collaboration, relationship building, interpersonal communication, performance management, presentation skills and public relations.

- Project management: Interviewees felt that project managers should be encouraged to attend the recommended training listed in the above-listed Training section of the survey. They also felt that there was a need to identify, recruit and train successful project and former project managers to serve as mentors to less skilled project and potential project managers. Additionally, respected professionals from finance and other relevant specialties should be identified, recruited and trained to serve as coaches and advisors to project managers.

- Knowledge transfer represents the most important issue for the future according to interviewees. Pending retirements and the associated potential loss of valuable knowledge have brought this issue to the fore. Interviewees indicated that there is insufficient information-sharing and communication across the departments.

- Job rotation and Cross training were areas that interviewees found valuable and necessary for employee development to support retention and information transfer. During the interviews, examples were cited where an individual resigned or retired and no one knew how to perform the duties of the position. Some interviewees suggested that labor agreements interfere with the ability to rotate jobs or cross-train and protocol should be written to support this effort.

- Recruitment of qualified and motivated employees is a significant challenge, but many of the issues affecting recruitment are state specific and are difficult to address on a tri-state basis. Those who change to a career in transportation in mid-career can be assimilated into the departments without significant problems. This bodes well for the Second Careers in Transportation (SCT) initiative, another program of the TEDPP initiative. A re-evaluation of community and university recruiting initiatives was recommended to ensure that they are up to date and effectively promoting a DOT career as an attractive career.

TSI Curriculum:
Based upon the above-listed needs assessment data, program curriculum was developed. A list of the courses is shown below in Table 1.

<table>
<thead>
<tr>
<th>Leadership Styles &amp; Workplace Principles</th>
<th>Having Difficult Conversations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systems &amp; Organizational Change</td>
<td>Trends &amp; Topics in Transportation</td>
</tr>
<tr>
<td>Coaching &amp; Feedback</td>
<td>Public &amp; Government Relations</td>
</tr>
<tr>
<td>Conflict Management &amp; Problem-Solving</td>
<td>Government &amp; Project Finance</td>
</tr>
<tr>
<td>Managing &amp; Optimizing Group Process</td>
<td>Critical Thinking</td>
</tr>
<tr>
<td>You Can’t Do It Alone</td>
<td>Attitude, Motivation &amp; Customer Service Skills</td>
</tr>
<tr>
<td>Adult Learners, Mentoring, Meetings &amp;</td>
<td>Technical Project Management</td>
</tr>
<tr>
<td>Train the Trainer</td>
<td>Ageism</td>
</tr>
</tbody>
</table>

TABLE 1

TRB 2011 Annual Meeting

Paper revised from original submittal.
TSI Participation:
Participants were selected from those who participated in the needs assessment interviews and met the following criteria:

1. Possess appropriate knowledge;
2. Proven ability in the skill they will be training/coaching;
3. Respected members of the organization;
4. Commitment to the project and;
5. Willing to learn necessary presentation and training skills.

Fifteen individuals were selected for the Institute. Years of service in their DOT, ranged from six to thirty-three years, with the average being slightly over nineteen years. As shown in Table 2 below, the job classifications varied as well.

TSI Participant Job Titles:

<table>
<thead>
<tr>
<th>Maintenance Transportation Administrator</th>
<th>Director, Civil Rights Office</th>
<th>Director of Human Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilities Program Manager</td>
<td>Assistant Traffic Engineer</td>
<td>Assistant Bridge Maintenance Engineer</td>
</tr>
<tr>
<td>Project Manager</td>
<td>Engineer</td>
<td>Public Service Manager II-Civil Engineer</td>
</tr>
<tr>
<td>Right-of-Way Chief</td>
<td>Right-of-Way Engineer &amp; Assistant Administrator</td>
<td>Municipal Highways Engineer</td>
</tr>
<tr>
<td>Operations Projects Coordinator</td>
<td>Administrator, Bureau of Mechanical Services &amp; Fuel Distribution</td>
<td>Policy Development Specialist</td>
</tr>
</tbody>
</table>

TABLE 2

TSI Results:
As shown below in Figure 1, TSI participants rated “change understanding diversity” and “increase your thinking” as the lowest and “better understand your role” and “increase your skill level” rated the highest.

FIGURE 1 (n= 15)
As shown below in Figure 2, participants were asked to rate the TSI using a scale from Excellent, Very Good, Good, OK or Poor. Over 60% rated the program Excellent.

**FIGURE 2 (N=15)**

As shown below in Figure 3, participants were asked a series of open-ended question about the program. Participants highly valued the interactive; role-playing exercises and were most challenged by absorbing new data and tools. While participants stated they found this a challenge, it won’t be known for a while if they were able to meet this challenge and incorporate new tools as part of their everyday work. A follow up survey of supervisors will be conducted within the next six months to evaluate the progress.

**FIGURE 3 (N=15)**
Lessons Learned:
- Adjust schedule to have more class time to absorb curriculum.

Replication Recommendations:
- Create a program tool kit.
- Implement a “train the trainer” approach.

Proven Practices:
- Secure dynamic instructors.
- Outline course expectations clearly.
- Encourage participants to have a high level of commitment.

In conclusion, the value of the TSI proved itself to be worthy of a second Institute. The TRC will partner with Vermont Technical College and plans to launch a second Institute in January 2011.

TRANSPORTATION SYSTEMS ACADEMY (TSA)
In 1987 Vermont created an education program within the corrections department shifting responsibility for educating incarcerated youth and those adults that had not graduated from high school, from local school districts to the Vermont Department of Corrections (DOC). It took until 2000 for the Community High School of Vermont (CHS VT) to become fully accredited with the ability to grant diplomas. As a diploma-awarding institution, offenders have the chance to earn a high school diploma, and not only a GED.

CHS VT began in six correctional facilities with six part-time faculty. It has now grown to include campuses at nine correctional facilities and eight parole offices, more than 50 full-time faculty and more than 150 adjunct faculty. More than 1,000 individuals have received their high school diplomas through the CHS VT since 2000.

In the late 1990’s Vermont Commissioner of Corrections, John Gorczyk approached the Vermont Agency of Transportation (VT AOT) and suggested a partnership for resolving the VT AOT’s workforce challenges. The agency at that time was faced with tremendous struggles in finding qualified employees, or in some cases, any applicants to fill its maintenance positions. A decade later and more than 30 years after this story began, the University of Vermont’s Transportation Research Center (UVM TRC) began working with the Vermont Agency of Transportation (VT AOT), the Community High School of Vermont (CHS VT), Vermont Local Roads (VLR) and the Technology Transfer Center at the University of New Hampshire (T² UNH) to pilot a new program that will create a workforce pipeline into the transportation sector. The TSA program meets multiple objectives:

- Career awareness
- Skill building
- Providing a trained workforce for the transportation sector
- Certifications
- Reducing recidivism

The first pilot of the Transportation Systems Academy was launched in November 2009 at the Community High School of Vermont’s (CHS VT) Northern State Correctional Center Campus. With a total enrollment of more than 4,100 students in 18 campuses around the state, it is the largest high school in Vermont. This source of potential workers has largely been untapped by the transportation industry. The CHS VT is committed to the TSA and plans to continue and offer the program as part of their curriculum.
The TSA curriculum was developed with input from VT and NH LTAPs, the Vermont Agency of Transportation maintenance managers and UVM TRC staff. The curriculum addresses real world skills needed by maintenance workers as identified by hiring authorities. The below list of courses in Table 2 was used for the 2009-2010 academic year.

<table>
<thead>
<tr>
<th>Course Name</th>
<th># of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipalities/Transportation 101 **</td>
<td>4</td>
</tr>
<tr>
<td>Construction Math</td>
<td>38</td>
</tr>
<tr>
<td>Citizenship &amp; Community Participation</td>
<td>16</td>
</tr>
<tr>
<td>Winter Roads *</td>
<td>4</td>
</tr>
<tr>
<td>OSHA-10 (certification)</td>
<td>10</td>
</tr>
<tr>
<td>Basics of a Good Road *</td>
<td>6</td>
</tr>
<tr>
<td>First Aid/CPR (certification)</td>
<td>6</td>
</tr>
<tr>
<td>Work Zone Flagging * (certification)</td>
<td>6</td>
</tr>
<tr>
<td>Project Planning &amp; Selling *</td>
<td>6</td>
</tr>
</tbody>
</table>

**Table 3**

**Course curriculum developed by UVM TRC and Vermont Local Roads (VLR)**

*Course curriculum developed by VLR and Technology Transfer Center at UNH.

**TSA Participation:**

Participant selection was conducted by the CHS VT staff and eligibility was based on the following:

1. Interest
2. Release date
3. Age
4. Housing facility
5. Willingness to enroll with CHS VT
6. Being in minimum or medium custody

Since this program was piloted in one correctional facility, offenders that were housed in that facility were eligible. DOC institutions are segregated by gender, thus this first round was only provided to males.

Twenty-three men began the program, three were unexpectedly released prior to the completion of the program, two were transferred to an out-of-state facility and four others dropped out of the program.

Twenty-three participants began the TSA with seventeen successfully graduating from the program.

There is ninety-six hours of classroom instruction that directly addresses transportation skills and knowledge as well as general workplace etiquette. The TSA curriculum complimented existing courses in the CHS VT and homework was assigned and assessments were conducted.

**TSA Evaluation:**

Both quantitative and qualitative evaluations of the program were conducted.

Pre and post-surveys were conducted and these qualitative evaluations asked four open ended questions:

#1: What is transportation?
#2: What are the problems with our transportation system?
#3: What are the potential solutions to our transportation problems?
#4: What type of people work in the transportation industry?

The evaluations documented change in the students’ perception of transportation and their views on the program both in the beginning, a pre-survey and at the end, a post-survey. These two surveys were conducted to evaluate the participants’ perceptions, knowledge and understanding of the transportation system and their interest in a career in the transportation sector.

By reading the full transcripts of responses to the four open-ended questions, themes were distilled by
using keyword searches. Responses using keywords were then coded and the totals tallied. Twenty-four individuals took the pre program survey, however only twenty-three actually started the program. Since the survey sample sizes were different and responses were not coded by respondent, we are unable to conclude any shifts in perception of those who completed both surveys.

Nonetheless, it was easy to discern that initial responses to question #1 were focused on travel or movement. The post survey responses showed a slightly greater percentage of respondents mentioned that transportation is about the system of moving people and goods, however the majority still considered transportation to be about movement.

The response to question #2, “What are the problems with our transportation system?” 62% of the respondents in the pre-survey responded with comments about workers or infrastructure with only 17% concerned about cost. The post-survey showed a near doubling in responses mentioning money, or transport funding. The responses to question #3 “What are the potential solutions to our transportation problems?” changed from the pre-survey response of hiring more workers to the post-survey response of providing more training. The answers to the final question #4, which was asked in both the pre and post-surveys, “What type of people work in the transportation industry?” shows an increase in perception that “all types or anyone” works in this field versus identifying specific job categories. Figures 4 and 5 show pre-survey results gathered from the initial twenty-four and the final eleven who took the post-survey.

**FIGURE 4 (N=24)**

![Pre TSA Survey Questions](chart)

- What types of people work in the transportation industry?
- What are some of the potential solutions to our transportation problems?
- What are the problems with our transportation system?
- What is transportation?
A quantitative survey was also used to measure responses in the pre and post survey. A four-point scale was used including: Strongly Agree; Agree; Disagree; and Strongly Disagree; no neutral option was provided. As shown in Figure 6, there was very little change in participant responses. Most participants agreed or strongly agreed that they would seriously consider a career in the field of transportation.
As shown in Figures 7-12 participants provided favorable results for all courses. Unfortunately, not every course evaluation asked all questions, thus the differences in the number of respondents and the difficulty in comparing courses.

**FIGURE 7**

![Graph showing course evaluation results](image)

**FIGURE 8**

![Graph showing instructor evaluation results](image)
FIGURE 9

Did you feel the course moved at a good pace?

- Construction Math N=8
- Citizenship & Community Participation N=16
- OSHA-10 N=16
- First Aid/CPR N=15

FIGURE 10

How well did the course hold your attention?

- Municipalities/Transportation 101 N=17
- Construction Math N=8
- Citizenship & Community Participation N=16
- Winter Roads N=18
- OSHA-10 N=16
- Basics of a Good Road N=16
- First Aid/CPR N=15
- Work Zone/Flagging N=13
- Project Planning & Selling N=11
FIGURE 11

Please rate the instructors delivery and presentation of the subject matter.

- Municipalities/Transportation 101 N=17
- Construction Math N=8
- Citizenship & Community Participation N=16
- Winter Roads N=18
- OSHA-10 N=16
- Basics of a Good Road N=16
- First Aid/CPR N=15
- Work Zone/Flagging N=13
- Project Planning & Selling N=11

FIGURE 12

What was your overall impression of the course?

- Municipalities/Transportation 101 N=17
- Construction Math N=8
- Citizenship & Community Participation N=16
- Winter Roads N=18
- OSHA-10 N=16
- Basics of a Good Road N=16
- First Aid/CPR N=15
- Work Zone/Flagging N=13
- Project Planning & Selling N=11
As shown in Figure 13, participants felt strongly that the TSA taught them skills that would be useful for a job in the transportation industry and the program increased their confidence in finding a job.

**FIGURE 13**

- Participating in the TSA taught me skills that would be useful for a job in the transportation industry. N=10
- Participating in the TSA helped me to feel more confident about my chances of finding a job upon release. N=10
- Participating in the TSA made me more aware of jobs in transportation. N=10
- Participating in the TSA will help me to transition from life in prison to life after release. N=10
- Participating in the TSA made me more aware of our transportation system. N=10

Participation and completion numbers of the nine (9) courses varied as shown below in Table 4.

<table>
<thead>
<tr>
<th>Course</th>
<th>Number of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipalities/Transportation-101</td>
<td>17</td>
</tr>
<tr>
<td>Construction Math</td>
<td>8</td>
</tr>
<tr>
<td>Citizenship &amp; Community Participation</td>
<td>16</td>
</tr>
<tr>
<td>Winter Roads</td>
<td>17</td>
</tr>
<tr>
<td>OSHA</td>
<td>16</td>
</tr>
<tr>
<td>Basics of a Good Road</td>
<td>17</td>
</tr>
<tr>
<td>First Aid/CPR</td>
<td>16</td>
</tr>
<tr>
<td>Work Zone/Flagging</td>
<td>13</td>
</tr>
<tr>
<td>Project Planning &amp; Selling</td>
<td>11</td>
</tr>
</tbody>
</table>

**Table 4**

Of the twenty-three individuals who started the program, seventeen graduated with seven completing 100% of the courses. Thirteen graduates or 76% of the graduates completed 78% or more of the courses.

As we moved forward in the follow-up stages of the program, thirteen of the seventeen graduates have accomplished the following:
- Seven have found gainful employment of which two are employed in the transportation industry
- Three are seeking or have completed 40-hour internships with AOT-VT with possible employment opportunities
- Three are finishing up other community-based requirements
- Four await release from states’ custody
Core Competencies: The TSA curriculum covers the following Department of Education Standards and Competencies.

- 1.13 Listen actively and respond
- 2.2 Problem-solving
- 3.3 Respect
- 3.13 Analyze roles and responsibilities
- 3.14 Dependability and productivity
- 3.15 Career choices
- 3.16 Develop a plan for current and continued education
- 6.1 Causes and effects in human societies
- 6.9 Meaning of citizenship
- 6.10 Types of government
- 6.11 Institutional access
- 6.12 Human rights
- 6.18 Nature of conflict
- 6.19 Identity and interdependence
- 7.6 Arithmetic, number and operational concepts
- 7.10 Mathematical problem-solving and reasoning
- 7.11 Analysis
- 7.17 Technological

Lessons Learned:
- Incorporate more real life experiences and hands-on learning
- Add a CDL and harassment course
- Create a smaller classroom setting
- Conduct mini training for instructors around specific transportation work
- Secure more support in the classroom
- Create a “meet and greet” portion of the course to meet with internship hosts and potential employers
- Present clearer expectations of instructors and students
- Schedule courses closer together

Replication Recommendations & Proven Practices:
- Create a program tool kit that will guide the replication process
- Communicate regularly with partners and instructors
- Connect with strong social/human services infrastructure within the community to support graduates
- Integrate accountability systems to support commitment levels and follow up with students

COMMUNITY COLLEGES
The Community Colleges Program main goal was to assess what community colleges are “currently doing” and “could do” in the future to prepare the next generation of transportation workers. The TRC worked with the American Association of Community Colleges (AACC) to provide for greater community college engagement in transportation workforce development efforts. Through this program, we were able to establish some findings, best practices and develop some recommendations to move forward to create an educational environment that better supports the next generation of transportation workers. The full report is available on the UVM TRC website uvm.edu/trc/workforcedev.
CONCLUSION

Two novel workforce development pilot projects were introduced in this paper; one with incumbent state DOT workers and the other with non-traditional labor pool. One provided transportation managers a means of attracting and maintaining workers in this challenging environment. While the other included nontraditional partnerships.

The assessment of these first two pilot programs revealed some interesting opportunities for future activities and connections. For instance the incumbent state DOT workers received training on mentoring and succession planning and are interested in continuing that work. There are many non-traditional labor pools beyond offenders, incarcerated or in the community on probation or parole, such as alternative high school students, people with disabilities, retirees and veterans. The TSA program could utilize TSI alumni to mentor and teach these individuals. By linking these two programs together, TSA students would learn from the workers they wish to become and the incumbent workers in the TSI could provide mentoring for the TSA graduates and a connection to the transportation industry.

ACKNOWLEDGMENTS

This material is based upon work supported by the Federal Highway Administration and funding for this research was provided to the University of Vermont Transportation Research Center through a grant from the US Department of Transportation. Special acknowledgement and thanks to Donna Aguiar and all the instructors and participants in these two programs as well as the Vermont Department of Corrections, Community High School of Vermont, Vermont Technical College, Vermont Agency of Transportation, Vermont Local Roads and the Technology Transfer Center at UNH.