STRATEGIES FOR K-12 ENGAGEMENT

LeadershipITE 2017

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- Center for Excellence in Education
- DiscoverE
- Future City Competition
- Girl Scouts
- How To Smile (website)
- ITE STEM Outreach for Disadvantaged Populations/Communities Subcommittee
- Science Buddies (website)
- Scouting Works
- Transportation You
- University of South Florida
Project Team

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Executive Summary

As ITE looks towards its future, the organization has a vested interest in attracting future members to ensure the continued growth and influence within the transportation profession. By engaging with students during the K-12 timeframe, ITE can educate younger students about the transportation profession as a career, while also improving the name recognition of the organization at an earlier age. Although some grass-root efforts have already been undertaken in this area by individual ITE members and Chapters, a more directed approach from the top of the organization down to its District, Sections, and Chapters would enhance member participation and ensure a consistent message is being delivered for ITE.

It is recommended that ITE pursue short-, medium-, and long-term actions to develop and enhance K-12 engagement strategies. Those strategies are as follows:

- **Short-Term:**
  - Addition of STEM Section to ITE Community
  - Partner with Pre-Existing Engineering/Planning Competitions with a K-12 Transportation Focus
  - Add a K-12 Specific Section of the ITE Website with Links to Pre-Existing Websites with K-12 Transportation Focused Content
  - Develop Handout / Marketing Materials for K-12 Students and Parents
  - Partner with Boy and Girl Scouts

- **Medium-Term:**
  - Develop a Transportation Day
  - Create a K-12 focused Transportation Engineering Competition
  - Create a Pre-University Membership Level
  - Create an ITE Journal for Kids
  - ITE Developed Outing Materials
  - Implement an ITE Scholarship

- **Long-Term:**
  - Refine the Transportation Day
  - Encourage Creation of K-12 Transportation Clubs
  - Transportation Club Traffic Bowl
  - Develop ITE Curriculum

The most efficient method to establishing the K-12 program is to take advantage of existing materials and efforts by other groups that overlap with the transportation profession. A K-12 student website will act as a central information hub to connect students, parents, teachers, and ITE members to information, learning materials, and activities. The longer-term strategies are suggested to refine and direct these materials into ITE led programs.

It is recommended that the STEM Outreach for Disadvantaged Populations/Communities Subcommittee take on the coordinating role to implement K-12 engagement strategies as outlined in this report.
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INTRODUCTION
As part of the Institute of Transportation Engineers (ITE) LeadershipITE Class of 2017, the members of Team Lemonade developed the following white paper report on strategies for ITE to engage with students from kindergarten to grade 12 (K-12). The report sets out to build upon prior work performed by ITE to improve student engagement across multiple levels of education.

The project was conducted in support of ITE’s:

- Mission statement “To be the principal source of professional expertise, knowledge, and ideas promoting transportation science, principles, and advocacy internationally.”
- Strategic planning goals for the profession to be “recognized for technical excellence in meeting transportation needs of the community” through the following objectives:
  - Attract students to the transportation as an opportunity to make a positive change to the world.
  - Increase student awareness of transportation career opportunities.
  - Increase ITE’s capacity to provide training and access to information.
  - Promote ITE benefits and resources to current and potential student members and Chapters.

Project Statement
How can ITE help to foster K-12 interest in the transportation profession, to help support the overall mission statement of the organization to promote professional development, support and encourage education, and develop public awareness programs?

Report Approach
The approach to the report is to identify stakeholders, review past work completed by ITE, and establish short, medium, and long term actions to be taken to develop and enhance K-12 engagement strategies.

The scope of the project is focused on U.S. and Canadian education systems. However, approaches may be adjusted for the contexts of other ITE member countries.

BACKGROUND
The project statement was derived from recommendations made by the LeadershipITE Class of 2016 group A-Team’s white paper titled, “What can ITE do to improve student engagement across multiple education levels to invigorate and secure the future of our profession?”

Summary of A-Team Report
The A-Team report, “What can ITE do to improve student engagement across multiple education levels to invigorate and secure the future of our profession?” clearly identified a need to better engage K-12 students. The group conducted a survey of university students and professors and completed a benchmarking report of other organizations for K-12 engagement activities.
From a sample of 296 university students who responded to the survey:

- 15% of surveyed ITE university students indicated that their Student Chapter was engaging in K-12 outreach.
- 95% of current university student members were willing to participate in K-12 engagement activities.

The A-Team report made the following primary actions to consider for K-12 outreach:

1. Develop a resource for direct K-12 inquiries.
2. Provide support and encouragement to Districts and Sections.
3. Encourage university Student Chapters to participate.
4. Provide incentives for K-12 institutions to participate.
5. Explore opportunities to collaborate with other organizations.
6. Incorporate the initiative into strategic planning activities.

Example actions from the A-Team report included:

- Create a K-12 specific section of the ITE website with resources, games and interactive activities. Include teacher and parent resources. Develop handout/marketing materials for distribution at the Section, District and student Chapters levels.
- Create a pre-university membership level and K-12 transportation club structure (similar to the Chinese concept) and track members from K-12 through full membership and/or university degree. ITE could encourage Student Chapters to participate by requiring pre-university level clubs to have a student chapter member as an advisor.
- Develop a K-12 website in partnership with WTS International, ITS America, and ASCE (could replace direct content on ITE website).
- Create a Transportation Engineering Day (including a board consisting of people from each major transportation organization) and hold simultaneous meetings in DC and other state capitals.
- Team with the Boy Scouts of America and Girl Scouts of America to develop an ITE sponsored merit badge and teach traffic safety at the national jamboree.

Current Assessment
A-Team’s research shows there is need to better engage K-12 students in the field of transportation and there is a great interest throughout ITE to take on a more active role.

STEM Subcommittee
The STEM Outreach for Disadvantaged Populations/ Communities Subcommittee (STEM Subcommittee) was liaised with during the development of this report. Team Lemonade attending a conference call with the STEM Subcommittee on April 3, 2017 to discuss the status of this report and ITE K-12 engagement. Following this meeting, two Team Lemonade members attended following STEM Subcommittee meetings.

Stakeholders
The following section identifies the key stakeholders that would provide input and be impacted by implementation of a K-12 outreach program.
ITE

ITE International is a key stakeholder to provide overarching policy and resources to implement a K-12 outreach program. This would largely target the U.S. and Canadian K-12 education system.

ITE Committees including the Advocacy Standing Committee, STEM Outreach for Disadvantaged Populations/Communities Subcommittee are key stakeholders working collaboratively towards a common goal of increasing interest and participation in the transportation profession early in life. Additional committees that may have interest in K-12 engagement and activities could include the Membership Standing Committee (Student Membership Subcommittee), and the Traffic Bowl Standing Committee.

ITE Districts may be interested in hosting and promoting portions of a K-12 outreach program. In particular, the Canadian District may host and promote similar items as ITE International that would fit into Canada’s education context.

ITE Sections, Chapters, and Student Chapters are expected to champion K-12 engagement at a membership level.

Students

Elementary School students are those ranging from Kindergarten to 5th grade. They are a target group characterized by their early level of education.

Middle School students are those ranging approximately in grades 6 to 8. They are characterized by their advancing STEM related courses and transition to secondary (high) school.

Secondary School students are those in grades 9 to 12. They are a target group characterized by their level of education preparing them for post-secondary school or otherwise. This group of students are also transitioning to a mature level to train for and acquire a driver’s license providing a greater awareness to rules-of-the-road.

Teachers

Teachers are those providing education and guidance to elementary through high school students. They are a target group characterized by their position to educate students about potential career opportunities.

Parents or Legal Guardians

Parents or legal guardians are those who have legal authority and care for elementary through high school students. They are a target group characterized by their influence to their children to support education outside of school.

Areas of Action

The following are specific goals to meet the strategic plan of ITE. They are as follows:

1) Increase the number and effectiveness of ITE members engaged in pre-college outreach.
2) Increase awareness, understanding and interest in the transportation profession among students from kindergarten to grade 12 (K-12).

3) Provide relevant exposure of the transportation profession to high school students who are likely to consider careers in the transportation field.

4) Establish ITE as a valuable resource to guide high school students through their future education and career decisions.

The goals are further refined into areas of action with a term to identify the intended time frame for the short-, medium-, and long-term. Table 1 summarizes the areas of action through a description, time frame (term), related goal, and identification of intended target audience and stakeholders. Much of the lead for ITE International can be organized and facilitated by the STEM Subcommittee. Details on the specific areas of action are further described in the following section on the Recommended Action Plan.

Table 1 – Areas of Action

<table>
<thead>
<tr>
<th>Term</th>
<th>Goal No.</th>
<th>Area of Action Description</th>
<th>Target Audience &amp; Stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-Term</td>
<td>1</td>
<td>STEM Section Addition to ITE Community</td>
<td><strong>Audience</strong>: Elementary/ middle/ high school students, teachers, and parents</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Lead by</strong>: ITE International and External Districts (Outside US)</td>
<td><strong>Lead by</strong>: ITE International and External Districts (Outside US)</td>
</tr>
<tr>
<td>Short-Term</td>
<td>1</td>
<td>Partner with Pre-Existing Engineering/ Planning Competitions with a K-12 Transportation Focus</td>
<td><strong>Audience</strong>: Elementary/ middle/ high school students</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Lead by</strong>: ITE International and External Districts (Outside US)</td>
<td><strong>Supported by</strong>: Teachers, ITE Sections and Chapters</td>
</tr>
<tr>
<td>Short-Term</td>
<td>2</td>
<td>Implement K-12 Specific Section of the ITE Website with Links to Pre-Existing Websites with K-12 Transportation Focused Content</td>
<td><strong>Audience</strong>: Elementary/ middle/ high school students, teachers, and parents</td>
</tr>
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<td>Short-Term</td>
<td>2</td>
<td>Develop Handout / Marketing Materials for K-12 Students and Parents</td>
<td><strong>Audience</strong>: Elementary/ middle/ high school students, teachers, and parents</td>
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<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Short-Term      | 2        | Partner with Boy and Girl Scouts                         | **Audience**: Elementary/ middle/ high school students  
**Lead by**: ITE International and External Districts (Outside US)  
**Supported by**: ITE Sections / Chapters, and parents                                                                      |
| Medium-Term     | 1        | Develop a Transportation Day                            | **Audience**: Elementary/ middle/ high school students  
**Lead by**: ITE International and External Districts (Outside US)  
**Supported by**: ITE Sections / Chapters                                                                                     |
| Medium-Term     | 1        | Create a K-12 focused Transportation Engineering Competition | **Audience**: Elementary/ middle/ high school students  
**Lead by**: ITE International and External Districts (Outside US)  
**Supported by**: ITE Sections / Chapters                                                                                     |
| Medium-Term     | 4        | Create a Pre-University Membership Level                 | **Audience**: High school students  
**Lead by**: ITE International and External Districts (Outside US)  
**Supported by**: ITE Sections / Chapters, and teachers                                                                |
| Medium-Term     | 2        | Create an ITE Journal for Kids                          | **Audience**: Elementary/ middle/ high school students, teachers, and parents  
**Lead by**: ITE International and External Districts (Outside US)                                                               |
| Medium-Term     | 2        | ITE Developed Outing Materials                           | **Audience**: Elementary/ middle/ high school students, teachers, and parents  
**Lead by**: ITE International and External Districts (Outside US)                                                               |
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<tr>
<td>Medium-Term</td>
<td>4</td>
<td>ITE Scholarship</td>
<td><strong>Audience:</strong> High school students &lt;br&gt;<strong>Lead by:</strong> ITE International and External Districts (Outside US) &lt;br&gt;<strong>Supported by:</strong> ITE Sections / Chapters</td>
</tr>
<tr>
<td>Long-Term</td>
<td>1</td>
<td>Refine the Transportation Day</td>
<td><strong>Audience:</strong> Elementary/ middle/ high school students &lt;br&gt;<strong>Lead by:</strong> ITE International and External Districts (Outside US)</td>
</tr>
<tr>
<td>Long-Term</td>
<td>3</td>
<td>Encourage Creation of K-12 Transportation Clubs</td>
<td><strong>Audience:</strong> Elementary/ middle/ high school students &lt;br&gt;<strong>Lead by:</strong> ITE International and External Districts (Outside US) &lt;br&gt;<strong>Supported by:</strong> ITE Sections / Chapters, and teachers</td>
</tr>
<tr>
<td>Long-Term</td>
<td>3</td>
<td>Transportation Club Traffic Bowl</td>
<td><strong>Audience:</strong> High school students &lt;br&gt;<strong>Lead by:</strong> ITE International and External Districts (Outside US) &lt;br&gt;<strong>Supported by:</strong> ITE Sections / Chapters, and teachers</td>
</tr>
<tr>
<td>Long-Term</td>
<td>4</td>
<td>ITE Curriculum</td>
<td><strong>Audience:</strong> High school students &lt;br&gt;<strong>Lead by:</strong> ITE International and External Districts (Outside US) &lt;br&gt;<strong>Supported by:</strong> ITE Sections / Chapters, and teachers</td>
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**Recommended Action Plan**

Team Lemonade has developed a recommended action plan to assist ITE in accomplishing the goal of increasing K-12 outreach. With the understanding that K-12 outreach is complicated and multifaceted, the goals associated with said outreach have been divided into short-term goals that can be completed immediately, medium-term goals which will require more time and effort to construct, and finally long-term goals which refine the previous short-term and medium-term goals in an effort to strive for continued improvement. The approaches to the action plan...
describe specific actions to be taken to accomplish the goal of establishing ITE’s K-12 outreach program. The benefits of such a program will affect the transportation profession as a whole while also increasing the familiarity of the Institute. The program will make ITE a central hub for engineering and/or STEM related topics. For current members, whom many are interested in helping with STEM outreach, this will provide an opportunity to participate and become more engaged with ITE internationally and locally. Most importantly, it will give K-12 students an opportunity to learn about transportation as a potential career and to help shape the future they will be living in.

Approaches to Completion of Action Plan

Short-Term Goals
To maximize efficiency and provide as much input as possible, the team decided that an ideal approach for ITE to improve K-12 outreach is to use the resources that are readily available as short-term goals. Upon establishing recommendations for the short-term goals, Team Lemonade has also researched electronic resources that may be used to implement medium- and long-term goals as well. These goals align with the areas of action outlined in the previous section.

STEM Section Addition to ITE Community
Team Lemonade recommends that ITE assign a staff member to coordinate with Sections that are interested in starting a STEM outreach program. Adding a STEM section to the ITE Community would help to ensure members can seek out other members for contacts, past experience and so on. ITE could have the STEM program kick-off at its annual international meeting in 2018 can further encourage sections to participate or start STEM program during the District/ Section/ Chapter Leadership Webinar.

Partner with Existing K-12 Engineering / Planning Competitions
Associated with the short-term goal of increasing the number and effectiveness of ITE members engaged in pre-college outreach, it is suggested that ITE partner with pre-existing engineering and planning competitions with a K-12 transportation focus. Two key competitions include the Future City Competition and Transportation You.

The annual Future City Competition¹ is a project-based competition of researching, designing, and building cities of the future for sixth through eighth graders. Future City is a great experience for students, exposing them to planning, research, technical writing, model scale building, and presentation opportunities, all of which are invaluable skills for students interested in engineering to develop. Sponsorship of this international competition would provide ITE with exposure to thousands of students at the very influential middle

¹ http://futurecity.org/
school age. ITE can also sponsor an award that is transportation related to encourage students to have a transportation component to their city design. Some Sections are currently sponsoring and judging competitions with an ITE related award. ITE can encourage more Sections and Student Chapters to volunteer for and promote their regional competition.

The Transportation You DC Youth Summit is a mentoring program for girls ages 13-18 that introduces them to transportation careers through programs and activities. This program was established through the Women’s Transportation Seminar (WTS), an international organization dedicated to the professional advancement of women in transportation. The competitions are in the form of engineering challenges throughout the five-day event. The girls also get the opportunity to meet with White House administrators, and tour the nation’s capital. ITE personnel could volunteer to mentor these girls as well during the week they are in D.C. ITE headquarters’ strategic location should be capitalized upon with such close proximity to the Transportation You DC Youth Summit annual location. This close proximity provides a unique opportunity to allow the girls to tour the facilities, and meet staff at ITE that have similar passions for transportation.

Implement K-12 Section to ITE Website
To increase awareness, understanding, and interest in transportation engineering among the K-12 cohort, development of a K-12 specific section of the ITE Website can link interested students to resources. This section of the website would be a collection of documented resources that are easily accessible, targeted at elementary, middle, and high school students. One option, which may be advantageous to ITE, is to require a login for access, specifically for high school student materials, which may be tied to a free pre-university membership. Tracking pre-university membership is one way to measure value of the efforts and track the portion of students who remain members at the university and professional levels.

In order to quickly implement the website and provide resources, there are several websites that currently exist that ITE could refer. Work would be required from the current ITE web designer, or other ITE staff, to implement the website section. Existing resources to include on the K-12 section of the ITE website have been identified. Those resources are described below.

- Science Buddies describes the role of a transportation engineer and provides links to several science fair project ideas for students. The projects cover topics such as bridge

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2 http://futurecity.org/form/sponsor-information-request
3 http://www.transportationyou.org/dc-summit/
4 http://www.sciencebuddies.org/science-engineering-careers/engineering/transportation-engineer
design\(^5\), maglev trains\(^6\), and city planning\(^7\) just to name a few. One convenient feature is the ability to purchase a kit of the necessary materials from Science Buddies. Additionally, the ‘More’ tab on the website leads to an ask an expert forum\(^8\) where you can post questions to be answered by industry professionals. Additional links are also provided to other sources that may be of interest, one of which already leads to the Institute of Transportation Engineers website.

- **How to Smile**\(^9\) provides various science and math activities for audiences that range in age from four years old to adult. The website was developed as a project of the university of California, Berkeley’s Lawrence Hall of Science, with funding provided by the National Science Foundation. While the website boasts over 3,500 handpicked activities from museums, universities, and other educational forums, the activities are easily filtered by age, material cost, learning time, and topic. Once a keyword search is initiated to focus on transportation, search results reveal there are 206 transportation related activities\(^10\) to choose from. These activities are sure to invigorate a child’s natural inclination to explore and problem solve through transportation engineering related fun activities.

- **ASCE pre-college outreach**\(^11\) is a specific section of the American Society of Civil Engineers (ASCE) website that provides a clean and easy-to-follow design which may be used as a visual foundation to build a website on. The website has resources for engineers, teachers, parents, and kids. The drop-down menu allows users to navigate through the website depending on their specific perspective of interest. The “Engineers” menu reveals several headings, titled activities, career fairs, National Engineers Week, purchase resources, and Outreach 101. The first section, titled activities, links to 100+ activities for elementary to middle school aged children through

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\(^7\) [http://www.sciencebuddies.org/science-fair-projects/project_ideas/Games_p025.shtml](http://www.sciencebuddies.org/science-fair-projects/project_ideas/Games_p025.shtml)  
\(^9\) [https://www.howtosmile.org/](https://www.howtosmile.org/)  
\(^10\) [https://www.howtosmile.org/resourcesearch?qq=transportation](https://www.howtosmile.org/resourcesearch?qq=transportation)  
\(^11\) [http://www.asce.org/pre-college_outreach/](http://www.asce.org/pre-college_outreach/)
ACSEVille\textsuperscript{12} which has its own transportation related section. The transportation related section leads to two activities that are appropriate for children in grades 3-6. There is also a link to the Dream Big Activities\textsuperscript{13} many of which are transportation related and are sponsored by ACSE, and others. ASCE also provides mentoring resources\textsuperscript{14} for engineers who are considering mentoring middle and high school students, with directions on the necessary steps to take to initiate and successfully start a club. ASCE highlights a transportation module\textsuperscript{15} which entails a sixty-four page reference for eight meetings, all focused on transportation engineering. ITE could benefit from investing in curriculum development, similar to the resources ASCE offers. ITE curriculum could focus on all types of transportation engineering related avenues that future engineers may wish to pursue. The second heading in the engineers drop down menu is titled career fairs, with links to pre-packaged sets of materials for career fairs at elementary through high schools for rent through ASCE, and links to a YouTube video\textsuperscript{16} about what a civil engineer is. The remaining tabs provide links to materials\textsuperscript{17} for DiscoverE’s National Engineers Week, and other outreach resources for purchase.

- **ASCEVille game**\textsuperscript{18} from the ASCE website dropdown menu for kids and teens is a game designed for children in grades 3-7, which focuses on civil engineering. Additionally, ACSE provides links to the previously mentioned YouTube video, and an online game\textsuperscript{19} where kids can design their own streets to show that cars and bikes can share the road. This game can help to stimulate a child’s natural inquisitive nature, while also instilling safety focused multimodal considerations in their thoughts of travel.

- There are several transportation related engineering activities that are linked from other resources at iExploreSTEM.org\textsuperscript{20} including experiments to test egg strength, create a hovercraft, and create a paper car powered by breath. The linked activities were not created by iExploreSTEM, but rather were described with the source credit provided with the link.

\textsuperscript{12}http://www.asceville.org/activities.html\textsuperscript{13}http://www.discovere.org/dreambig/activities\textsuperscript{14}http://www.asce.org/civil_engineering_club/?ga=1.247632839.19791929.1486928362\textsuperscript{15}http://www.asce.org/uploadedFiles/Membership_and_Communities/Ways_To_Get_Involved/Pre-College_Outreach/Content_Pieces/Final%20Version%20Transportation%20Module.pdf\textsuperscript{16}https://www.youtube.com/watch?v=cJaRJ7K-Lw\textsuperscript{17}http://discovere.org/our-programs/engineers-week\textsuperscript{18}http://www.asceville.org/\textsuperscript{19}https://streetmix.net/\textsuperscript{20}https://iexplorestem.org/engineering-activities
The PBS Kids website has a section called “Zoom by kids, for kids!” with activities that link with several engineering related activities, many of which are transportation focused. Some examples of the linked activities are designing an egg boat, future cities, a flood elevator, an apparatus for heavy moving, a hovercraft, and others. The unique aspect of the PBS Kids website activities is that the activities were all submitted by viewers of the television channel, and users are encouraged to share experimental thoughts or results, which are then also displayed on the activity page.

Develop K-12 Marketing and Handout Materials
Another short term goal identified by Team Lemonade is the development of handout and marketing materials for both K-12 students and parents which could consist of a compilation of all the resources that have been collected and identified as valuable resources that will guide today’s youth into choosing a transportation engineering related career path. The handout material should be clear and concise with easily accessible data that can be used to promote the use of the developed resources. Ideally, these materials could be handed out at career fairs, at Great American Teach-In days, and at other activities that occur throughout the U.S. and Canada. Additionally, these handout materials could be made available as an electronic resource and provided to high school members of ITE if the institution decides to implement membership availability at that level. One example of the type of materials that are recommended to be adopted was made by Lockheed Martin. Team Lemonade has made a draft of an ITE student handout, which will be included in the appendix of this report. The pamphlet could be modified for specific circumstances. For example, a bingo board of street signs may be used as a cover image for middle or elementary school events. Another example of future edits could include geographically specific activities which could be populated by local student chapters or sections, such as a section student poster competition. Another idea could include updating the pamphlet with current topics from the ITE Journal as it is released, which would undoubtedly require a greater time investment. Other versions of the pamphlet should focus on parental related guidance and teacher related guidance, both of which may be beneficial in the future.

Partner with Boy Scouts and Girl Scouts
Finally, the last of the short term goals identified by Team Lemonade is for ITE to partner with the Boy and Girl Scouts. This partnership could be fostered through events that already occur within the organizations themselves, or could be something such as developing a new badge. One

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21 http://pbskids.org/zoom/activities/sci/#engineering
example is the “STEMsational ME!” badge that was designed by the Girl Scouts of Orange County STEM Consortium. Research has found that STEM interest and perceptions of relevance of STEM to one’s life provide a foundation for successful STEM learning and careers. ITE could potentially become a partner in inspiration to the Girl Scouts of America to provide girls with additional ways of learning and applying STEM skills specifically related to transportation. One such partnership exists with the National Science Foundation, and is called Imagine Engineering, which “offers girls from low-income and underserved communities the chance to experience STEM and plan for futures in STEM fields.” In addition to the Girl Scouts of America, the Boy Scouts of America also provides opportunity for ITE to make an impact on the future career goals of today’s youth. The Boy Scouts currently offer a Truck Transportation Merit Badge, which has some transportation engineering application. However, it is more focused on encouraging boys to become truck drivers. The Boy Scouts do make it easy to become engaged in their community with an engagement platform that allows organizations and individuals to be more involved with their local troops.

Medium-Term Goals
Upon executing the first suggested action plan for short-term goals, it is recommended to move forward with implementing medium-term goals. These goals also align with the areas of action outlined in the previous section.

Create ITE K-12 Focused Transportation Engineering Competition
Refinement of the K-12 focused Transportation Engineering Competition equates to evolving it into an ITE specific event. As the involvement of ITE evolves competitions as a joint event, ITE will need to determine the merits of developing an ITE specific transportation engineering competition versus remaining partnered with other organizations.

ITE Transportation Day
The first suggested action plan associated with a medium-term goal is developing a Transportation Day. Transportation Day is to be an annual one-day event. The purpose of Transportation Day is to increase awareness, understanding and interest in transportation engineering among the public with a specific focus on students in grades pre-K-12. Similar to Engineers Week, Transportation Day will celebrate how transportation engineers make a

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http://www.scouting.org/filestore/Merit_Badge_ReqandRes/Truck_Transportation.pdf

http://scoutingworks.com/engagement-platform/programs/
difference in our world and bring transportation to life for the public. ITE Districts, Sections and Chapters will lead in promoting Transportation Day by showcasing the profession through various outreach efforts. ITE will also work with other major transportation organizations to celebrate and promote Transportation Day.

As part of the implementation process, ITE would need to determine an official recurring date for Transportation Day. ITE would need to consider other annual engineering related events such as Engineers Week (DiscoverE Family Day, Engineers Week, Future City, Girls Day, Global Day, and Global Marathon) when determining a final date for Transportation Day. ITE would need to produce standard guidelines and outreach materials for Districts, Sections and Chapters to promote the event. ITE would also need to create a committee, which would include people from other major transportation organizations to help support Transportation Day.

Transportation Day should also be branded once established to increase the familiarization and the participation as Transportation Day becomes a notable annual event. Team Lemonade proposed several alternatives amongst the team including Transportation Engineering Day (TED) and Transportation Day (TD). However, when it was brought to our attention that TED Talks already exist and are not related to the branding that was hoped for, TED was thrown out. Similarly, TD stands for Transportation Disadvantaged, and that is not necessarily the best association either. Following the dismissal of the original ideas for branding, the team decided that a brand should be developed once the idea of holding a Transportation Day was decided on. Noting that it would be neglectful of our time to invest too much time into branding an idea that had not been fully vetted through the ITE executive board.

Create a Pre-University Membership Level
The fourth action plan for the medium-term goal suggests creating a pre-university membership level for high school students. This membership level would provide high school students with opportunities to learn about and become involved in the transportation profession as a student at an earlier stage before entering college. Becoming an ITE High School Student member would provide a heads start and knowledge for success in the field of transportation.

In order to implement this membership grade, ITE would need to create a new application form on the ITE website, which would allow high school students to sign up for High School Student membership. This form would be similar to the current student membership form for college students. This would be a free membership as long as the student is enrolled in high school. Upon graduation from high school, the member will be upgraded to regular ITE student membership, which is free for the first year. ITE would also create and maintain a specific section on the ITE website for high school students, which would include resources they can use to learn more about the transportation profession.

Create an ITE Journal for Kids
Team Lemonade has made another medium-term recommendation to develop and maintain an ITE Journal for Kids. This journal could be updated annually once initiated, and possibly more frequently if feedback is positive. The ITE Journal for Kids could include sections such as travel safety tips, safe routes to school, active transportation to encourage healthy lifestyles while
being environmentally conscious in daily choices. The ITE Journal for Kids could have activities such as transportation word searches, crossword puzzles, and mazes. The ITE Journal for Kids could also include any transportation related activities that students have completed with explanations of the results and associated challenges that were overcome. This could be solicited as a student competition to encourage submissions. The development of the ITE Journal for Kids is a medium-term goal due to the understanding that it will take substantial effort by many individuals to develop and distribute.

ITE Scholarship
Develop scholarship for high school students entering engineering, planning, or related transportation field. The scholarship would favor someone interested in a transportation career and with a good volunteer / community background. If a high school student membership were developed, then membership in ITE would be of benefit on a scholarship application. Scholarships can be funded by industry and would open the door to summer positions and coop opportunities.

ITE Developed Outing Materials
Develop standardized transportation-focused materials for educational events. Museums, especially ones marketed towards children, typically have Engineer week related events, as well as other events throughout the year that are staffed by volunteers. Having a package of materials to allow volunteers to showcase the transportation profession would improve ITE exposure and member engagement. Example materials could be similar to the following:

- Tabletop car stopping distance discussion and interactive experiment, such as [Motion Commotion](http://4-h.org/parents/national-youth-science-day/motion-commotion/) developed for 4-H clubs National Youth Science Day.

- Outdoor car stopping distance activity - students would move a distance away from a starting point to guess how long a car would take to stop given a beginning speed and roadway conditions. The volunteer would wheel off the correct distance (as given in a pre-computed handout) to show students correct stopping distances. Talks about distracted drivers could be incorporated using larger perception/reaction times in the pre-computed handout for the volunteer.

- Traffic signal equipment interaction, similar to or in conjunction with Touch-A-Truck events, where traffic signal equipment (controller, signal heads, etc.) can be viewed and discussed.

- Traffic signal demonstration, whether using a portable traffic signal assembly, microsimulation video, live stream of video detection, or similar manner of describing traffic signal operations.

- Transportation Planning examples and simulations utilizing Sim City, such as this [Future Cities](http://futurecity.org/lb/simcity/a/terraforming-and-land-use-planning) example.
• Additional discussion on similar items has taken place on the ITE Communities\(^{31}\) board, via a post by the Advocacy Committee and STEM Sub-committee. The opportunities ranged from generic engineering items (such as an egg drop competition) to focused transportation options (such as signal timing simulations).

**Long-Term Goals**

Long-term goals deal with developing existing partnership opportunities into ITE focused activities and resources.

**Encourage Creation of K-12 Transportation Clubs**

Facilitation of K-12 transportation clubs will support K-12 membership levels and activities. A teacher or parent liaison and a local ITE member at a Section, Chapter, or Student Chapter level would support clubs. Clubs will need to be supported by web-based resources, communication with an ITE K-12 liaison, and nearby industry professionals. Club activities could include a Traffic Bowl competition, participation in Transportation Day and engineering competitions, and industry speakers and technical tours.

**Refine the Transportation Day**

Evaluate the Transportation Day with appropriate measures of effectiveness (see following section) to establish a feedback loop. Over time, it could develop into more of an ITE event, but it may be stronger in partnership with other groups.

**Transportation Club Traffic Bowl**

Developing a traffic bowl for high school level students in their transportation clubs will broaden knowledge and awareness of transportation engineering and planning among secondary school students.

**ITE Curriculum**

Development of an ITE curriculum similar to ASCE curriculum that focuses on all types of transportation engineering related avenues that future engineers may wish to pursue. This material can be made available through the ITE website for student resources.

**Measurement of Effectiveness**

As progress is made through the above action plan, ITE will need to track effectiveness of its outreach to K-12 students. This is especially critical as the efforts transition from short-term implementation to medium- and long-term strategies. To aid in the measurement of the program’s effectiveness, the following list of potential metrics has been developed:

- **Website Visits** - Upon development of the student-specific section of the ITE website, visits to the website should be tracked. This could be as basic as monthly reports, but should also include website traffic before and after major events designed to attract

\(^{31}\) [http://community.ite.org/communities/community-home/viewthread?GroupId=1597&MessageKey=0af00082-b625-45ec-b992-7deb517ed2c&CommunityKey=7e0793b5-eved-48d4-8808-24d0bc9259ae&tab=digestviewer](http://community.ite.org/communities/community-home/viewthread?GroupId=1597&MessageKey=0af00082-b625-45ec-b992-7deb517ed2c&CommunityKey=7e0793b5-eved-48d4-8808-24d0bc9259ae&tab=digestviewer)
attention to ITE’s K-12 efforts.

- **Membership Statistics** - Increasing membership numbers in ITE is a positive result from focusing efforts on developing K-12 interest in the profession. In tracking membership statistics, specifically the number of student members becoming full members, the continued effectiveness in reaching students earlier in their education and directing them to a transportation-focused path can be measured. As the Pre-University membership level and K-12 Clubs are started, attendance and membership at these early levels should also be tracked as individual members pass from one level to the next. Additionally, ITE may choose to track the trends of the demographic makeup of new membership to identify what strategies are working best to attract diverse new membership. Attracting diverse membership in regards to race/ethnicity, age, sex, etc. will position ITE to make more well-rounded meaningful decisions, in addition to encouraging differing perspectives in the discussion boards and other membership engagement.

- **Pre-University Membership Enrollment** - As a Pre-University membership is developed, tracking when students become members (age and/or grade), activity while members, and ultimate enrollment and study focus will allow a continual assessment of K-12 activities.

- **Membership Engagement** - The majority of the efforts in the Action Plan will require the volunteering of time by members. An effort to track this investment of time, coupled with other measurements, would provide a measure of effectiveness in particular events. This would allow ITE to determine where best to direct their efforts and resources, into events that historically provide the most exposure compared to the investment required. The volunteer time should be tracked and reported on a Section level via a Section Board member, which would also provide data into regional effectiveness and potential opportunities.

- **Partner Organization Benchmarking** - As ITE develops a K-12 program, early Action Plans will involve collaborating with other organizations already working in the K-12 arena. In developing these partnerships, ITE should seek to benchmark the results of their efforts against the partner organizations to determine relative effectiveness in reaching students.

- **Post-Event Surveys** - In order to gauge the effectiveness of certain events, surveys to participants should be considered. The surveys should attempt to determine the awareness and interest in Transportation Engineering before and after the event, as well as the good portions of any program and the areas for improvement.

- **Membership Surveys** - Membership surveys can include a question of how members joined the profession and/or ITE. This would identify the results of K-12 outreach strategies.
CONCLUSIONS & RECOMMENDATIONS

ITE has the opportunity to capture the next generation of transportation professionals in the early stage of their education through STEM activities. With the support of the organization through the STEM Committee, Advocacy Group, and interested members, it is recommended that ITE pursue the short-, medium-, and long-term actions indicated in this report to develop and enhance K-12 engagement strategies. Those strategies are as follows:

- **Short-Term:**
  - Addition of STEM Section to ITE Community
  - Partner with Pre-Existing Engineering/Planning Competitions with a K-12 Transportation Focus
  - Add a K-12 Specific Section of the ITE Website with Links to Pre-Existing Websites with K-12 Transportation Focused Content
  - Develop Handout/Marketing Materials for K-12 Students and Parents
  - Partner with Boy and Girl Scouts

- **Medium-Term:**
  - Develop a Transportation Day
  - Create a K-12 focused Transportation Engineering Competition
  - Create a Pre-University Membership Level
  - Create an ITE Journal for Kids
  - ITE Developed Outing Materials
  - Implement an ITE Scholarship

- **Long-Term:**
  - Refine the Transportation Day
  - Encourage Creation of K-12 Transportation Clubs
  - Transportation Club Traffic Bowl
  - Develop ITE Curriculum

The key to successfully implementing the K-12 program is to take advantage of existing materials and efforts by other groups that overlap with the transportation profession. These have been largely identified as transportation engineering and planning, but can also include others. A K-12 student website will act as a central information hub to connect students, parents, teachers, and ITE members to information, learning materials, and activities. The longer-term strategies are suggested to refine and direct these materials into ITE led programs. The benefits of such a program will affect the transportation profession as a whole while also increasing the familiarity of the Institute. The program will make ITE the central hub for engineering and/or STEM related topics. For current members, interested in helping with STEM, this will give them an opportunity to participate and become more engaged with ITE internationally and locally. Most importantly, this program will give K-12 students an opportunity to learn about transportation as a potential career and to help shape the future they will be living in.

The STEM Subcommittee is the best candidate to champion the K-12 engagement efforts outlined in this report. The remaining action items will require efforts from many ITE members and it may be the most beneficial to have one central subcommittee to coordinate efforts. This may eventually require a new Outreach subcommittee as the K-12 program matures.
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