Students and ITE

What can ITE do to improve student engagement across multiple education levels to invigorate and secure the future of our profession?

LeadershipITE 2016

by

The A-Team

August 2016
ACKNOWLEDGMENTS

The authors thank Kathi Driggs, Colleen Agan, Hibbett Neel, Faisal Hamood and all others who participated in surveys.
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EXECUTIVE SUMMARY

The following paper was prepared as part of the LeadershipITE Class of 2016 group project. Five (5) individuals from a diverse set of backgrounds came together in January 2016 to form the A-Team. After much thought and discussion, the A-Team developed their project statement. The project statement is “What can ITE do to improve student engagement across multiple education levels to invigorate and secure the future of our profession”.

What we did…

The A-Team began the process by identifying the Stakeholders. The Stakeholders for this project included ITE, Students (both Primary and Secondary), Universities, and other organizations. Once the Stakeholders were identified, the A-Team began a benchmarking effort.

The benchmarking effort included multiple surveys. A one (1) page survey was prepared by the team to distribute to students that attended the ITE Open House during the TRB Annual Conference. Results from this survey led the team to develop a professor survey due to an overwhelming response that professors are the main reason students are in the transportation field. The team reached out to 127 university professors and had a 31% response rate. A few of the responses we received for ways to attract more students to ITE included the following: 59% suggested offering a practical design competition, 54% suggested making meetings more financially accessible and 51% suggested offering scholarships.

The team developed a second student survey that included 28 questions that HQ staff assisted in email out to students. The survey was sent to 2,294 students and we had a 10% response rate. We believe the response rate was low due to the survey timeframe (May). We had 50% of the responses indicate students were unaware of scholarship opportunities within ITE. We also received multiple responses regarding ITE’s Cost and Value. One student’s response to the survey stated: “The dues seem expensive, and other than a million unwanted emails, I'm not exactly sure what the dues cover since it seems like I still have to pay for every event that is specific to ITE.” This summarizes the basic sentiment we got from most student responses. Additional benchmarking was completed for ITE and other professional organizations that could be competing with ITE for members.

What we found…

After all surveys were gathered and the information tabulated, the team developed an Action Plan for ITE. The Action Plan was divided into Primary and Secondary Plans. The Primary Plan is for ITE to be a facilitator in establishing a new program. This program would revolve around the K-12 education level. The plan has actionable recommendations based on the 2014 Strategic Plan. The Secondary Plan is for ITE to be a leader in enhancing and/or expanding existing programs. This plan has ten (10) action items that include funding opportunities, marketing scholarships, expand the Western District Student Leadership Summit, creating a student advisory board, and seeking partnerships with other organizations.
INTRODUCTION

The 2016 LeadershipITE class is comprised of an extraordinary group of individuals from a diverse set of backgrounds. When five class members come together to effect change in either ITE or the transportation profession, great things happen. That was just the case with this year’s A-Team who decided as part of the program to tackle the challenge as it relates to student engagement across multiple education levels. With that in mind, this document embarks on a journey that benchmarks ITE’s current efforts as it relates to students and establishes an action plan, built off current surveys of key stakeholders, for taking these efforts to the next level to secure the future of our profession.

The A Team

First let’s introduce those who make up the 2016 A-Team:

Shane Bergin, P.E., PTOE graduated from Auburn University with his bachelor of civil engineering in 2002 and his master of civil engineering in 2004. Shane joined Neel-Schaffer, Inc. in 2004 and has more than 12 years of experience in civil engineering, traffic analysis, roadway design, utility design, and construction administration services. His experience also includes preparation of planning studies, construction plans, and specifications and permit applications. Shane has been involved in a variety of projects throughout Alabama, Mississippi, and Florida, where he holds professional engineering licenses. He works out of the firm's Mobile, AL, USA office. Shane is married to Marybeth and they have one son, Wiley, who is 2 years old.

Keith Hall, P.E., LEED AP, IMSA II, Greenroads STP is a project manager with Maser Consulting in Hamilton, NJ, USA specializing in all aspects of traffic signal design, bicycle infrastructure, complete streets design, and intelligent transportation systems. He is an advocate for sustainability in design, which began while he was studying in the Netherlands as an avid bicyclist. One of Keith's core philosophies is community involvement and outreach, which has been the impetus for his involvement in an array of organizations for many years. Within ITE he has served a variety of committee roles both locally for the Metropolitan Section of New York and New Jersey as well as at the International level. Outside of the workplace, Keith is a volunteer firefighter and EMT, having served countless numbers of hours to the local community during the past 9 years. He has been awarded numerous levels of recognition for training certifications and assistance during natural disasters.
Hanieh Houshmandi, P.E., T.E., PTOE is a civil/transportation engineer for San Mateo County in Redwood City, CA, USA with focus on traffic operations and transportation planning. She loves traveling and has traveled to 16 countries so far, with hopes to travel to many more. Hanieh enjoys observing different transportation infrastructures around the world and seeing how different cultures utilize their transportation network.

Kellie Reep, P.E. graduated from North Carolina (NC) State University in 2009 with a bachelor of science in civil engineering. She has been working as a transportation engineer with Stantec for more than 7 years. Kellie grew up near Raleigh, NC, USA and recently moved to Charlotte, NC. Her professional interests are in capacity analysis, corridor studies, microsimulation modeling, and signal design. Kellie and her husband, Andrew, attend all of the home NC State football games. She took her first international trip to Italy in May.

Charles Stevens, P.E., PTOE, LEED AP is a research engineer with the Texas A&M Transportation Institute. He has focused his research efforts in the areas of traffic operations, including smart corridors, transportation systems management and operations, unmanned aerial vehicles, and climate change impacts to surface transportation. He holds a bachelor's degree and master's degree in civil engineering from Texas A&M University, College Station. Charlie was awarded the prestigious National Young Engineer of the year award by the National Society of Professional Engineers in 2015 and has been an active member of ITE since his college days at Texas A&M. Charlie enjoys playing golf and tennis, is married to Roma (also an ITE member), and has a beautiful 8-year-old daughter named Asha.

PROJECT PROBLEM STATEMENT

In order to facilitate the completion of the project a problem statement was developed:

“What can ITE do to improve student engagement across multiple education levels to invigorate and secure the future of our profession?”

After much debate and discussion during the project selection process at our first meeting in Washington D.C., the A-Team developed this project statement and scope out of a cumulative passion amongst all team members to focus on the future of ITE and the profession at large. Much of the drive comes from team members who were once ITE student members themselves and the ties that still exist to the next generation of transportation professionals.
PROJECT APPROACH

It is the A-Team’s intention to provide ITE leadership with a narrative that will discuss opportunities to improve and grow the organization. At a basic level this project will target:

• Who is impacted?
• How is ITE doing now?
• How can ITE improve?

As an approach, the project team will identify student stakeholders, where the organization is now regarding students, where are other organizations regarding students (K-12), and what are some actionable items ITE can consider to improve and grow the organization.

STAKEHOLDERS

One of the most critical steps was defining the stakeholders for our topic to determine who we needed to seek input from. Below is a list and brief description of the stakeholders identified for the effort to improve the student ITE experience and further engage them in ITE.

ITE International

ITE as a stakeholder includes not only International ITE, but also the Districts, Sections, and Student Chapters, and their leadership.

Students

The primary focus of our project was students. The students were broken out into two categories:

Primary (K-12)

The primary education stakeholders include pre-college students from Kindergarten through 12th grade, as well as educators within that category.

Secondary (College/ University)

Secondary education stakeholders include students and professors at the college / university level. This includes individuals at the undergraduate, graduate, and Ph.D. levels.

Universities/ Programs/ Institutions

This group includes the universities that students attend, the programs that the universities offer, as well as other types of institutions that offer transportation engineering related curriculums.
Other Organizations

Our group looked at many other organizations that serve as counterparts to ITE within the engineering field, as a whole. Such organizations include, but are not limited to ASCE, APA, ITS America, and WTS.

ITE AND STUDENTS NOW

The A-Team considered and selected multiple possible sources of information including current students, professors, ITE (as an organization) and other national engineering organizations. In utilizing these sources of information, the A-Team completed a survey of current university students and professors, investigated the current and future structure of ITE in regards to students, and completed a benchmarking study of other organizations for K-12 activities.

The University Student Perspective

As part of our efforts to create a point of reference for ITE’s current efforts as they relate to student engagement, the first group polled were the students themselves. Two separate surveys were prepared and presented to engage and solicit feedback from students.

The first was presented at ITE HQ’s Student Night on January 11, 2016, an event hosted in conjunction with TRB. The short seven (7) question paper-based survey was completed by 118 students and all responses were summarized to best evaluate any trends in the data (Appendix A). This survey was used to gauge current member sentiment and define areas that needed further detailed questioning or other groups to be surveyed.

The second survey was sent out with the assistance of ITE Headquaters’ staff (via Survey Monkey) to all current ITE Student Members during the month of May 2016. This survey was a more in-depth look at ITE and students containing a total of 28 questions, mostly multiple choice but some were left open-ended (Appendix B). Of the current 2,294 students this survey was sent out to, 296 responded. The following notes the key findings that these student surveys revealed that aid in creating a benchmark for where ITE stands today from a student perspective and provide direction for the future.

Current Student Demographic

A larger percentage of student members are pursuing their Masters or Doctorate degrees (about 55%) as opposed to undergraduate education (45%).

Of the current student membership pool, roughly 2/3 are or were international students demonstrated by the fact that 60% of survey respondents noted that they received their primary
(K-12) education outside the United States and 65% received their undergraduate education outside of the U.S.

**Interest in Transportation**

We asked students what got them interested in transportation. We were surprised to see that the most predominant response was that they always liked it. This indicates that they likely got interested at a young age and developed their interests into the field of transportation engineering or planning. Most students (more than 60%) decide to concentrate in transportation during their undergraduate years, indicating that this may be the best time to pursue them for membership in ITE.

**Affiliation with ITE**

Overwhelmingly, the large majority of our survey respondents said that they learned or heard about ITE from a professor while in college. Not surprisingly, many (nearly 50%) of students attend ITE meetings to network with other professionals to increase their potential for getting a job after graduating. A smaller percentage attend meetings to learn actually about transportation. Student members of ITE are also members of other organizations.

When asked how likely students were to join ITE upon graduation, we got a very high response (nearly 90%) of yes, if their employer would pay for membership. However, when asked if they would join if there employer would NOT pay, the percentage of students “very likely” to join dropped to just 27%. About 60% said they were “somewhat likely” to join given the latter circumstances. When asked what other organizations (not ITE) would they consider joining after graduation, the top two responses were ASCE and ITS America. One comment was, “Make it easier to learn about ITE, what it does, and what it provides.”

**Cost and Value**

Generally, what we saw from the survey data collected by our team was that many students feel that their membership to ITE is very expensive and provides little benefit to them professionally.

One student’s response to the survey stated: “The dues seem expensive, and other than a million unwanted emails, I'm not exactly sure what the dues cover since it seems like I still have to pay for every event that is specific to ITE.” This summarizes the basic sentiment we got from most student responses.

Another responded, “I think this organization is slightly outdated. I have hope for Paula and Shawn, but in its current state, it isn’t meeting my needs.”
Funding

Most student chapters appear to get the majority of their funding from the local ITE chapters, but a larger majority didn’t know where their funding came from (over 60%). When asked what fundraising activities their student chapter participates in, most responded with none/not sure.

Student Chapter and Advisor Activity Level

More than 20% of students said that their student chapter advisor is not involved in their activities at all. Another 60% said that they either do not have or aren’t sure if they have a local ITE chapter representative assigned to their student chapter. One responded stated: “The professors are not very involved or charismatic and it anything makes me NOT interested in ITE.”

While over 50% indicated participation in the ITE Traffic Bowl, many offered ways which it could be improved upon or enhanced. Further, ideas for other types of ITE-led competitions were suggested to increase activity. Only 12% stated that ITE was doing a good job and that no further efforts were needed on behalf of ITE to better engage its student members and keep them interested in the organization.

Early Education (K-12) Outreach

A very small percentage (15%) of students said their chapter is currently participating in K-12 outreach, though many mentioned this in an open-ended question as something they wish their student chapter would do. Over 95% of current student members responded that they would be willing to host or participate in K-12 activities as part of their student chapter.

Scholarships

When asked about scholarships, over 50% responded that they are not aware of any scholarship opportunities. As one student simply put it, “I didn’t know they (ITE) offered scholarships.”

The Professor Perspective

As part of our benchmarking effort, in March 2016, we reached out to 127 university professors with a 15 question survey. These professors were listed by ITE as the chapter advisors for their respective universities. Despite the list being outdated we received an impressive 31% response rate and were able to update the professor contact information for ITE. Please see appendix C

From our surveys we discovered that professors are the most important factor in guiding students towards transportation as a career choice with 26% of students selecting them as the
deciding factor. Given how important of a role the professor’s play in shaping the future of our industry, their input is invaluable. Below is a highlight of input from professors in charge of ITE university chapters:

**Access to University Chapter**

Not all university chapters are open to all, 10% are only open to transportation students and therefore not beneficial to students who may be considering transportation as a career.

**Meeting Frequency**

It was found that 5% of student chapters never meet, only 77% have meet regularly once or more per month. In some chapters, ITE does not meet separately but under an umbrella with several other student organizations.

**Involvement of Professionals**

It was found that 70% of the professors indicated that collaboration with transportation or civil engineering professionals is key in development of student members and most strive to invite professionals to attend their meetings.

**General Support needs from ITE**

Although 60% of professors surveyed spoke positively of ITE’s supporting role, a great many indicated hope for more support in the form of stipend to cover cost of food and drinks for meetings and need for support in setting up mentorship programs. Need for support appears greater in smaller schools with more limited resources.

**Sources of Support for University Chapters**

Most of the support comes from local/district chapters or the university itself. Only 5% of professors indicated any kind of support from International ITE.

**Activities Popular with Students**

Regular meetings, traffic bowl, guest speakers, conferences and road trips are the top 5 activities listed by the professors in the order of popularity.

**Ways to Attract More Students to ITE**

Professors were eager to provide input on how to attract more students to ITE. Below is the list of the top suggested activities desired by the professors:

- Offer a practical design competition similar to steel bridge and concrete canoe. (59%)
- Make meetings more financially accessible. (54%)
• Offer scholarships. (51%)
• Hold seminars hosted by industry professionals. (46%)
• Increase interaction with ITE leadership. (36%)

Comments and Suggestions

Participants also provided written comments and suggestions. Two high quality examples include:

• “There is too much competition among [university] clubs and other activities for our students to carve out a niche role for ITE.”
• “[Consider] combining with other organizations.”
• “Accept more foreign universities into ITE.”

The ITE Perspective

The A-Team understands that International ITE knows that the student chapter (secondary education) is important for the future success of ITE. We, as a team, were unaware of the Student Chapter Committee and the report that was provided to the IBOD Board in 2015. It is clear that International ITE has concerns about the Student Chapters or this committee would not have been formed in 2014. The surveys conducted by the Student Chapter Committee in 2015 could also account for the low return we received. The Student Chapter Committee was co-chaired by Bob Stammer and Michael Knodler.

A preliminary report with the findings of the surveys was provided to the IBOD Board in July 2015 while a final report was provided to the Board in October 2015. The Student Chapter Committee provided the following recommendations or Action Items:

• Increase Headquarters Staff Support.
• Revise the Student Chapter Manual.
• Insure that Faculty Advisers have adequate guidance and Headquarters assistance to enhance their Chapter’s probability of success.
• The IBOD and Headquarters must have a better Student Chapter monitoring process
• Improve “networking” opportunities.
• Think “incentives” to improve performance and satisfaction levels.

While we believe that International ITE understands that K-12 students need exposure to the profession to ensure transportation’s future. However, we found no evidence through discussions with headquarters and little through the districts and sections. There is no guidance or links provided on ITE’s webpage for K-12 information. One team member had their spouse contact headquarters to request any information or guidance to help their child’s school. Phone calls were made on several occasions and messages were left. The team also attempted to contact all Sections and Districts to determine if K-12 outreach was being done. For the Sections
and Districts that responded, very little is being done if any at all. What is being accomplished is being completed by individuals or the student chapters.

**Other Organizations and K-12 Outreach**

ITE as an organization is not a leader in K-12 outreach. It could be assumed that for future growth and to compete with other international and domestic based engineering societies and organizations, ITE must continuously deliver its vision to potential future members of the society. Upon discussion with the international leadership, there are no known formal K-12 outreach efforts (international) within the United States and with the exception of a board approved Smart-Driving Club charter granted to the Jinan Foreign Language School in China, none internationally. The A-Team views the organization’s lack of K-12 outreach as an opportunity; one that may not have been previously explored by leadership. In order to determine the potential benefits and understand successful K-12 outreach initiatives, the A-Team completed a benchmarking study of national and international engineering organizations across all fields.

**Methodology**

In order to complete the benchmarking study, the A-Team developed a questionnaire and selected organizations for the study. The A-Team then conducted telephone interviews of organizations lasting between 10 and 30 minutes. Observations and statements from each interview were recorded on pre-prepared interview forms and later reviewed to determine potential trends. Unique and innovative K-12 outreach approaches were highlighted for additional discussion.

**Organization Selection**

The A-Team prepared an initial list of 23 National/International organizations for potential phone interviews. Contact information was acquired online or through known contacts and each of the 23 organization was contacted and either participated in the interview or was given contact information by voicemail. Of the 23 organizations contacted, 15 organizations participated in the interviews (see Table 1).
Table 1. Organizations Participating in the K-12 Outreach Interviews

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<td>American Railway Engineering and Maintenance-of-Way Association</td>
<td>AREMA</td>
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<tr>
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<td>Society of Automotive Engineers</td>
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Interview Questionnaire

The -A-Team prepared a six question interview guide to assist in the phone conversations. The questions were developed to gain information about:

- K-12 Outreach practices,
- Formal vs. informal activities,
- Strategic planning and goal setting,
- Standing Committees,
- Quantification of Benefits, and
- Response to K-12 Request (Speakers Bureaus).

Data Reduction and Analysis

The results of the interviews were analyzed both quantitatively and qualitatively to determine trends and highlights. The -A-Team prepared a series of spreadsheets (see Table 2) as well as recording details of specific K-12 outreach approaches that may be of interest to the ITE leadership (see Figure 1).
Table 2. Sample Worksheet for Data Reduction and Analysis (for outreach)

<table>
<thead>
<tr>
<th>ORG</th>
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Figure 1. Screenshot of AIAA Structural Dynamics Interactive Website (J)
Bonus: Secret Shopper Exercise

As discussed early in the ITE Perspective section, a member of the -A-Team had his spouse contact ITE about K-12 resources for the child’s school. This was done to observe the ITE Headquarters response to a request for K-12 information.

Study Findings

The analysis of interview data produced multiple findings that may be of interest to ITE leadership including:

- Percent having any K-12 Outreach
- Direct vs. Indirect K-12 Outreach
- Types of Outreach
- Names of K-12 Initiatives
- Event Participation
- Online Presence
- K-12 Clubs and Memberships
- Non-Student Resources
- Strategic Planning
- Formal Committees
- K-12 Benefits
- Speaker Requests

Summary of K-12 Outreach

The summary of findings regarding K-12 outreach was divided into three components: any outreach, direct outreach and indirect outreach. Organizations were affirmed to have any outreach if they responded positively to the request for an overview of K-12 activities (see Figure 2).
Of the 15 organizations that participated, 12 (80 percent) indicated that they participated in K-12 outreach activities. Direct K-12 outreach was affirmed with the verification of an organization having created their own web content and outreach materials (see Figure 3). Examples of high quality web content were found from ASCE with ‘ASCEVille’, IEEE with ‘tryengineering.org’, and SAE with ‘A World in Motion’.

**Figure 2. “Any” K-12 Outreach Findings**
Of the 15 organizations that participated, 9 (60 percent) were verified to having created their own web content and outreach materials. Indirect outreach included the organization utilizing 3rd party content that was directly hyperlinked on the organizations website. Indirect outreach was not quantified by percentage since only two organization truly fit this description: SWE with ‘engineergirl.com’ and SPE with ‘energyforme.org’.

Examples of K-12 Outreach

In addition to the information provided during the interview, the -A-Team also reviewed the many websites and corresponding K-12 content. Some common examples of K-12 outreach include:

- Activities (see Figure 4)
- Videos
- Games
- Software
- Career
- Ask an Expert (Even for homework…)
In addition to direct student outreach, organizations also provided content for teachers including:

- Videos
- Materials
- Lesson Plans
- Classroom Grants
- Memberships
- Awards
- Magazine

**K-12 Outreach Nomenclature**

The -A-Team thought it was very important to record the various names that the interviewed organizations used in reference to their individual K-12 programs. This list might also provide ITE leadership with some understanding of the underlying goals of K-12 Outreach. Six common names were associated with various committees and online initiatives and included:

- K-12
- STEM
- Pre-Professional
- Pre-College
- Sustainable Profession
Teachers and Students

In addition to these program titles, staff members with dedicated K-12 responsibilities included:

- Senior Manager of Pre-College Outreach
- Foundation Program Coordinator
- Education and Community Outreach Specialist
- Practice Lead - Community Engagement
- Outreach Manager
- Professional Development Manager
- Senior Program Manager, Educational Outreach
- K-12 Educational Development

Formal K-12 Event Participation

Of the 15 organizations interviewed, many participate in various national competitions, national events, and events that were specifically developed by the organizations.

Competitions

The two common competitions that were recorded in the interviews were the Future Cities Competitions, and Math Counts.

Future Cities (3):

"Future City starts with a question—how can we make the world a better place? To answer it, 6th, 7th, and 8th grade students imagine, research, design, and build cities of the future that showcase their solution to a citywide sustainability issue. Past topics include stormwater management, urban agriculture, and green energy.

Students present their solutions via a virtual city design (using SimCity); a 1,500-word city essay; a scale model; a project plan, and a presentation to judges at Regional Competitions in January. Regional winners represent their region at the National Finals in Washington, DC in February. After the competition is over, student participants are not only prepared to be citizens of today’s complex and technical world, they are poised to become the drivers of tomorrow.

Future City is a cross-curricular program that lets students in the 6th, 7th, and 8th grades do the things engineers do: identify problems, brainstorm ideas, design solutions, test and retest, build and then share the results."

MathCounts: (4):

"The MATHCOUNTS Foundation is a 501(c)(3) non-profit organization that strives to engage middle school students of all ability and interest levels in fun,
challenging math programs, in order to expand their academic and professional opportunities. Middle school students exist at a critical juncture in which their love for mathematics must be nurtured, or their fear of mathematics must be overcome. MATHCOUNTS provides students with the kinds of experiences that foster growth and transcend fear to lay a foundation for future success.

For more than 30 years MATHCOUNTS has provided enriching, extracurricular opportunities to students and free, high-quality resources to educators. Every child is unique, but we believe all children are capable of seeing the beauty and joy of math, whether they come to us already passionate about math, or intimidated by it.”

Formal Events

There three common formal/national events recorded during the interviews: Discover Engineering Family Day, USA Science and Engineering Festival, and the US News STEM Solutions.

Discover Engineering Day (5):

Discover Engineering Family Day is a fun-filled day designed to introduce students 4 to 12 to the wonder of engineering and the importance of technological literacy. It attracts thousands of people and kicks off DiscoverE Engineers Week activities in the national capital area.


WHAT CAN ATTENDEES EXPECT?
Nearly 30 Family Day exhibitors present basic science and engineering principles through hands-on and mind-challenging activities. Special demonstrations are also sprinkled throughout the day.

Past features include:
• Engineer and TV personality Nate Ball demonstrating the reverse-rappelling Atlas Powered Ascender
• One of NASCAR champion Jeff Gordon’s replica racecars, courtesy of DuPont
• Former Space Shuttle Columbia astronaut Dr. Roger Crouch
• Appearances by stars of the PBS Kids TV show ZOOM
• A model of one of NASA’s Mars Exploration Rovers
• A Blind Driver Challenge simulator from the National Federation of the Blind
USA Science & Engineering Festival (6):

The USA Science & Engineering Festival is a national grassroots effort to advance STEM education and inspire the next generation of scientists and engineers. Our exhibitors, performers, speakers, partners, sponsors and advisors are a who-is-who of science and engineering in the United States: from major academic centers and leading research institutes and government agencies to cutting-edge high tech companies, museums and community organizations.

U.S. News STEM Solutions (7):

As students, teachers, job seekers and employers alike can attest, growing interest in STEM is providing renewed energy to communities across the nation. At the very heart of this critical movement is U.S. News STEM Solutions. Now in its fifth year, the National Leadership Conference brought together the brightest minds in business, academia and government not only to contribute key insights to the nationwide STEM debate; but also to ensure that STEM’s hard-won momentum is channeled into practical, self-sustaining strategies for inspiring, educating and hiring the diverse STEM workforce of tomorrow.

Organization Based Events

There are also several examples of organization sponsored/hosted K-12 events including:

- ANS: Nuclear Art
- SWE: Invent it, Build it
- SAE: Engineering Design Challenge
- ECAN: Straw Bridge

K-12 Clubs and Memberships

Of the 15 organizations, two organizations provided K-12 Clubs: ASCE and SWE. ASCE has incorporated high school clubs into normal organizational activities and actually tracks the success of the club by evaluating the percent of high school student members that eventually end up as civil engineering majors in college. The rate of club member to civil engineering major was provided by ASCE to be approximately 40%. SWE has developed ‘SWE Next’ and it is an official membership level within the organization. Creating a high school club level allows SWE to track members from K-12 to full membership. However, SWE did not have any membership transition statistics available. In addition to ASCE and SWE K-12 level clubs, AIAA and SWE offer official teacher membership that offer monthly periodicals and resources directly from the respective organizations.
One of the questions specifically targeted the organizations strategic thinking and programming for K-12 outreach. This included determining if K-12 Outreach was part of the formal strategic planning document and if any formal committees existing to facilitate K-12 Outreach. Of the 15 organizations, 7 indicated that K-12 was in their organizations formal strategic plan (see Figure 5). However, this may be an inflated number as the results might be skewed for fear of appearance – twisting existing language in the strategic plan to fit a K-12 Outreach description. If a positive indication was given it was recorded as positive.

![K-12 Language in Strategic Plan](image)

**Figure 5. Organizations Having K-12 Outreach in Their Formal Strategic Plan.**

In addition to requesting information on strategic planning, participants were asked to affirm any formal standing committees related to K-12 Outreach. Out of the 15 organizations, 6 indicated that their organization has a standing K-12 committee or subcommittee including these examples:

- AIAA - STEM K-12
- ECAN - Sustainable Profession Committee
- IEEE - K-12 Subcommittee of Education Committee
- SAME - STEM Committee - National Level Committee
- SAE - Pre-College Education Committee

**Quantifying the Benefits of K-12 Outreach**

Another targeted area for the interviews was the determination of quantifiable benefits for K-12 Outreach. The request was not intended for specific metrics of success or failure but to determine potential ways to track K-12 outreach. In response to this request the organizations provided the many ways they quantified their K-12 outreach initiatives including:
Speaker Requests

The last interview question inquired about each organization’s method for responding to speaker request related to K-12 events, such as school related job and science fairs. In all but one case, the organization handled speaker requests in an ‘ad hoc’ manner, usually passing information down to the corresponding state and local chapter. However, one organization had develop a map available on their website with contact information for local section representative (see Figure 6).

Figure 6. ANS Local Section Map (8)

Secret Shopper Exercise Results

A series of phone calls were placed to the Headquarters office of ITE:

1. First Call (03/21) to Main Number
a. Left Message which was not returned prior to Nashville Meeting

2. Second Call (03/25)
   a. Left Message which was not returned prior to Nashville Meeting

3. Third Call (03/31) to Marianne Saglam Ext. 123
   a. No message left.

This was presented at the Nashville meeting in early April. After presenting this, another LITE participant and employee of ITE Headquarters indicated that she was aware of the call. The spouse of the A-Team member did later receive a call from headquarters.

Study Conclusions

It can be concluded that there is a potential organizational benefit to K-12 outreach. It is the recommendation of the A-Team regarding potential K-12 action, that a framework be developed with target goals for short, intermediate and long term intervals. It is also recommended that any K-12 outreach actions be in line with the strategic vision of ITE and if necessary the strategic plan be revised to include direct K-12 outreach goals for the betterment and growth of the organization.

ACTION PLAN FOR CONSIDERATION

When developing actions for consideration by the ITE leadership two distinct categories emerged including Primary Actions and Secondary Actions. Primary actions should include to actions where ITE is a facilitator and will establishing new organizational programming. Secondary actions include those action recommendation where ITE would play a lead role in improving and enhancing existing programs.

Primary Actions for Consideration (K-12 Outreach)

In some situations where very little has been done in the past, it will be necessary to consider creating new initiatives and programs. This is especially the case for K-12 outreach, if determined to be a benefit to the organization. With any new K-12 initiative, it is our recommendation that the leadership consider most if not all of the following foundation recommendations for a new program:

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

The following are specific examples of potential actions that ITE could initiate for improvement and growth in the K-12 outreach area:
Example Action: Create a K-12 specific section of the ITE web site with resources, games and interactive activities. Include teacher and parent resources. Develop handout/marketing materials for distribution at the Section, Districts and Student Chapters levels.

Example Action: Create a pre-university membership level and K-12 transportation club structure (similar to 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.

Example Action: Develop a K-12 website in partnership with WTS International, ITS America, and ASCE (could replace direct content on ITE website).

Example Action: 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.

Example Action: Team with the Boy Scouts of America and Girl Scouts of America to develop and ITE sponsored merit badge and teach traffic safety at the national jamboree.

Example Action: Develop car bingo phone/tablet app in multiple languages sponsored by ITE.

Example Action: Develop a worldwide (Pokémon Go Style) sign game app that would allow all ITE members and nonmembers to collect the signs of the world.

**Secondary Actions for Consideration (University Student Chapters)**

When developing potential secondary action for consideration by the ITE leadership, the A-Team utilized those findings from the information gathered through survey or interviews.

**Announce Funding Opportunities for Chapter Activities**

Since ITE and its districts and chapters are already strapped for money, we believe there is an opportunity to share fundraising opportunities and ideas with the student chapters, as many of them do not appear to think of doing those types of activities. Some schools are doing great things (sponsorships, BBQ/bake sales, grants from the university, traffic counts for consultants, etc.), but others are doing very little, so it would be advantageous to share that knowledge amongst the chapters, or at the very least, their advisors.

**Improve Marketing of Existing Scholarships**

Our team was shocked at the number of survey respondents who indicated that they were not even aware of scholarship opportunities available to them. Also surprising was that many students said they thought that additional scholarships would be a good way to get students involved in or aware of ITE. Given that many of them do not know that there are already
scholarship programs available at multiple ITE levels, it seems like marketing and promoting these opportunities is the key to increasing awareness about ITE and what the organization can do for students.

*Improve Advisor Coordination*

ITE should update the current list of advisors and have more regular communication with them or have liaison section advisors to student chapters. In contacting all professors affiliated with student chapters, we discovered that the current list of contacts that ITE provided is quite out of date. Some professors have moved on from ITE or the universities all together. We have updated the professor contact list which is available in Appendix D.

*Provide Student Chapter Forum*

As with the ITE Community, a new group should be made available to the student chapters for sharing ideas. It should not count as one of the groups students can join since it will be only for students and student advisors. This will allow the student chapters to share ideas, seek advice and keep up with each other beyond meetings and competitions.

*Expand Student Leadership Summit*

For the past 3 years, the Western District has been hosting a successful leadership summit for student members. The event is typically over a weekend and is hosted by a university student chapter of ITE reducing the cost significantly to around $50 for the entire weekend including food. ITE could expand this event to other Districts.

There are presentations from leading professionals in the industry as well as leadership workshops and fun transportation engineering-related activities. Conference modules include Professional Leadership, Engineering Ethics, Emerging Technologies, and Networking Opportunities.

It is our recommendation that International ITE help facilitate the summit spreading to other districts. Midwestern District will be holding their first summit in a few months and Texas District has expressed interest in holding a summit. It is encouraged that student chapters interested in hosting attend a leadership summit prior to holding one to become familiar with how a successful summit should be hosted. We believe that International ITE can play a key role in facilitating these student leadership summits that are geographically close and therefore very accessible (usually driving distance from one’s university). These summits are very affordable and therefore more students can attend and enjoy the many benefits of such events.
Reevaluate Competition Opportunities

ITE should reevaluate traffic bowl and international sponsored events, maybe adding in some type of practical design competition.

As part of surveying efforts to develop a baseline for ITE and its current student engagement activities, several of the questions to both students and the professors alike focused on the current structure of the traffic bowl as ITE’s main competition. Survey participants were also surveyed on whether other such friendly competitions should be implemented at the International level to bolster student activity and engagement.

In terms of the traffic bowl, only half of all respondents to the student survey reported that their student chapter participated in the traffic bowl, which is rather underwhelming. One respondent even stated, “I do not know what traffic bowl means.” When asked what changes they would make, if any, to the traffic bowl format, the consensus indicated the following:

- Better marketing.
- Make it more inclusive, particularity for undergraduate or first-time 27+ students to participate.
- Institute a consistent 2 rounds of play at all levels.
- Take less focus off the buzzer.
- Consider a how-to guide, preparation guide, or what to study so all have a fair chance; possibly including a free platform for students to practice with in advance.
- Consistently applied rules, maybe a formal set needs to be established.

Because of the history of the traffic bowl and it being unique to ITE’s history, changing to broaden the scope to accommodate all is impractical and detrimental to the energy it generates. Rather, ITE should focus on creating other activities or competition that allow for more student interaction and engagement, especially amongst the groups who may not have the competitive advantage in the traffic bowl. When asked what ITE can do to attract more students and keep students interested, over 40% responded to add a design competition. This was further clarified with a question specific to getting more undergraduate students interested, since this appeared to be the decision point when most move into transportation and get involved in ITE (as this group has felt rather excluded from the traffic bowl), which is often dominated by graduate students. The general sentiment as it related to the type of design competition was as follows:

- It should reflect a real world problem that people in the industry face since the goal of most students is to get a job.
- Mimic a design charrette, allowing for new innovative ideas possibly with a real world project.
Hands on project building off what others are doing (e.g. ASCE Steel bridge/concrete canoe design completions, MCAA Student Chapter Competition that challenges students’ professionals’ skills and knowledge with a real RFP).
- There shouldn’t be an intensive software or technical “barrier to entry”.
- Raising public awareness about transportation.
- Have some sort of financial incentive to win and recognition at the annual meeting.

**Consider International Student Advisory Board**

Students indicated they would like more interaction with ITE leadership and the possibility of electing a student advisory board at the International level made up of students. There seems to be a vacuum between the international level and student chapters. As student interests and needs change, the international level should be able adjust in a leadership level to assist the district and section levels. One way this could be completed would be to form a student advisory board that could meet with the international board once a year minimum. This could be accomplished by each district having a student representative that works with their professional counterpart.

International board of directors should also support the forming of student advisory boards within each district and section. It would be the responsibility of the districts and sections for monetary support of the students forming the advisory boards to ensure participation.

**Additional Focus on Networking and Job Opportunities**

ITE should consider refocusing the understood value of ITE (to students) on professional networking and job opportunities. When asked about the value of ITE to students, the overwhelming response was for the networking potential with industry professionals and the ability to seek out a job. Nearly 50% of students noted this as their #1 reason for joining, more than those who joined simply to learn more about transportation, or because it was recommended by an advisor, professor, family, or friend. As noted previously in the benchmarking section, many current students find difficulty in justifying the value in the escalating costs associated with ITE activities. It’s not the student dues structure that is the issue, it’s the cost associated with being able to attend section, district, and international level meetings and events. While most professional members have the ability to garner employer support for such events, students have limited opportunities and are faced with barriers to raising their own funds. Establishing a more cost-effective way to have students attend such events, whether sponsored from the corporate level or within ITE itself, provides students with the ability to take advantage of such opportunities. Another approach would be offering more networking style or mentorship events where students have the ability to seek out professional relationships external of the rigidity of a presentation. This forum offers the added value the students are seeking from ITE and thus they may be willing to justify the costs associated due to the potential for return on their investment.
Instilling the value of ITE in students early on is very important to the long-term stability and continued growth of the ITE organization and its desire to retain these students once they graduate. ITE’s current efforts on this front need to be enhanced so that targeted campaigns can be put into place to increase the conversion rate from students to full members which currently stands at 25%. When current student members of ITE were asked about their willingness to join ITE and pay for their membership post-graduation, the consensus response was “somewhat likely,” - very lackluster to say the least. The written responses were much more telling and summed up simply by “too expensive.” Considering that ITE has recently implemented a reduced dues structure for young professionals, it was interesting to still find this sentiment. It led to the revelations through student responses such as “make it a bit easier to learn about ITE, what it does, and what it provides,” that ITE is not effective conveying its value to students, which is translated to their indecision when it comes to becoming a full member, somewhat independent of the cost associated.

Establish Student-to-Full Member Conversion Metric

ITE should increase its focus and understanding of the conversion rate from students to fulltime member. It is our understanding that the tracking of student to professional memberships has only been done for the past couple of years, so it is difficult predict future trends. However, based on the results of our student survey, it appears that many members are shifting their focus toward ASCE or ITS Americas after they graduate. The survey also indicated that 38% percent of students do not belong to any organization other than ITE. If ITE could capture those students and convert them to full time members, that would be a pretty significant contingency. It seems that the major hurdle for students now is that the cost of joining ITE, at least at an international level, is too expensive once they graduate. Several members of our Leadership ITE class joined their local section chapters prior to joining International ITE. Often times the local chapter dues are much lower than International dues. Guiding students toward this option, where available, may be a good way to convert them to full-time ITE members in the long term. This would be a great way to introduce students to the organization while giving them a chance to gradually work their way up to involvement at a national and international level.

Proactively Seek Partnerships with Other Organizations

In an arena where ITE is competing with many other student organizations, the focus should be more on partnerships with other organizations and co-sponsorship opportunities rather than being in individual silos. It’s more about the exposure and marketing to a larger audience rather than competition for a dedicated few. Over 60% of students responded that they are members of one or more other student organizations (most notably SWE, ASCE, EWB among a host of 30 others mentioned in the survey), which means they can only commit so much time to each. While students should be encouraged to participate in multiple organizations, rather than just one, the ability to have more student engagement comes through collaboration. Seeing the highest amount of student membership overlap is with ASCE, why not encourage more student
chapters to have some joint meetings with a common speaker on a transportation topic. Some student chapters actively engage in these joint meetings already and have noted the value in both increasing their membership as well as meeting attendance and overall chapter awareness. Or maybe ITE can partner with ASCE at the international level to develop a transportation-themed design competition open to student members of both organizations. These partnership opportunities also allow for the burden of cost to be shared collectively and the potential to reduce or eliminate the costs passed along to students. The name of the game for ITE at this career stage is exposure and brand recognition that will stay with students beyond their academic studies and become part of their professional life; recognizing ITE’s true value and identifying with it.

Strategic Planning Alignment

In team discussion it was determined that alignment with the current strategic plan was of the utmost importance to afford the leadership leverage in acting on the recommendations of this project. In reading the 2014 strategic plan three goals and corresponding objective were found that align (see Table 3) the most with student activities including:

1. Goal for Professional Knowledge - [Students] will view ITE as the premier source for global transportation information, insight and solutions tailored to their needs.
   1.1. Objective 1: Increase accessibility to timely, accurate, relevant and well organized information gathered from around the world.
   1.2. Objective 2: Increase awareness of the relevance and range of ITE’s information to target groups.

2. Goal for The Profession - The profession will be recognized for technical excellence in meeting transportation needs.
   2.1. Objective 1: Attract students to the transportation profession as an opportunity to make a positive contribution to the world.
   2.2. Objective 2: Increase student awareness of transportation career opportunities.
   2.3. Objective 3: Increase ITE’s capacity to provide training and access to information.
   2.4. Objective 4: Promote ITE benefits and resources to current and potential student members and chapters.

3. Goal for Collaboration among Transportation Related Professional Organizations - Collegial and collaborative environment that advances technical knowledge, provides opportunities for workforce development and creates forums for global information exchange.
   3.1. Objective 1: Increase meaningful and appropriate communications with related member groups.
   3.2. Objective 2: Increase collaboration within the global community and other diverse groups.
   3.3. Objective 3: Collaboration with professional organizations with an interest in transportation
Table 3. Summary of Action Alignment with Strategic Planning Objectives

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<th>Strategic Planning Objectives</th>
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<td>Encourage K-12 Institutions to Participate</td>
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<td>Partner with Other Organizations for K-12 Activities</td>
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CONCLUSIONS

With the continuing desire to sustain and/or grow current membership numbers, the future of our profession and organization, students, should be on the minds of every leader of ITE. It can be assumed that with the exception of lapsed members, university and K-12 students represent the demographic most likely to produce the future generations of ITE members and or student-to-full membership conversions.

University Student Chapters

It is evident from the findings of this investigation that ITE can vastly improve coordination and communication with its existing Student Chapters. The most prominent example of a communication gap can be found in ITE marketing of scholarships. Additional coordination with student chapters can also provide updated advisor information – some being more than five years out of date. Student participants also showed a desire to network with
professionals and interact with ITE leadership. Bringing student and the future of ITE to the table in the form of an advisory board could build trust and recognition of value to student members. Lastly, in order to retain student members and increase student-to-full member conversions, ITE must provide value to students when they are students, through opportunities for networking and career growth. It will also be very important to track student-to-full member conversion to be confident ITE is continuing to provide enough value to young professionals as they grow with the organization.

The K-12 Opportunity

A significant opportunity exists in creating an initiative for outreach to K-12 students. Currently ITE does not conduct any significant K-12 outreach. However, when investigating other national engineering and technical organizations, K-12 outreach was found to be not only prevalent but used as a strategy for sustainability within the respective organization and corresponding field of engineering. An initiative could start small by simply creating web content for students and teachers and build over time. Some international organizations have created high school clubs and high school membership levels allowing them to track students from high school to full membership. Other professional organizations are leveraging K-12 outreach activities for growth and awareness – ITE should strongly consider doing the same. It is also recommended that consideration for this opportunity be reflected in strategic planning efforts by creating a K-12 committee and or placing targeted objectives in a revised strategic plan.

The ITE of the Future

The -A-Team understands that at the same time we were undertaking this study and development of recommended actions that ITE has already begun to invest energy into student activities by adding staff at headquarters having student member responsibilities. As a team project we can only hope that the leadership of ITE will review our work and seriously consider the proposed recommended actions.

It was not long ago we were students ourselves. Somewhere out there right now there is a student considering ITE. We must continue to utilize opportunities such as LeadershipITE to learn and understand what that student values and what ITE can do to help him/her become a future leader in our profession.
REFERENCES