Evaluation of 2011 Velocity Prep Programs

In 2001, Skillpoint Alliance began hosting Velocity Prep programs, in which groups of approximately twenty high school students form consulting companies and research, plan, and develop specific project deliverables to address clients' real-world problems. Students are paid a stipend for their work and, at the end of four weeks, present their deliverables to their clients. In June 2011, seventeen students from Del Valle High School participated in ROBOTech Velocity Prep, in which they worked to develop robots for disaster relief missions on behalf of the University of Texas at Austin Mechanical Engineering Department. From late July through early August 2011, twenty students from Eastside Memorial Green Tech participated in GREENTech Velocity Prep, in which they worked to develop energy solutions for the Texas Colonias on behalf of the Texas Engineering Experiment Station (TEES). On the first and final days of the program, Skillpoint Alliance asked Velocity Prep participants to complete pre- and post-program surveys.

> This program was very helpful. I wanted to see if I really wanted to pursue a career in engineering. I was afraid when a person told us we would be working with other people most of the time. I like to be by myself. But finishing this program made me feel like I can deal with people. I really hope this program expands and reaches many people. I am only sad that I will not be able to participate next year.
> - ROBOTech rising senior

Background Information on Velocity Prep Participants

The majority of 2011 Velocity Prep participants were African-American or Hispanic and low-income. Over four out of five ROBOTech participants (82.4 percent) indicated that no one in their households had earned any degree or certification above a high school diploma. A slight majority of GREENTech participants (55.0 percent) also reported that no one in their households had earned any degree above a high school diploma.

Table 1: Velocity Prep Participants' Demographic Information

	ROBOTech Participants	GREENTech Participants
Total Enrollment	17	20
African American	5.9%	60.0%
Hispanic	76.5%	40.0%
White	17.6%	0.0%
Economically Disadvantaged	70.6%	75.0%

Table 2: Educational Attainment of Velocity Prep Participants' Household Members

	ROBOTech Participants' Household Members	GREENTech Participants' Household Members
Less than 9th Grade	11.8%	25.0%
Some HS, No Diploma	11.8%	0.0%
HS Diploma or GED	58.8%	30.0%
Technical Certificate	0.0%	5.0%
Associate's Degree	5.9%	15.0%
Bachelor's Degree	11.8%	20.0%
Graduate Degree	0.0%	5.0%

All Velocity Prep participants identified themselves as rising eleventh or twelfth graders. A majority of ROBOTech participants reported themselves as "bubble students" in math, science, and English/Language Arts courses, which means that they earned either Bs or Cs in their most recent of these courses. The most (75.0 percent) reported earning Bs or Cs in English/Language Arts, while 68.8 percent and 50.0 percent of participants earned Bs or Cs in math and science, respectively. GREENTech participants reported slightly higher overall grades; only 40 percent reported having Bs or Cs in science, math, and English/Language Arts.

Velocity Prep Impacts on Participants' High School Plans

- While the change was statistically insignificant, two out of the three GREENTech participants who at the beginning of Velocity Prep planned to graduate on the Minimum High School Diploma Program reported at the end of the program that they now planned to graduate on at least the Recommended High School

Program.[1] However, all Velocity Prep participants were uncertain about graduation requirements for any of the diploma programs.

- ROBOTech participants reported a significant increase in the likelihood that they would take engineering courses in high school.
- GREENTech participants reported significant increases in both the likelihood that they would take extra science courses in high school and the likelihood that they would take extra math courses in high school.

Velocity Prep Impacts on Participants' Postsecondary Plans

- Participants in both Velocity Prep programs reported increased interests in trade and technical schools: the proportion of ROBOTech participants who expressed interest in trade or technical schools increased from 47.1 to 58.8 percent, and the proportion of GREENTech participants who expressed interest in trade or technical schools increased from 60.0 to 70.0 percent.
- While the proportion of GREENTech participants who reported interest in two-year community colleges increased from 70.0 to 80.0 percent, the proportion of ROBOTech participants interested in two-year community colleges decreased from 82.4 to 76.5 percent. The participants reporting decreases in their interests in two-year community colleges reported being "highly likely" to enroll in four-year colleges.
- The proportion of ROBOTech and GREENTech participants who expressed interest in four-year colleges or universities remained static, but the proportion of ROBOTech participants who were "highly likely" to enroll at four-year schools increased from 52.9 to 70.6 percent.

> Working in small companies, I got a taste of what the real world was like. It was hard but overall I feel like a better, harder worker.
> - GREENTech rising senior

Velocity Prep Impacts on Participants' Interest in STEM Careers

- The proportions of ROBOTech and GREENTech participants who named engineering as one of their top three career choices increased significantly from the pre-program to the post-program survey: the proportion of ROBOTech participants increased from 35.3 percent to 70.6 percent, and the proportion of GREENTech participants increased from 25.0 percent to 55.0 percent.
- The proportion of ROBOTech participants who named a specific type of engineering (i.e. chemical engineering) as one of their top three career choices increased from 17.6 percent to 41.2 percent.[2]

Velocity Prep Impacts on Participants' Knowledge of STEM Careers

- ROBOTech participants reported statistically significant increases in their levels of STEM career awareness, defined as their knowledge of what STEM careers were and what STEM professionals did at work.
- GREENTech participants reported statistically significant increases in their levels of awareness about the STEM job market, defined as their knowledge about STEM employment and salary levels.

Velocity Prep Impacts on Participants' Skills and Abilities

- Increases in proportions of GREENTech participants who reported that they were capable of completing electrical engineering projects, writing business plans, and completing wiring projects were significant.
- ROBOTech participants reported significant increases in their proficiencies with LabVIEW and Microsoft Excel software programs.
- GREENTech participants reported significant increases in their proficiencies with Google SketchUp, a computer-assisted design software program, and in their abilities to use Microsoft Excel to create graphs and charts and work on budgeting.
- ROBOTech participants reported significant increases in their perceptions of their academic preparedness for postsecondary school.

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[1] Any references to results as significant throughout this report refer to results being statistically significant at the 90 percent confidence level or greater. Results not described as significant were statistically insignificant below that level. However, results should not be taken as definitive program impacts because sample sizes were small and a control group was lacking.

[2] Answers to this question may be more subject to response bias; some participants may have chosen top three careers that they thought program administrators wanted them to report. However, several participants reported the same careers on the pre-program and post-program surveys. This indicates that participants did not necessarily feel pressured to provide answers that they thought program administrators would like.

Evaluation of ROBOTech Velocity Prep 2011

Introduction

For ROBOTech Velocity Prep 2011, seventeen students from Del Valle High School worked as a consulting company for Dr. Benito Fernández at the UT-Austin Mechanical Engineering Department to develop robots for disaster relief missions. Participants were assisted by a college mentor, a mechanical engineering undergraduate student, and a facilitator, a graduate student in project-based science, technology, engineering, and math [STEM] education. The college mentor and facilitator were asked to help participants connect with other sources of information, serve as contact points between participants and the client, and help students understand and navigate the project.

Participants worked out of a Del Valle High School classroom as well as Skillpoint Alliance's Mobile Learning Center, a trailer set up as a fully functional computer lab with Wi-Fi, heating and air conditioning, instructional monitors, and handicap accessibility. At the beginning of the program, they created professional email accounts and installed and familiarized themselves with various software programs, including Dropbox, Solid Works, and LabVIEW. They also created two companies and set up internal management structures, including appointing two CEOs to lead their companies. Participants researched ideas and made three site visits to National Instruments, the UT-Austin Mechanical Engineering Department, and Star Flight, which provides aerial emergency medical service. In addition to stipend payments, participants received bonuses based on evaluations given by their team members and by the college mentor and program facilitator. On the final day of the program, participants returned to UT-Austin to present their final deliverables, including fully functional robot prototypes, to their client.

> This program was very helpful. I wanted to see if I really wanted to pursue a career in engineering. I was afraid when a person told us we would be working with other people most of the time. I like to be by myself. But finishing this program made me feel like I can deal with people. I really hope this program expands and reaches many people. I am only sad that I will not be able to participate next year.
>
> -Rising female senior

On the first and second days of the program, Skillpoint Alliance asked students to complete pre-program surveys in order to gather demographic and contact information, ascertain students' future high school, postsecondary, and career plans, assess students' attitudes about science, technology, engineering, and math [STEM] and STEM careers, and determine students' motivations, goals, and concerns for participation in the ROBOTech program. On the final day of the program, Skillpoint Alliance asked students to complete post-program surveys to determine program impacts. Results from these surveys were analyzed using a variety of techniques, including significance tests, and are reported in the remainder of this chapter. Any references to results as significant throughout this report refer to results being statistically significant at the 90 percent confidence level or greater. Results not described as significant were statistically insignificant below that level.

Although significance test results are presented in this report, these results should not be taken as definitive program impacts. First, all student data was self-reported. Therefore, some students may have answered questions differently on a post-program survey in order to please program administrators. Skillpoint Alliance has requested follow-up administrative data on participants' future academic outcomes that will reduce this problem. Second, surveys could not be given to a control group of students, students who were very similar to ROBOTech participants but had not participated in the program. Including a control group of students in this evaluation would determine which results were effects of the program and which were effects of some other factor. Skillpoint Alliance has also requested data on academic outcomes of a control group of students. Third, although data will continued to be gathered in future years, currently, the number of participants in each program was very small, which increase the likelihood that any statistical significance results would not be generalizable to a larger group.

Demographic Information on ROBOTech Velocity Prep Students

The Del Valle Independent School District (DVISD) is a suburban school district within the Austin metropolitan area. DVISD serves a primarily Hispanic, low-income student population. As shown in Table 1A below, demographic information for ROBOTech participants matched closely with demographic information for the Del Valle Independent School District (DVISD) and Del Valle High School. Notably, 58.8 percent of participants were

female, an increase from ROBOTech Velocity Prep programs of previous years; program staff designed the 2011 ROBOTech project, which required participants to create a disaster relief robot, to appeal more strongly to female students. Over three quarters (76.5 percent) identified themselves as Hispanic/Latino, which is similar to the proportion of Hispanic/Latino students at Del Valle High School (72.9 percent). However, ROBOTech had lower proportions of African-American students than what would be representative of Del Valle High School, as opposed to GREENTech, which recruited higher proportions of African-American students than would be representative of Eastside Memorial Green Tech High School. A majority of ROBOTech participants (70.6 percent) reported that someone in their household was currently receiving free or reduced price lunch, a proxy measure for economic disadvantage. This number is similar to the 74.5 percent of Del Valle High School students who receive free or reduced price lunch. A majority of participants (58.8 percent) additionally identified themselves as rising juniors, while the others were rising seniors.

Table 1A: ROBOTech Velocity Prep Demographic Comparisons

	ROBOTech Participants	Del Valle High School[1]	Del Valle ISD[1]
Total Enrollment	17	2,127	10,032
African American	5.9%	17.0%	11.9%
Hispanic	76.5%	72.9%	80.1%
White	17.6%	8.8%	7.0%
Asian/Pacific Islander	0.0%	0.9%	0.8%
Native American	0.0%	0.4%	0.3%
Economically Disadvantaged	70.6%	74.5%	85.0%

Additionally, as can be seen in Table 2A below, the majority of ROBOTech participants came from households in which the highest level of educational attainment among members was a high school diploma or general equivalency diploma (GED). The vast majority of participants (82.4 percent) reported that no one in their households had earned any type of postsecondary certification or degree. Data from the American Community Survey suggests that the adult members of ROBOTech participants' households have similar educational attainment to the Del Valle ISD community, in which 78.7 percent of residents over age twenty-five have less than an Associate's degree. Both of these results contrast sharply with educational attainment among adults over age twenty-five in the Austin-Round Rock MSA, in which recent data suggests that nearly half of all adults over age twenty-five (44.9 percent) hold at least an Associate's degree.

Table 2A: ROBOTech Velocity Prep Educational Attainment Comparisons

	ROBOTech Participants' Household Members	Del Valle ISD – Population 25 and Over[2]	Austin-Round Rock MSA – Population 25 and Over[2]
Less than 9th Grade	11.8%	15.3%	7.0%
Some HS, No Diploma	11.8%	12.9%	6.7%
HS Diploma or GED	58.8%	29.7%	20.4%
Some College, No Degree	N/A	20.8%	21.0%
Associate's Degree	5.9%	4.5%	6.2%
Bachelor's Degree	11.8%	11.7%	25.6%
Graduate Degree	0.0%	5.0%	13.1%

Impacts of ROBOTech Velocity Prep on High School Goals

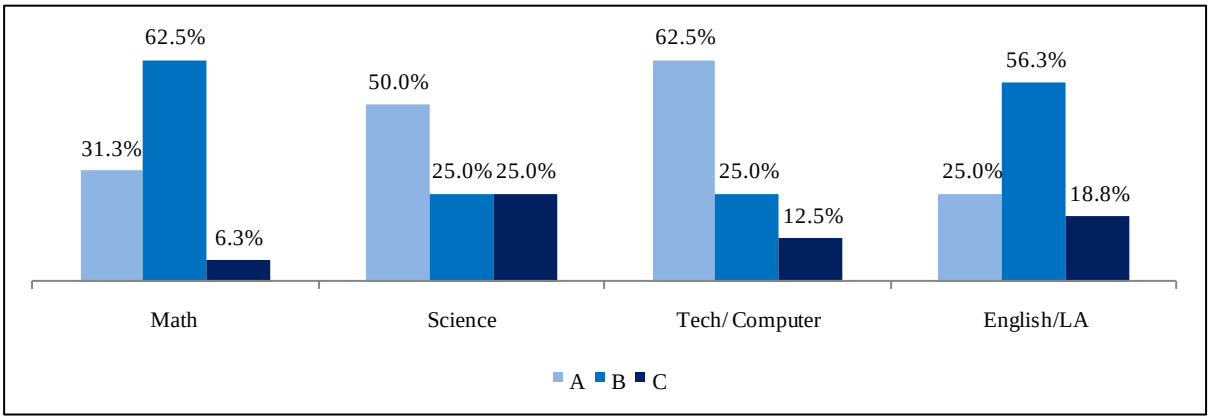
Although some ROBOTech Velocity Prep participants reported high grades, group grade point averages for math, science, English, and computer and technology courses fell solidly into B to B plus ranges. As can be seen in Figure 1A below, over two-thirds (68.8 percent) of ROBOTech participants reported receiving Bs or Cs in their most recent math classes, and three-quarters of participants (75.0 percent) reported earning Bs or Cs in their most recent English or Language Arts classes. Additionally, half reported receiving Bs or Cs in their most recent science classes. Although data from student records confirming students' self-reported grades were not available at the time of the

[1] Campus-level and district-level data from 2009-2010 TEA Academic Excellence Indicator System (AEIS) Campus Profile (http://ritter.tea.state.tx.us/cgi/sas/broker)

[2] Educational attainment data for Del Valle ISD and Austin-Round Rock MSA populations 25 and over from U.S. Census Bureau, 2005-2009 American Community Survey (http://factfinder.census.gov).

writing of this report, that data, as well as data on students' grades for the next school year, will be available to future evaluators. One particular point of interest will be ROBOTech participants' future science and math grades.

Figure 1A: ROBOTech Velocity Prep Participants' Most Recent Grades



Although the final impacts of ROBOTech on participants' high school grades and course enrollment are unknown, participants' survey responses indicate that the program impacted their interest in STEM courses and work ethic in high school. When asked on the post-program survey if their participation in ROBOTech had made them decide to work harder in school, 88.2 percent answered that the program influenced them "moderately" or "a great deal" in this direction. 64.7 percent of participants also indicated that their participation in ROBOTech led them to enroll in different classes in school "moderately" or "a great deal." Additionally, a comparative analysis of ROBOTech participants' pre- and post-program survey ratings of their likelihoods of enrolling in STEM courses indicates that ROBOTech participants are significantly more likely to enroll in engineering high school courses. Participants were asked to indicate the likelihood that they would enroll in extra math or science courses, beyond requirements for the Minimum High School Diploma Program, or any engineering or technology courses on a nine-point scale. On this scale, nine represented "very likely" to enroll, while one represented "not at all likely." Results, shown in Table 3A below, indicate that the ROBOTech program had positive impacts on participants' desires to enroll in extra science and math courses but made the greatest impacts on the likelihoods that participants would enroll in engineering courses. In contrast, GREENTech participants reported nearly opposite results; part of this difference might be explained by the ROBOTech program focusing more intently on engineering.

> You need those [STEM] courses to go on in life.
> -Rising female junior

Table 3A: Likelihood ROBOTech Velocity Prep Participants Will Take HS STEM Courses (9-point scale)

	Pre-Program Survey Mean	Post-Program Survey Mean	Average Change Per Participant
Extra Science Courses	6.12	6.59	0.47
Extra Math Courses	6.24	6.82	0.59
Computer and/or Technology Courses	6.71	6.41	-0.29
Engineering Courses	5.53	6.18	0.65

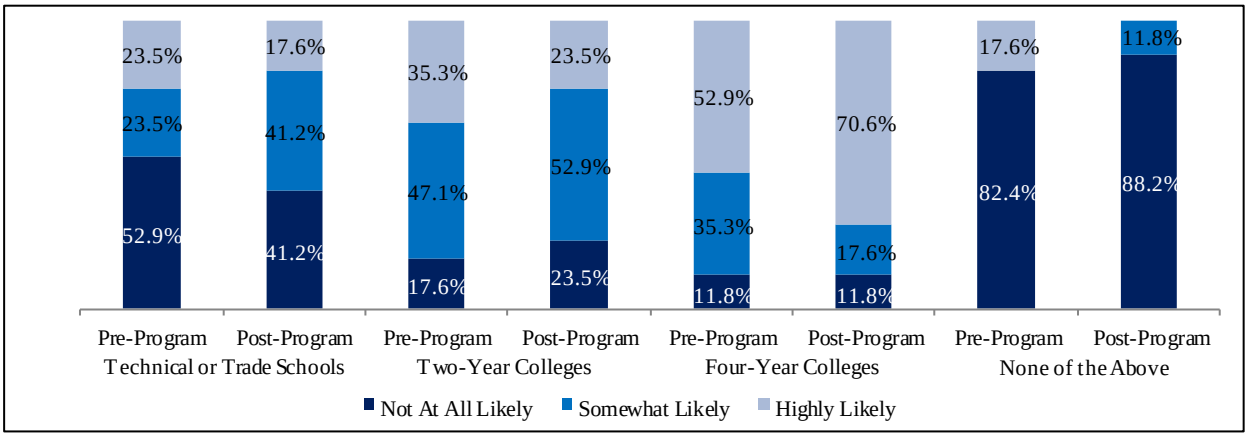
All of the participants reported that they plan to graduate on the Recommended or Distinguished Achievement High School Programs on both the pre-program and post-program survey, and only one student switched her planned diploma program from the Distinguished Achievement to the Recommended High School Program. Despite these responses, participants seemed somewhat unsure of the requirements for various high school diploma programs: when asked how likely they were to take extra science and math classes beyond requirements for the minimum high school program, fewer than one-third of participants indicated on the pre-program survey that they were "very likely" to do so.

Impacts of ROBOTech Velocity Prep on Postsecondary Plans

Although the majority of participants indicated that they expected to pursue postsecondary education on the pre-program survey, after completing the program, participants expressed stronger intentions to pursue postsecondary education and increased interest both in four-year colleges and technical schools. As shown below in Figure 1B, on the pre-program survey, 47.1 percent of participants reported that they were "somewhat likely" or "highly likely" to enroll at technical or trade schools following their high school graduations. On the post-program survey, 58.8 percent of participants reported that they were "somewhat likely" or "highly likely" to enroll at technical or trade schools.

On the pre-program survey, 88.2 percent of participants reported that they were "somewhat likely" or "highly likely" to enroll at four-year colleges or universities. However, only 52.9 percent reported that they were "highly likely" to enroll at four-year schools. On the post-program survey, 88.2 percent of participants again reported that they were either "somewhat" or "highly likely" to enroll at four-year institutions, but the percentage reporting that they were "highly likely" to do so increased by one-third to 70.6 percent. These results differ almost exactly from that of the GREENTech program, in which a large proportion of participants reported decreases from "highly likely" to "somewhat likely" that they would enroll in four-year colleges and universities. This may be partially a result of ROBOTech participants interacting to a greater extent with personnel at a four-year college or of ROBOTech site visit speakers and guest speakers greater emphasizing careers that require four-year college diplomas. However, ROBOTech participants also began the program with a relatively low number (52.9 percent) indicating that they were "highly likely" to continue on to a four-year college or university.

Figure 1B: ROBOTech Participants' Likelihoods of Enrolling in Postsecondary Education



ROBOTech may also have influenced students who were not considering enrolling in postsecondary education immediately following high school to look again at various types of postsecondary schools. On the pre-program survey, 17.6 percent of participants indicated that they were "highly likely" not to enroll at any postsecondary institution immediately following high school; on the post-program survey, only 11.8 percent of participants reported that they were "somewhat likely" not to enroll in any postsecondary education immediately.

Interestingly, the percent of participants interested in two-year community colleges decreased from 82.4 percent of participants reporting that they were "somewhat" or "highly likely" to enroll in community colleges on the pre-program survey to 76.5 percent of participants reporting that they were "somewhat" or "highly likely" to enroll in community colleges on the post-program survey. This may be a result of participants' increased interests in technical or trade schools and four-year institutions. Indeed, all of the participants who reported decreased interests in community colleges answered that they were "highly likely" to enroll at four-year colleges or universities. Although increases in participants' interests in four-year colleges and universities is laudable, research indicates that, while many low-income youth report that they intend to go on to college, these youth frequently do not enroll for a variety of

> [In ROBOTech Velocity Prep] I was able to interact with the engineering environment and just be somewhere where I felt that I belong.
>
> - Rising female junior

reasons, including, prominently, inabilities to afford college educations. [3] Participants should be aware that, even if their eventual goals are Bachelor's degrees, they can take advantage of less expensive options, like community colleges, before attaining four-year degrees.

ROBOTech Velocity Prep Impacts on Interest in STEM and STEM Careers

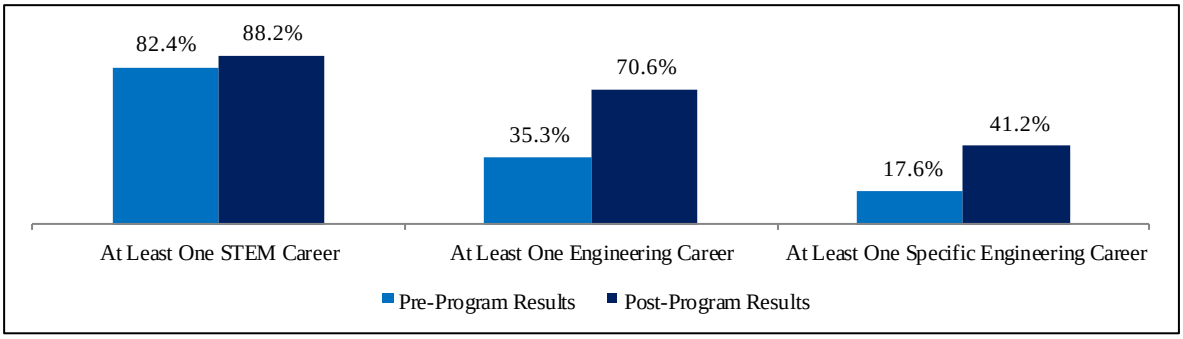
One major goal of Velocity Prep is to interest participants in STEM careers, especially engineering fields, as well as interest students more in STEM courses and activities. Comparisons between pre- and post-program survey results suggest that ROBOTech was particularly successful in encouraging participants to consider engineering careers, as well as interesting participants in additional extracurricular science and technology activities.

ROBOTech participants were asked to name their top three careers on both the pre-program and post-program surveys. Their answers were coded as to whether they named STEM careers, engineering careers, and specific types of engineering careers, and results showing proportions of participants who named various careers on the pre-program and post-program surveys are displayed in Figure 3A below. The vast majority of ROBOTech participants (82.4 percent) named at least one STEM career as one of their top three career choices on the pre-program survey; this number increased slightly to 88.2 percent of post-program survey respondents. About one-third of participants (35.3 percent) named at least one type of engineering career (including "engineer") as one of their top three career choices on the pre-program survey. This number increased significantly from the pre-program to post-program survey, on which 70.6 percent of participants named at least one type of engineering career as a top three career choice. A small number of participants (17.6 percent) named at least one specific type of engineering career (i.e., mechanical engineering) as a top three career choice on the pre-program survey. This number increased by 133 percent from the pre-program to post-program survey to 41.2 percent of participants reporting that at least one of their top career choices was a specific type of engineering.

> I used to think that an engineer is a person that builds houses or really big buildings. Now I am looking into being a biomedical engineer, which to my understanding is a mix of medicine and engineering.
>
> - Rising female junior

While some participants possible named engineering careers on the post-program survey because they believed that program staff wanted them to do so, several participants also commented on their increased interests in engineering in the post-program survey comments. Others remarked that they had learned about additional engineering careers that appealed to them. Notably, several participants who had originally expressed interest in medical careers added biomedical engineering as a top career choice on the post-program survey. Also, in comparison, the same number of GREENTech participants reporting a specific type of engineering career did not change from pre-program to post-program survey; this indicates that ROBOTech participants' greater exposure to engineering careers may have genuinely impacted the types of careers they are considering.

Figure 3A: Changes in ROBOTech Velocity Prep Participants' Top Three Career Choices

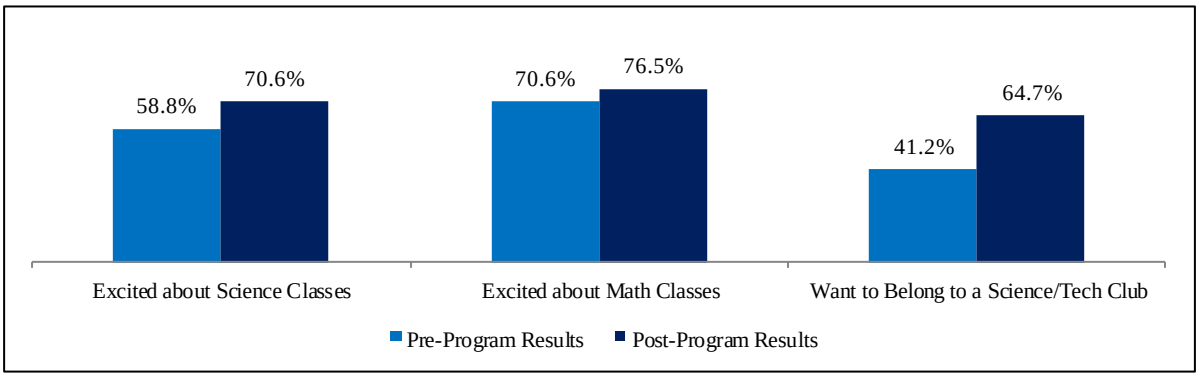


When asked whether their participation in ROBOTech Velocity Prep had increased their interests in studying engineering after high school, 58.8 percent of the participants responded that the program had increased their interest "moderately" or "a great deal." Additionally, a comparison between pre-program and post-program survey

[3] Arnold, Karen, Shezwae Fleming, Mario DeAnda, Benjamin Castleman, and Katherine Lynk Wartman, "The Summer Flood: The Invisible Gap Among Low-Income Students," *Thought & Action*, Fall 2009.

responses to a question about how motivated participants were to pursue a STEM career indicates that ROBOTech sustained most participants' high levels of interest in STEM careers and possibly slightly increased the interest levels of some participants.

Figure 4A: *ROBOTech* Participants' Interests in STEM Courses and Activities (Strongly Agree or Agree)



A majority of ROBOTech participants, 58.8 percent and 70.6 percent respectively, reported high levels of engagement with their science and math classes at the start of the program. Therefore, changes in participants' levels of excitement about their upcoming math and science courses were small, although changes in ROBOTech participants' levels of interest in joining a science or technology club were statistically significant. As can be seen in Figure 4A above, the number of ROBOTech participants who reported some interest in joining a science or technology activities club at the close of the program increased by 57.1 percent from the number interested at the beginning of the program. Despite this large change, high levels of pre-program excitement about math and science courses indicates that ROBOTech participants are already fairly engaged with these courses.

ROBOTech Velocity Prep Impacts on Knowledge of Careers

Another goal of ROBOTech Velocity Prep was to provide participants with additional information about STEM careers. ROBOTech was particularly successful at educating participants about different types of STEM careers and what STEM professionals do at work. Participants' increased abilities to name specific engineering careers are one indicator of participants' increased knowledge of different engineering careers. This success is partially confirmed with results to post-program survey questions. 88.2 percent of participants responded that *ROBOTech* had helped them understand engineering better "moderately" or "a great deal." 88.2 percent of participants also responded that ROBOTech gave them a better understanding of their career goals "moderately" or "a great deal."

The best confirmation of Rotech's impacts on participants' awareness and perceptions of STEM careers comes from a comparison of pre-program and post-program survey responses to a question about this topic. When asked to rate their levels of awareness about STEM careers on a one to five scale, where five represented a high level of awareness, the mean participant response increased significantly from 3.47 to 3.82. ROBOTech was less successful at providing participants with information about the current STEM job market, including information about salaries and where to find jobs; although the mean participant response also increased, the change was small.

> [ROBOTech Velocity Prep] taught me how to work better with people. I normally like working by myself, but this made me break out of my comfort zone. I'm glad it did.
> - Rising female senior

ROBOTech Velocity Prep Impacts on Skills and Abilities

Participants reported gaining a variety of skills from ROBOTech Velocity Prep*;* they particularly emphasized working in groups and giving the formal presentation at the end of the program as important program experiences. Participants were also asked to rate their level of agreement with a variety of statements regarding their perceptions of their own "soft" job skills like teamwork or leadership and engineering-related skills. Results from these ratings on both the pre-program and post-program surveys are displayed in Table 5A below.

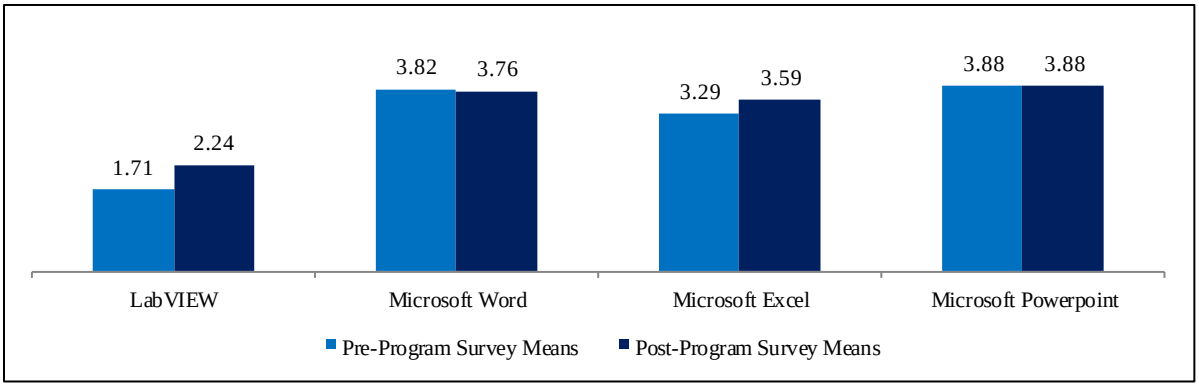
The Velocity Prep programs were intended, in part, to demand that participants stretch their capacities beyond what was mostly expected of them in their high school courses. Additionally, Velocity Prep programs require that participants lead their own teams. Accordingly, many ROBOTech participants found themselves reassessing their skills and abilities. For example, most participants had rated themselves as already able to work well in groups at the start of the program. While the percentage of participants who agreed that they were able to work effectively in groups increased slightly, as seen in Table 4A below, larger proportions of participants commented on the post-program survey that they had learned a great deal about working in teams during the program. Although several students moved from "agreeing" that they could successfully write and give a formal presentation to "strongly agreeing" that they could do so, high initial self-ratings by students resulted in no shift from pre-program to post-program proportions of participants who agreed that they could give a formal presentation. Participants also learned during the program that some tasks were more difficult than they initially believed. While 94.1 percent believed that they would be able to program a robot at the program's outset, only 76.5 percent believed that they would be able to do at the program's conclusion. Additionally, while 88.2 percent of participants thought that they were capable of leading a team at the beginning of the program, only 76.5 percent of participants indicated that they still held this belief on the post-program survey.

Table 4A: ROBOTech Velocity Prep Participants' Abilities and Skills (Strongly Agree or Agree)

	Pre-Program Results			Post-Program Results		
	Agree	Strongly Agree	Total Agree	Agree	Strongly Agree	Total Agree
Solve Difficult Problems	35.3%	47.1%	82.4%	47.1%	41.2%	88.2%
Work Effectively in Groups	35.3%	52.9%	88.2%	41.2%	52.9%	94.1%
Deliver Formal Presentation	52.9%	41.2%	94.1%	29.4%	64.7%	94.1%
Design and Build Something Mechanical	52.9%	35.3%	88.2%	35.3%	47.1%	82.4%
Meet Scheduled Deadlines	41.2%	58.8%	100.0%	41.2%	52.9%	94.1%
Use Computer for Graphs and Tables	64.7%	35.3%	100.0%	17.6%	64.7%	82.4%
Lead a Team	47.1%	41.2%	88.2%	41.2%	35.3%	76.5%
Set and Meet Goals	52.9%	41.2%	94.1%	29.4%	58.8%	88.2%
Program a Robot	58.8%	35.3%	94.1%	47.1%	29.4%	76.5%

Participants were also asked to rate their proficiency with a variety of software used during the program. They could rate themselves on a four-point scale, on which one represented no familiarity with the software and four represented proficiency. As shown in Figure 5A, participants reported significantly higher levels of proficiency with National Instruments LabVIEW and Microsoft Excel software at the end of the program: 52.9 percent of participants reported increased proficiencies with LabVIEW, and 35.3 percent of participants reported increased proficiencies with Microsoft Excel. Participants reported similar levels of proficiency with Microsoft Word and Microsoft PowerPoint on both the pre-program and post-program surveys.

Figure 5A: Comparison of VP ROBOTech Participants' Mean Software Proficiency Ratings (4-point scale)



ROBOTech participants appeared to have higher levels of confidence in their ability to succeed in postsecondary education and, in particular, to succeed in engineering fields following the program. The mean response to a question asking participants how well prepared they felt to succeed in postsecondary school, on a five-point scale,

rose from 3.53 on the pre-program survey to 4.24 on the post-program survey, an increase significant at the 95 percent confidence level. However, despite this large and statistically significant increase in participants' perceptions of their own postsecondary preparedness, participants' perceptions of how well prepared they were to enter the workforce immediately following high school remained fairly static. However, these results are positive: participants left the program realizing that they should continue their educations because they are academically prepared but not ready for the workforce without postsecondary education.

Finally, participants agreed that ROBOTech had increased their confidence in participating in engineering activities and pursuing engineering-related careers. 82.4 percent of participants answered that Velocity Prep had increased confidence in their abilities to participate in engineering projects or activities either "moderately" or "a great deal," while over three-fourths (76.5 percent) found that Velocity Prep made them more confident in their abilities to succeed in engineering or a technical field either "moderately" or "a great deal."

Conclusion

Participant survey responses indicate that ROBOTech Velocity Prep succeeded on a number of fronts. ROBOTech participants reported significant increases in the likelihoods that they would take engineering courses in high school, in their levels of STEM career awareness, and in their proficiencies with several software tools. Increased numbers of ROBOTech participants expressed interest in trade or technical schools and indicated that they were "highly likely" to enroll at four-year institutions. Over twice as many ROBOTech participants stated that one of their top three career choices were engineering careers, and twice as many also named specific types of engineering careers. Finally, students expressed greater confidence in their academic readiness for postsecondary school.

Despite these successes, Skillpoint Alliance could possibly improve ROBOTech Velocity Prep in these ways:

- Ask that site visit and guest speakers, as well as the college mentor and program facilitator, speak more about the STEM job market and education requirements for STEM careers. Although ROBOTech participants indicated that they had learned a great deal about different types of STEM careers, especially engineering careers, they were still uncertain about the STEM job market and education requirements for STEM careers.

- Inform participants about connections between enrolling and succeeding in high school science and math courses and successfully pursuing STEM careers. While participant interest in engineering courses grew significantly over the course of the program, change in participant interest in science and math courses was smaller. Asking site visit and guest speakers, as well as the college mentor, to speak more about the amount and types of math and science classes that engineering departments require incoming students to have taken might help participants see this connection.

- Continue to promote technical or trade schools and two-year community colleges as alternatives to beginning school at four-year colleges and universities. While participant interest in technical or trade schools rose over the course of the program, over forty percent of participants still expressed no interest in technical or trade schools. In addition, participant interest in two-year community colleges dropped during the program. While ROBOTech did a laudable job of increasing student interest in four-year colleges and universities, participants participants should be encouraged to gather more information about a range of postsecondary education options.

- Continue designing explicit strategies to market the ROBOTech program to female participants. Skillpoint Alliance was very successful at recruiting female participants this year, very possibly because of explicit choices made by program staff to interest female students in the "helping" mission of disaster relief. Once in, the female participants appeared to enjoy the program as much as the male participants.

- Consider designing a marketing strategy to appeal more to students not previously interested in engineering or STEM careers. While the majority of ROBOTech participants were bubble students in their science and math courses, they also indicated that they had high levels of motivation to pursue engineering and STEM careers on the pre-program survey.

GREENTech 2011

Introduction

For GREENTech Velocity Prep 2011, twenty students from Eastside Memorial Green Tech High School, part of the Austin Independent School District [AISD] worked as a consulting company for Dr. Dean Schneider with the Texas Engineering Experiment Station (TEES) to design energy solutions for a group of fifteen homes in the Texas Colonias, houses on illegally subdivided land that frequently lack electricity and other basic services. Skillpoint Alliance additionally worked with a consultant to assist in the development of this program. Participants were assisted by a college mentor, an undergraduate student with previous experience in solar design, and a facilitator, a graduate student in project-based science, technology, engineering, and math [STEM] education. The college mentor and facilitator helped participants connect with other sources of information, served as contact points between participants and the client, and helped students understand and navigate the project.

Participants worked at the Eastside Memorial Green Tech High School as well as the Skillpoint Alliance offices. At the beginning of the program, they created professional email accounts and installed and familiarized themselves with various software programs, including Dropbox and Google SketchUp, a computer-assisted design software program. They also created three companies and set up internal management structures, including appointing three CEOs to lead their companies. Participants researched ideas for their projects on their own and also by meeting with solar tech employers and content experts on the Texas Colonias. In addition, participants made four site visits to Austin Energy, HelioVolt (solar technology firm), Redwood Colonia, and Valence Technology (energy storage solutions), which were intended both to aid participants in their research and expose them to new STEM careers. In addition to stipend payments, participants received bonuses based on evaluations given by their team members and by the college mentor and program facilitator. On the final day of the program, participants returned to UT-Austin to present their final deliverables, including business proposals and a solar charging station, to their client and a public audience.

> Working in small companies, I got a taste of what the real world was like. It was hard but overall I feel like a better, harder worker.
>
> - Rising female senior

On the first and second days of the program, Skillpoint Alliance asked students to complete pre-program surveys in order to gather demographic and contact information, ascertain students' future high school, postsecondary, and career plans, assess students' attitudes about science, technology, engineering, and math [STEM] and STEM careers, and determine students' motivations, goals, and concerns for participation in the GREENTech program. On the final day of the program, Skillpoint Alliance asked students to complete post-program surveys to determine program impacts. Results from these surveys were analyzed using a variety of techniques, including significance tests, and are reported in the remainder of this chapter. Any references to results as significant throughout this report refer to results being statistically significant at the 90 percent confidence level or greater. Results not described as significant were statistically insignificant below that level.

Although significance test results are presented in this report, these results should not be taken as definitive program impacts. First, all student data was self-reported. Therefore, some students may have answered questions differently on a post-program survey in order to please program administrators. Skillpoint Alliance has requested follow-up administrative data on participants' future academic outcomes that should reduce this problem. Second, surveys could not be given to a control group of students, students who were very similar to GREENTech participants but had not participated in the program. Including a control group of students in this evaluation would determine which results were effects of the program and which were effects of some other factor. Skillpoint Alliance has also requested data on academic outcomes of a control group of students. Third, although data will continued to be gathered in future years, currently, the number of participants in each program was very small, which increase the likelihood that any statistical significance results would not be generalizable to a larger group. Fourth, one participant was fired by a team for excessive absences during the course of the program. Since this participant was present for part of the program, this student also complete pre- and post-program surveys; results are included in overall GREENTech results. Results changed little when the non-completer's results were excluded.

Demographic Information on GREENTech Velocity Prep Students

Three-quarters (75.0 percent) of GREENTech participants indicated that they were rising juniors, while the remainder of participants were rising seniors. Program staff noted that this discrepancy might be partially a result of unequal recruitment efforts: while program staff was able to present to the entire tenth grade, they were not able to present to the eleventh grade. Half of participants were female, but, in terms of race/ethnicity, the GREENTech Velocity Prep population differed dramatically from the Eastside Memorial Green Tech High School population. As shown in Table 1B below, 60.0 percent of GREENTech participants identified themselves as African-American, while 40.0 percent of GREENTech participants identified themselves as Hispanic. Three quarters of GREENTech participants (75.0 percent) indicated that somewhat in their household received free or reduced lunch, a proxy variable for economic disadvantage. The proportion of the general student body at Eastside Memorial Green Tech High School identified as economically disadvantaged was slightly higher at 87.8 percent, while the proportion of AISD students identified as economically disadvantaged was slightly lower at 63.5 percent. While GREENTech participants were somewhat different from the Eastside Memorial Green Tech student body at large, they did identify themselves as a mostly minority, low-income group.

Table 1B: GREENTech Velocity Prep Demographic Comparisons

	GREENTech Participants	Eastside Memorial Green Tech[4]	Austin ISD[4]
Total Enrollment	20	443	84,245
African American	60.0%	18.1%	11.3%
Hispanic	40.0%	79.9%	58.9%
White	0.0%	2.0%	25.8%
Asian/Pacific Islander	0.0%	0.0%	0.3%
Native American	0.0%	0.0%	3.7%
Economically Disadvantaged	75.0%	87.8%	63.5%

As can be seen in Table 2B below, members of GREENTech Velocity Prep participants' households held lower levels of education than members of typical Austin ISD households. While a quarter of participants reported that the highest level of education held by adults in their households was less than ninth grade, fewer than a tenth of adults over twenty-five in Austin ISD reported similar levels of education. However, the percentage of adults in Austin ISD (47.6 percent) and Austin-Round Rock MSA (44.9 percent) with some sort of postsecondary degree or certification are similar to the percentage of GREENTech participants who have at least one householder with a postsecondary degree or certificate (45.0 percent). Comparing American Community Survey results with these results may be somewhat misleading because participants were only asked to report the educational attainment of the household member who held the highest level of education; therefore, GREENTech participants' household members possibly have substantially lower educational attainments than adults in both Austin ISD and Austin-Round Rock MSA.

Table 2B: GREENTech Velocity Prep Educational Attainment Comparisons

	GREENTech Participants' Household Members	Austin ISD – Population 25 and Over[5]	Austin-Round Rock MSA – Population 25 and Over[5]
Less than 9th Grade	25.0%	9.1%	7.0%
Some HS, No Diploma	0.0%	7.5%	6.7%
HS Diploma or GED	30.0%	17.5%	20.4%
Some College, No Degree	N/A	18.3%	21.0%
Technical Certificate	5.0%	N/A	N/A
Associate's Degree	15.0%	5.0%	6.2%
Bachelor's Degree	20.0%	27.2%	25.6%
Graduate Degree	5.0%	15.4%	13.1%

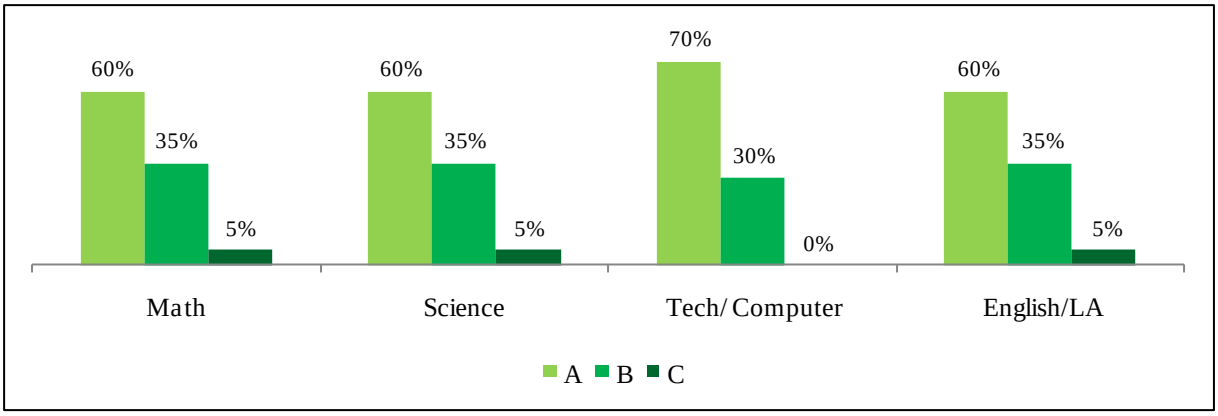
[4] Campus-level and district-level data from 2009-2010 TEA Academic Excellence Indicator System (AEIS) Campus Profile (http://ritter.tea.state.tx.us/cgi/sas/broker)

[5] Educational attainment data for Austin ISD and Austin-Round Rock MSA populations 25 and over from U.S. Census Bureau, 2005-2009 American Community Survey (http://factfinder.census.gov).

Impacts of GREENTech Velocity Prep on High School Goals

As can be seen in Figure 1B below, GREENTech Velocity Prep participants reported high grades on the pre-program survey. Participants reported grade point averages in their most recent science, math, and engineering courses in the B plus range. Participants reported even higher grade point averages, in the A minus range, in their most recent technology and computer courses. On the pre-program survey, the majority of students (85.0 percent) answered that they planned to graduate on either the Recommended High School Program or Distinguished High School Program. On the post-program survey, the number of students planning to graduate on the Minimum High School Program shrank by five percentage points. Although data from student records confirming students' self-reported grades and diploma programs were not available at the time of the writing of this report, that data, as well as data on students' future grades and diploma programs at graduation, will be available to future evaluators.

Figure 1B: GREENTech Velocity Prep Participants' Most Recent Grades



Although true impacts of GREENTech Velocity Prep on participants' high school course-taking and work behaviors are yet unknown, participants reported on the post-program survey that participating in the program had led them to reconsider some of their high school behaviors. The vast majority of participants (85.0 percent) answered that GREENTech Velocity Prep had inspired them to work harder in school "moderately" or "a great deal;" half of participants believed that the program had inspired them to work harder "a great deal." However, GREENTech Velocity Prep's impact on participants' plans for high school course enrollments may be slighter: while 65.0 percent of participants responded that the program had influenced them to take difference classes in school "moderately" or "a great deal," only a quarter answered that the program influenced them "a great deal."

Despite only one-quarter of participants responding that GREENTech Velocity Prep had influenced them "a great deal" to take different classes in school, participants indicated that GREENTech Velocity Prep had increased the likelihood that they would enroll in extra science or math courses. As can be seen in Table 3B below, on the pre-program survey, on average, participants had rated the likelihood that they would take extra science courses beyond requirements for the Minimum High School diploma program at 5.40 on a 9-point scale, where 9 represented "Very Likely." On the post-program survey, this mean shifted to 6.15, a statistically significant increase. On the pre-program survey, on average, participants had rated the likelihood that they would take extra math courses at 6.25. This average also increased to 6.60 on the post-program survey. However, participants' interest in taking computer, technology, or engineering courses did not substantially increase from the pre-program to post-program surveys. However, these responses are somewhat complicated because only three participants on the pre-program survey and one on the post-program survey indicated that they were planning to graduate on the Minimum Diploma Program; if all but one were planning to graduate on diploma programs requiring more math and science courses, the mean likelihoods that participants would take math or science courses should have been much higher.

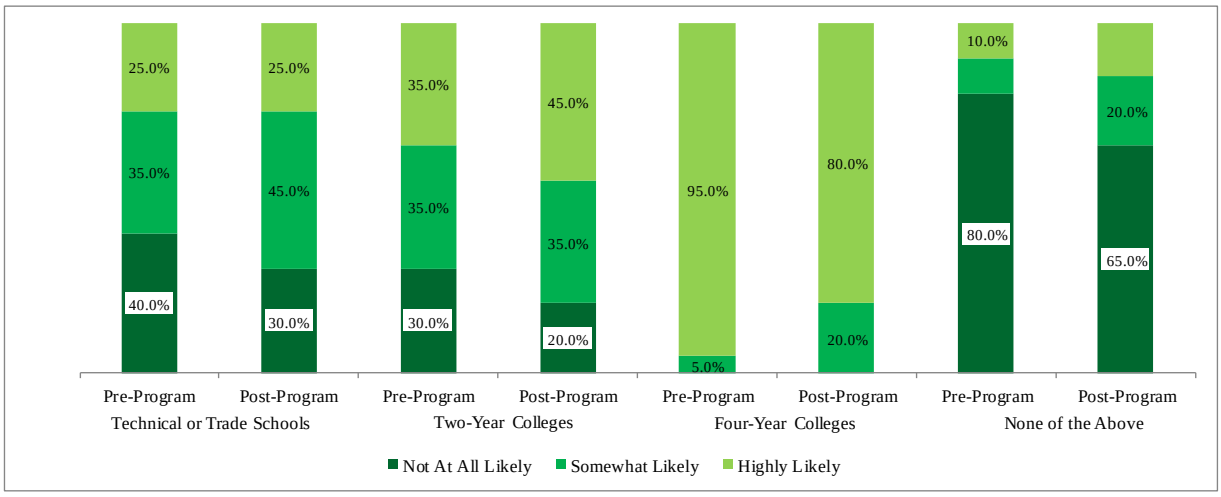
Table 3B: Likelihood GREENTech Velocity Prep Participants Will Take HS STEM Courses (9-point scale)

	Pre-Program Survey Mean	Post-Program Survey Mean	Average Change Per Participant
Extra Science Courses	5.40	6.15	0.75
Extra Math Courses	6.25	6.60	0.35
Computer and/or Technology Courses	6.85	6.90	0.05
Engineering Courses	6.15	6.15	0.00

Impacts of GREENTech Velocity Prep on Postsecondary Plans

While GREENTech Velocity Prep participants began the program expecting to attend postsecondary school, the program appears to have increased their interests in different types of postsecondary school, as indicated below in Figure 2B. On the pre-program survey, the vast majority of GREENTech Velocity Prep participants (95.0 percent) indicated that they were "highly likely" to enroll at a four-year college or university following high school graduation, while the remaining participants (5.0 percent) answered that they were "somewhat likely" to enroll at a four-year institution. While participants unanimously answered that they were either "somewhat likely" or "highly likely" to enroll at a four-year college or university on the post-program survey, the percentage of participants indicating that they were "highly likely" to do so shrank by fifteen percentage points to 80.0 percent. At the same time, the percentage of participants either "somewhat likely" or "highly likely" to enroll at a technical or trade school grew by ten percentage points, and the percentage of participants either "somewhat likely" or "highly likely" to enroll at a two-year community college grew by ten percentage points.

Figure 2B: Likelihood of GREENTech Velocity Prep Participants Pursuing Post-Secondary Education



Unfortunately, the percentage of participants who reported themselves as "somewhat likely" or "highly likely" not to attend technical or trade schools, two-year community colleges, or four-year colleges or universities increased by fifteen percentage points from the pre-program survey to the post-program survey. The reasons for this are unknown, but the largest number of participants (35.0 percent), when asked why they might not be able to pursue postsecondary education on the pre-program survey, answered that they did not have the financial resources to attend. That number did not decrease on the post-program survey. These results align with research indicating that low-income youth often intend to attend postsecondary education. However, many of these youth do not go on to enroll, often because of concern about financial resources; this phenomenon occurs even among recently graduated low-income high school seniors who have been accepted at postsecondary education institutions.[6] Encouraging participants to consider other, less expensive, forms of postsecondary education may help keep participants on the path to postsecondary education.

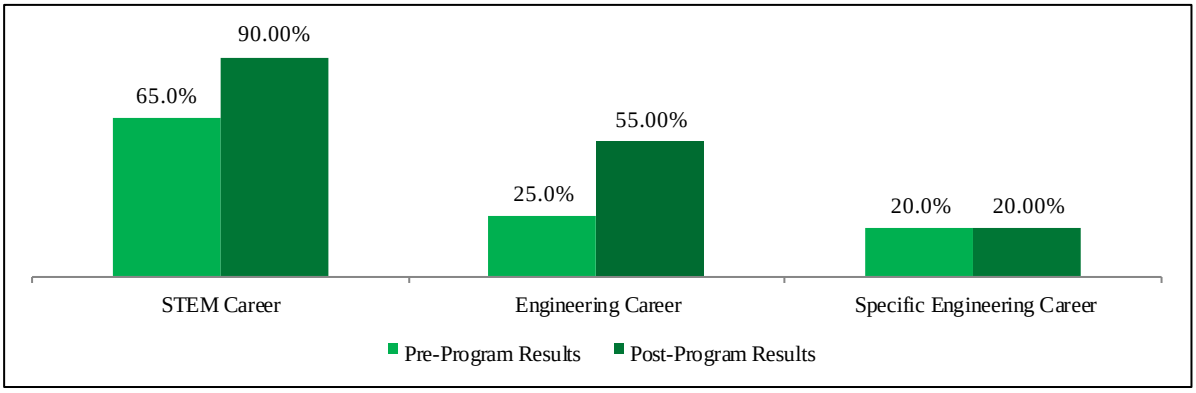
GREENTech Velocity Prep Impacts on Interest in STEM and STEM Careers

One major goal of GREENTech Velocity Prep is to interest participants in STEM careers, especially engineering fields, as well as increase student interest in STEM courses and activities. One particular goal unique to

[6] Arnold, Karen, Shezwae Fleming, Mario DeAnda, Benjamin Castleman, and Katherine Lynk Wartman, "The Summer Flood: The Invisible Gap Among Low-Income Students," *Thought & Action*, Fall 2009.

GREENTech Velocity Prep was interesting participants in "green" jobs. Comparisons between pre- and post-program survey results suggest that GREENTech Velocity Prep was particularly successful in encouraging participants to consider STEM and engineering careers, as well as increasing student interest in science and math courses.

Figure 3B: Changes in GREENTech Velocity Prep Participants' Top Three Career Choices



GREENTech participants were asked to name their top three careers on both the pre-program and post-program surveys. Their answers were coded as to whether they named STEM careers, engineering careers, and specific types of engineering careers and are shown above in Figure 3B. While nearly two-thirds of participants (65.0 percent) named at least one STEM career on the pre-program survey, 90.0 percent of participants named at least one STEM career on the post-program survey, a twenty-five percentage point increase that was statistically significant. One-quarter of participants (25.0 percent) named at least one type of engineering career (including "engineer") as one of their top three career choices on the pre-program survey. This number increased by over 100 percent from the pre-program to post-program survey, on which over half of participants (55.0 percent) named at least one type of engineering career as a top three career choice. This increase was also statistically significant. One-fifth of participants named at least one specific type of engineering career (i.e., mechanical engineering) as a top three career choice on the pre-program survey, a number that remained constant on the post-program survey. In contrast, the proportion of ROBOTech participants interested in at least one specific type of engineering career increased by 133 percent from the pre-program to post-program survey. This result indicates that, while GREENTech Velocity Prep may have whetted participants' interests in engineering, it did not inform them much about various types of engineering careers.

> At first I was not sure I wanted to pursue a career in this field, but now I feel like it is something I will consider.
> - Male rising junior

When asked whether their participation in GREENTech Velocity Prep had increased their interests in studying engineering after high school, 80.0 percent of the participants responded that the program had increased their interest "moderately" or "a great deal." In addition, several students wrote in that GREENTech had interested them in possibly pursuing a career in engineering. When asked on the pre-program survey to rank how motivated they were, on a five-point scale in which five represented "very motivated," to pursue STEM careers, participants' average level of motivation was a 3.65. This average increased only to 3.85 on the post-program survey; although this increase is slight, participants did report high initial levels of motivation to pursue STEM careers.

A comparison of pre-program and post-program survey results also indicates that GREENTech Velocity Prep had small, but positive, effects on participants' interest in STEM courses and activities. The proportion of participants who reported being excited about science classes increased by ten percentage points from 70.0 percent to 80.0 percent. The proportion of participants excited about math classes and interested in joining a science or technology club increased by five percentage points from 85.0 percent to 90.0 percent and 65.0 percent to 70.0 percent, respectively. However, participants rated themselves highly initially, which gave them little room for growth and indicates that Skillpoint Alliance is primarily serving participants who are already interested in STEM.

Impacts on Knowledge of Careers

Post-program survey only questions indicated that participants had learned a substantial amount about what being an engineer actually means and helped to clarify participant career goals: 90.0 percent of participants reported on the post-program survey that the program had helped them understand engineering better "moderately" or "a great deal." Additionally, 90.0 percent of participants reported that the program led them to a better understanding of their career goals "moderately" or "a great deal." Despite these positive answers to post-program survey questions, a comparison of participants' answers on the pre-program and post-program surveys to a question about their awareness of STEM careers indicated very little movement in any direction. This result was somewhat disappointing, since ROBOTech participants' ratings of their knowledge about STEM careers, including what different STEM careers exist and what STEM professionals do at work, significantly increased from pre-program to post-program survey. This result also confirms that GREENTech did not successfully inform participants about a variety of STEM careers, particularly engineering careers.

On the other hand, a comparison of participants' answers on the pre-program and post-program surveys indicates that participants' self-reported knowledge about the STEM job market, including STEM employment rates and salaries, grew significantly during the program. On the pre-program survey, participants reported that their average awareness about the STEM job market, on a scale from one to five in which five represents "very high," was 3.20. On the post-program survey, participants reported that their average awareness about the STEM job market was 3.60. In contrast, ROBOTech participants reported no such gain in awareness about the STEM job market.

Impacts on Skills and Abilities

Although GREENTech Velocity Prep lasted only a month, participants reported several increases in their perceptions of their skills and abilities. Several participants wrote in that the program had helped them learn about to work in groups, and, as shown in Table 4B below, although the proportion of participants reporting that they felt confident about their abilities to work in groups did not increase much from pre-program to post-program survey, all participants reported having confidence about their teamwork abilities at the end of the program. One pattern particularly apparent in the answers to the teamwork question but also evident in other soft skills related questions is that, although the total proportion of participants who agreed that they possessed those skills increased from pre-program to post-program survey, the proportion of participants who strongly agreed that they possessed those skills decreased. One potential cause might be that some participants rated themselves very highly at the beginning of the program and then later learned that leading teams and working in groups, for example, were more difficult to accomplish in a professional environment than they initially thought.

> I think the whole part about being in groups with people that I didn't really know was a good experience because I came out of my shell.
>
> - Female rising junior

> Personally, the thing that impacted me the most was learning about what components that go into an electric system and seeing that I actually understood what each component's role in the design was.
>
> - Male rising junior

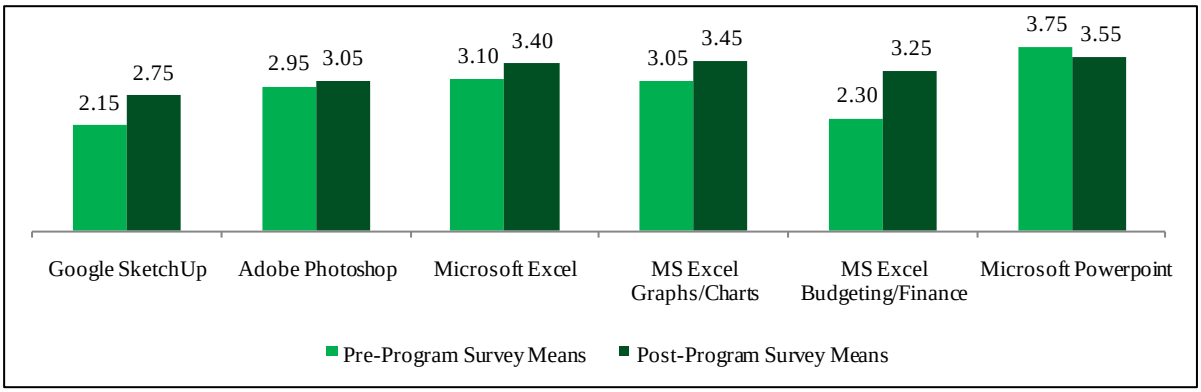
Participants reported the strongest increases in engineering-related abilities and skills; again, the same pattern discussed above is present, but fewer participants were confident in their initial abilities. As seen in Table 4B below, the proportions of participants who reported being confident in their abilities to design and build mechanical things and solve difficult problems increased by fifteen percentage points. The proportions of participants who reported being confident in their abilities to complete electrical engineering projects or complete electrical wiring projects increased by twenty percentage points from the pre-program to the post-program survey.

Table 4B: GREENTech Velocity Prep Participants' Abilities and Skills (Strongly Agree or Agree)

	Pre-Program Results			Post-Program Results		
	Agree	Strongly Agree	Total Agree	Agree	Strongly Agree	Total Agree
Design and Build Mechanical Things	55.0%	25.0%	80.0%	90.0%	5.0%	95.0%
Lead a Team	55.0%	25.0%	80.0%	80.0%	15.0%	95.0%
Solve Difficult Problems	45.0%	35.0%	80.0%	70.0%	25.0%	95.0%
Work in Groups	35.0%	60.0%	95.0%	65.0%	35.0%	100.0%
Meet Deadlines	70.0%	25.0%	95.0%	70.0%	20.0%	90.0%
Give Formal Presentation	50.0%	40.0%	90.0%	60.0%	35.0%	95.0%
Set and Meet Goals	65.0%	25.0%	90.0%	80.0%	15.0%	95.0%
Complete Electrical Engineering Project	50.0%	20.0%	70.0%	70.0%	20.0%	90.0%
Write Business Plan	45.0%	15.0%	60.0%	50.0%	15.0%	65.0%
Build a Model to Scale	55.0%	20.0%	75.0%	75.0%	10.0%	85.0%
Complete Electrical Wiring Project	35.0%	25.0%	60.0%	60.0%	20.0%	80.0%

During the program, participants were asked to use a variety of computer software tools to create their projects; on the pre-program and post-program surveys, participants were asked to rank their proficiency with these tools on a one to four scale, on which one represented complete lack of familiarity with the tool and four represented proficiency. Participants reported the most amount of growth in their proficiencies with Google SketchUp, a computer-assisted design software program, and Microsoft Excel as a tool for creating graphs, charts, and budgeting and finance documents. As can be seen in Figure 5B below, at the beginning of the program, participants ranked their average proficiency with Google SketchUp as 2.15. At the end of the program, participants ranked their average proficiency with Google SketchUp as 2.75, an increase that was also statistically significant at the 95 percent confidence level. Although participants did not report substantial or statistically significant increases in their proficiencies with Microsoft Excel, they did report both substantial and statistically significant increases in their proficiencies using Microsoft Excel to create graphs and charts and to work on budgeting and financial information. The mean proficiency level participants reported for their knowledge of Microsoft Excel as a tool to create graphs and charts increased from 3.05 to 3.45, while the mean proficiency level reported for their knowledge of Microsoft Excel as a tool to work on budgeting and financial information increased from 2.30 to 3.25.

Figure 4B: Comparison of Participants' Mean Computer Software Proficiency Ratings (4-point scale)



Finally, participants gave mostly positive answers to questions on the post-program survey about GREENTech Velocity Prep's impacts on their confidence in their ability to succeed in engineering fields and in engineering activities. A full 90.0 percent of participants agreed "moderately" or "a great deal" that the program had increased confidence in their abilities to participate in engineering projects or activities, with 20.0 percent agreeing that the program had increased their confidence "a great deal." Also, 80.0 percent of participants answered that the program had increased their confidence "moderately" or "a great deal" in their abilities to succeed in engineering or technical fields, with 30.0 percent responding that the program increased their confidence "a great deal." Finally, 85.0 percent of participants found that the program increased their confidence in succeeding in business fields "moderately" or "a great deal," with 25.0 percent answering that the program increased their confidence "a great deal." Surprisingly,

GREENTech participants did not report large or significant increases in perceptions of their academic preparedness for postsecondary school or workforce readiness, unlike ROBOTech participants, who reported significant increases in academic preparedness.

Conclusion

GREENTech Velocity Prep, in its first operational year, appears to have been very successful. GREENTech participants reported significant increases in the likelihoods that they would take extra science courses in high school and in their levels of awareness about the STEM job market. Two out of the three GREENTech participants who at the beginning of Velocity Prep planned to graduate on the Minimum High School Diploma Program reported at the end of the program that they now planned to graduate on at least the Recommended High School Program. Larger numbers of GREENTech participants expressed interest in both technical or trade schools and community colleges at the end of the program, and the proportion of GREENTech participants who named engineering as one of their top three career choices increased significantly over the course of the program.

Despite these successes, Skillpoint Alliance could possibly improve GREENTech Velocity Prep in these ways:

- Ask that site visit and guest speakers, as well as the college mentor and program facilitator, speak more about various STEM careers and education requirements for STEM careers. Although GREENTech participants indicated that they had learned a great deal about the STEM job market, they were still uncertain about the education requirements for STEM careers. This could include informing GREENTech participants about the importance of high school science and math courses; while the proportion of GREENTech participants interested in taking extra science courses in high school significantly increased, participants' ratings of the likelihoods that they would take extra science and math courses in high school were low on both the pre-program and post-program survey.

- Ensure that GREENTech participants learn more about types of engineering careers. ROBOTech is very engineering-focused, which is reflected by ROBOTech participants' increased interest in specific types of engineering careers on their post-program surveys. In contrast, the proportion of GREENTech participants naming a specific type of engineering career did not change from the pre-program to post-program survey. If Skillpoint Alliance intends GREENTech to be more focused on technical careers, than it is working. However, if Skillpoint Alliance wants GREENTech to expose participants to engineering careers, more emphasis will have to be placed on engineering during the program.

- Consider engaging GREENTech participants more with four-year colleges or universities. While GREENTech participants reported increased interests in two-year community colleges and technical or trade schools, the proportion of participants who were "highly likely" to attend four-year schools actually decreased. In contrast, the proportion of ROBOTech participants "highly likely" to attend four-year schools increased, maybe as a result of their increased contacts with representatives from four-year schools. Larger proportions of GREENTech participants reported concerns about their financial abilities to pay for postsecondary education, so any increased contact should possibly include discussions about financial aid.

Comparison of 2011 ROBOTech Velocity Prep and GREENTech Programs

Introduction

While ROBOTech Velocity Prep and GREENTech Velocity Prep were both conceived of and managed by staff at Skillpoint Alliance, the two programs differed in participants served, program staff, and program content. Unsurprisingly, survey data gathered from ROBOTech and GREENTech participants indicates that, although the programs had some similar impacts upon participants, many of their influences differed.

Results in this report come from surveys completed by participants on the first, second, and final days of the program. Results from these surveys were analyzed using a variety of techniques, including significance tests, and are reported in the remainder of this chapter. Any references to results as significant throughout this report refer to results being statistically significant at the 90 percent confidence level or greater. Results not described as significant were statistically insignificant below that level. Although significance test results are presented in this report, these results should not be taken as definitive program impacts. First, all student data was self-reported. Therefore, some students may have answered questions differently on a post-program survey in order to please program administrators. Second, surveys could not be given to a control group of students, students who were very similar to GREENTech participants but had not participated in the program. Including a control group of students in this evaluation would determine which results were effects of the program and which were effects of some other factor. Third, the number of participants in each program was very small, which increase the likelihood that any statistical significance results would not be generalizable to a larger group.

Demographic Comparisons of ROBOTech and GREENTech Participants

While ROBOTech served students at Del Valle High School, GREENTech served students at Eastside Memorial GREENTech within the Austin Independent School District. As can be seen in Table 1C below, both groups contained high percentages of minority participants and similar percentages of participants who indicated that one member of their household received free or reduced lunch, a proxy variable for low socio-economic status. However, as can be seen in Table 2C below, ROBOTech participants' members had lower levels of educational attainment than GREENTech participants' household members. While only 17.7 percent of ROBOTech participants indicated that any member of their household had a postsecondary degree or certification, nearly half of GREENTech participants (45.0 percent) answered that at least one member of their household had a postsecondary degree or certificate. Additionally, while 85.0 percent of GREENTech participants answered that English was the main language spoken at their homes, over half of ROBOTech participants (52.9 percent) responded that English was not the main language spoken at their homes.

Table 1C: Demographic Comparisons of Velocity Prep Participants by Program

	ROBOTech Participants	GREENTech Participants
Total Enrollment	17	20
African American	5.9%	60.0%
Hispanic	76.5%	40.0%
White	17.6%	0.0%
Asian/Pacific Islander	0.0%	0.0%
Native American	0.0%	0.0%
Economically Disadvantaged	70.6%	75.0%

Table 2C: Educational Attainment Comparisons of Velocity Prep Participants by Program

	ROBOTech Participants' Household Members	GREENTech Participants' Household Members
Less than 9th Grade	11.8%	25.0%
Some HS, No Diploma	11.8%	0.0%
HS Diploma or GED	58.8%	30.0%
Technical Certificate	0.0%	5.0%
Associate's Degree	5.9%	15.0%
Bachelor's Degree	11.8%	20.0%
Graduate Degree	0.0%	5.0%

On average, although all Velocity Prep participants listed that they were matriculating in either 11th or 12th grade, GREENTech participants were less far along in high school than ROBOTech participants. While 41.2 percent of ROBOTech participants responded that they were entering the 12th grade in Fall 2011, only 25.0 percent of GREENTech participants were entering the 12th grade at the same time. Program staff indicated that this discrepancy was possibly because Skillpoint staff was not able to present to the 11th grade at Eastside Memorial Green Tech.

Grades reported by ROBOTech participants and GREENTech participants also differed somewhat. As can be seen in Table 3C below, GREENTech participants reported receiving As in more courses than ROBOTech participants: while 68.8 percent of ROBOTech participants reported receiving Bs or Cs in their most recent math courses, 60.0 percent of GREENTech participants reported receiving As in their most recent math courses. While only one quarter (25.0 percent) of ROBOTech participants reported receiving As in their most recent English/language arts courses, 60.0 percent of GREENTech participants reported earning As in these courses.

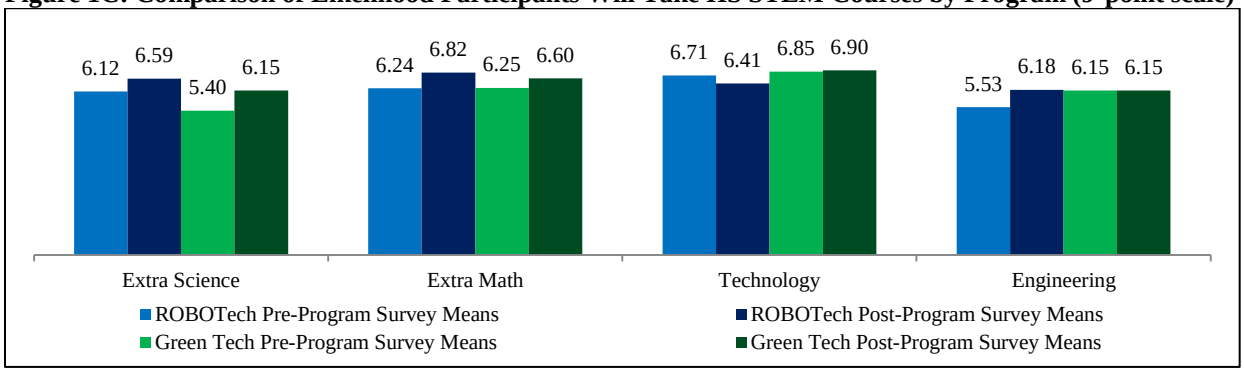
Table 3C: Grades of Velocity Prep Participants by Program

	ROBOTech Participants			GREENTech Participants		
	A	B	C	A	B	C
Most Recent Science Course	50.0%	25.0%	25.0%	60.0%	35.0%	5.0%
Most Recent Math Course	31.3%	62.5%	6.3%	60.0%	35.0%	5.0%
Most Recent Technology/Computer Course	62.5%	25.0%	12.5%	70.0%	30.0%	0.0%
Most Recent English/Language Arts Course	25.0%	56.3%	18.8%	60.0%	35.0%	5.0%

Impacts of Velocity Prep on High School Goals

As shown in Table 4C below, similar proportions of participants in both programs indicated that Velocity Prep had influenced them to work harder in school and decide to take different classes in school. 88.2 percent of ROBOTech participants answered that ROBOTech Velocity Prep had influenced them "moderately" or "a great deal" to work harder in school, while 85.0 percent of GREENTech participants agreed that GREENTech Velocity Prep had influenced them "moderately" or "a great deal" to work harder in school. The proportion of participants who answered that Velocity Prep influenced them "a great deal" to work harder was also similar, as 58.8 percent of ROBOTech participants and 50.0 percent of GREENTech participants gave this answer. 64.7 percent of ROBOTech participants answered that ROBOTech Velocity Prep had influenced them to take different classes in school "moderately" or "a great deal," and 65.0 percent of GREENTech participants responded that GREENTech Velocity Prep had influenced them to take different classes in school either "moderately" or "a great deal."

Figure 1C: Comparison of Likelihood Participants Will Take HS STEM Courses by Program (9-point scale)



Velocity Prep participants were also asked on the pre-program and post-program survey to rate the likelihood that they planned to take extra science and math courses, beyond the requirements for graduation on the Minimum High School Program, and any technology or engineering courses in high school. They could rate the likelihoods from one to nine, where one represented "not likely at all" and nine represented "very likely." Their average ratings given on the pre-program and post-program surveys are displayed in Figure 1C above. ROBOTech participants reported the greatest increases in the likelihoods that they would take engineering courses in high school; this increase was statistically significant. In contrast, GREENTech participants reported high increases in both the likelihood that they would take extra science courses in high school and the likelihood that they would take extra math courses in

high school; the first increase was also statistically significant. Since GREENTech participants reported lower levels of interest in enrolling in extra science and math courses at the beginning of the program, they had more room to grow.

Additionally, while no ROBOTech participants indicated that they planned to graduate on the Minimum High School Diploma Program on either the pre-program or post-program survey, two GREENTech students moved from planning to graduate on the Minimum High School program on the pre-program survey to planning to graduate on the Recommended High School program on the post-program survey. Since high school graduation on any diploma program other than the Minimum High School Diploma Program would require "extra" science or math courses, as explained in the survey question, participants possibly were not all that familiar with their high school graduation standards.

Impacts of Velocity Prep on Postsecondary Plans

On both the ROBOTech and GREENTech pre-program surveys, the vast majority of participants expressed interest in pursuing postsecondary education immediately following high school and, in particular, enrolling at a four-year college or university. On the ROBOTech pre-program survey, 88.2 percent of participants reported that they were "somewhat likely" or "highly likely" to enroll at four-year colleges or universities following high school. On the GREENTech pre-program survey, all participants (100.0 percent) reported that they were "somewhat likely" or "highly likely" to enroll at four-year colleges or universities following high school. While the proportion of ROBOTech participants "somewhat" or "highly likely" to enroll at a four-year college or university did not change on the post-program survey, the percentage of participants "highly likely" to enroll at a four-year school increased from 52.9 percent to 70.6 percent. However, while all GREENTech participants still believed that they were "somewhat" or "highly likely" to attend four-year colleges or universities, the proportion of GREENTech participants "highly likely" to enroll at four-year colleges or universities declined from 95.0 percent to 80.0 percent. This result is possibly explained by ROBOTech participants' greater contact with faculty at a four-year university, as well as their site visit to the Mechanical Engineering Department at UT-Austin.

However, proportions of participants interested in alternative forms of higher education, particularly trade and technical schools, were smaller on the pre-program survey: only 47.1 percent of ROBOTech participants reported that they were "somewhat likely" or "highly likely" to enroll at technical or trade schools, and 60.0 percent of GREENTech participants found themselves "somewhat likely" or "highly likely" to attend technical or trade schools. Both Velocity Prep programs appear to have increased participants' interests in technical or trade schools. On the post-program survey, the proportion of ROBOTech participants "somewhat" or "highly likely" to enroll at trade or technical schools increased by 11.7 percentage points to 58.8 percent. The proportion of GREENTech participants "somewhat" or "highly likely" to enroll at technical or trade schools also increased, from 60.0 percent to 70.0 percent. However, the two programs may have had dissimilar effects on participants' interest in two-year community colleges. While the proportion of ROBOTech participants "somewhat" or "highly likely" to enroll at these schools decreased by 5.9 percentage points, the proportion of GREENTech participants "somewhat" or "highly likely" to enroll at two-year community colleges increased by 10.0 percentage points from 70.0 percent to 80.0 percent.

35.0 percent of ROBOTech participants and 11.8 percent of GREENTech participants indicated that the largest obstacle to them pursuing postsecondary education immediately following high school was financial difficulty. An additional 20.0 percent of ROBOTech participants and 11.8 percent of GREENTech participants saw personal obligations as potential obstacles to postsecondary education. These obstacles, which are more easily overcome at less expensive and often closer two-year colleges or technical and trade schools, indicate that increasing participant interest in technical and trade schools is an important outcome for this program. Additionally, two-year colleges and technical and trade schools are less likely to be discussed as postsecondary alternatives by teachers, who are mostly required to hold four-year degrees. Unfortunately, while GREENTech participants reported greater interest in two-year schools, ROBOTech participants did not. Instead of prioritizing one type of higher education over another, participants should be encouraged to gather more information about a range of postsecondary education options.

Impacts on Interest in STEM and STEM Careers

Both ROBOTech Velocity Prep and GREENTech were intended to increase participants' interests in science, technology, engineering, and math [STEM] and STEM careers. Survey results from both programs indicate that both

programs were successful in increasing participant interest in STEM careers and that, while both programs increased participant interest in certain STEM activities, these activities differed by program.

On the pre-program and post-program surveys, Velocity Prep participants were asked to name their top three careers. These careers were coded as to whether or not they fell into a STEM field, were a type of engineering career (including "engineer"), or were a specific type of engineering career (i.e., chemical engineering). As shown in Table 4C below, more ROBOTech and GREENTech participants named STEM careers, engineering careers, and specific types of engineering careers as their top three career choices after completing the program. However, increases were only statistically significant at the 95 percent confidence interval for the change in Velocity Prep and GREENTech participants naming at least one engineering career, although the increase in GREENTech participants naming at least one STEM career was statistically significant. Surprisingly, although the proportion of ROBOTech participants naming at least one specific type of engineering career more than doubled from the pre-program to the post-program survey, the proportion of GREENTech participants naming at least one specific type of engineering career remained static. This result indicates that ROBOTech was much more successful than GREENTech at informing participants about a variety of engineering careers.

Table 4C: Changes in Velocity Prep Participants' Top Three Career Choices by Program

	ROBOTech Participants		**GREENTech Participants**	
	Pre-Program	Post-Program	Pre-Program	Post-Program
At Least One STEM Career	82.4%	88.2%	65.0%	90.0%
At Least One Engineering Career	35.3%	70.6%	25.0%	55.0%
At Least One Specific Engineering Career	17.6%	41.2%	20.0%	20.0%

Despite ROBOTech participants' greater interest in specific types of engineering careers following the program, only 58.8 percent of ROBOTech participants responded that Velocity Prep had influenced them "moderately" or "a great deal" to study engineering after high school, while 80.0 percent of GREENTech participants responded that Velocity Prep had influenced them to study engineering after high school "moderately" or "a great deal." However, when both groups were asked on pre-program and post-program surveys how motivated they were to pursue STEM careers on a scale from one to five, their mean responses increased very little.

Velocity Prep may be successful in impacting participants' interest in STEM courses and activities, but its impact is not consistent across the programs. Increases in the proportion of GREENTech participants excited about their upcoming science classes were statistically significant. However, for ROBOTech participants, only the increase in participants interested in joining a science or technology club was statistically significant.

Impacts on Knowledge of Careers

Besides encouraging participants to consider STEM careers, another goal of Velocity Prep is to increase participants' knowledge of STEM careers and encourage participants to think about their career plans. Both Velocity Prep programs appear to have been very successful at increasing participants' knowledge of engineering as a career. On the post-program survey, 88.2 percent of ROBOTech participants responded that Velocity Prep had helped them understand engineering better "moderately" or "a great deal," while 90.0 percent of GREENTech participants reported that the program had helped them understand engineering better "moderately" or "a great deal." Additionally, 88.2 percent of ROBOTech participants and 90.0 percent of GREENTech participants reported that the program led them to a better understanding of their career goals "moderately" or "a great deal."

When asked to rate their levels of awareness about STEM careers on a one to five scale, where five represented a high level of awareness about what different STEM careers were and what STEM professionals did at work, the mean ROBOTech participant response significantly increased from 3.47 to 3.82. While the mean GREENTech level of STEM career awareness also increased from pre-program to post-program survey, this increase was slight and statistically insignificant. These results partially mirror student responses to questions about their top career choices: while more ROBOTech participants named a variety of specific engineering careers on the post-program survey, the same proportion of GREENTech participants who named specific engineering careers on the pre-program survey named them on the post-program survey. However, the mean GREENTech awareness about the STEM job market, a rating of how much participants felt they knew about STEM employment and salary rates that was also on a five-point scale, increased significantly from 3.20 on the pre-program survey to 3.60 on the post-program survey. Again,

while the change in means from pre-program to post-program ROBOTech survey was also positive for this question, the change was insubstantial.

Most ROBOTech and GREENTech participants remained uncertain about the amount of education they would need for a STEM career. While the majority of both ROBOTech and GREENTech participants reported on the post-program survey that they would need more than a high school diploma for a STEM career, only 23.5 percent of ROBOTech participants and 15.0 percent of GREENTech participants identified the minimum level of education necessary as technical certification. However, considering that participants dealt mainly with engineers who had at least Bachelor's degrees, this confusion is somewhat understandable.

Impacts on Skills and Abilities

Velocity Prep provided participants with the opportunity to use skills and abilities they had developed in a school setting in an environment that more closely resemble a real-world business. In their answers to free-response questions, both ROBOTech and GREENTech participants acknowledged that Velocity Prep had taught them a great deal about soft skill activities like working in groups and completing projects. However, especially as seen in Table 5C below with the ROBOTech group, decreases in participants' confidence in their soft skill abilities may indicate that participants learned some of these activities were more difficult than they initially realized. However, as shown in Table 5C below, a substantial proportion of GREENTech participants learned that they were capable of completing electrical engineering projects, writing business plans, and completing electrical wiring projects.

Table 5C: VP Participants' Changes in Abilities by Program (Strongly Agree or Agree)

	ROBOTech Participants		**GREENTech Participants**	
	Pre-Program	Post-Program	Pre-Program	Post-Program
Design and Build Something Mechanical	88.2%	82.4%	80.0%	95.0%
Lead a Team	88.2%	76.5%	80.0%	95.0%
Solve Difficult Problems	82.4%	88.2%	80.0%	95.0%
Program a Robot	94.1%	76.5%	----	----
Work Effectively in Groups	88.2%	94.1%	95.0%	100.0%
Meet Scheduled Deadlines	100.0%	94.1%	95.0%	90.0%
Deliver Formal Presentation	94.1%	94.1%	90.0%	95.0%
Set and Meet Goals	94.1%	88.2%	90.0%	95.0%
Complete Electrical Engineering Project	----	----	70.0%	90.0%
Write Business Plan	----	----	60.0%	65.0%
Build a Model to Scale	----	----	75.0%	85.0%
Complete Electrical Wiring Project	----	----	60.0%	80.0%

Table 6C: Changes in VP Participants' Average Ratings of Computer Skills (4-point scale)

	ROBOTech Participants		**GREENTech Participants**	
	Pre-Program	Post-Program	Pre-Program	Post-Program
NI LabVIEW	1.71	2.24	----	----
Microsoft Word	3.82	3.76	----	----
Microsoft Excel	3.29	3.59	3.10	3.40
Microsoft Excel for Creating Graphs/Charts	----	----	3.05	3.45
Microsoft Excel for Budgeting/Finance	----	----	2.30	3.25
Microsoft Powerpoint	3.88	3.88	3.75	3.55
Google SketchUp	----	----	2.15	2.75
Adobe Photoshop	----	----	2.95	3.05

As can be seen in Table 6C above, both ROBOTech and GREENTech participants indicated that they had learned a substantial and significant amount about certain software utilized during the program. On the pre-program and post-program surveys, they were asked to indicate their software proficiencies on a four-point scale, on which one represented "not familiar" and four represented "proficient." In particular, ROBOTech participants reported a significant increase in their average proficiency with LabVIEW software, which they used to program the robots they designed. They reported moving from an average proficiency of 1.71 to 2.24, a significant change at the 95 percent confidence level. GREENTech participants reported increasing from an average proficiency of 2.15 to an

average proficiency of 2.75 with Google SketchUp, a computer-assisted design software. This change was also significant. While participants began the program reporting high levels of proficiency with Microsoft PowerPoint and Microsoft Word, they also reported increased knowledge of Microsoft Excel as a result of the program. In particular, GREENTech students, who used graphing and budgeting features in Microsoft Excel to help create their business plan, reported significant increases in their knowledge of Microsoft Excel as a tool for these features.

While ROBOTech participants reported a substantial increase in their average confidence about their readiness for postsecondary school, GREENTech participants reported only a small increase, as displayed in Table 7C below. ROBOTech participants' assessment of their readiness for postsecondary school, determined on a five-point scale, rose from 3.53 on the pre-program survey to 4.24 on the post-program survey, a significant increase. Neither ROBOTech nor GREENTech participants changed their perceptions of their workforce readiness.

Table 7C: Changes in VP Participants' Mean Ratings of College and Career Readiness (5-point scale)

	ROBOTech Participants		**GREENTech Participants**	
	Pre-Program	Post-Program	Pre-Program	Post-Program
Postsecondary Education Preparedness	3.53	4.24	3.50	3.60
Workforce Readiness	3.76	3.88	3.75	3.75

On the post-program survey, both ROBOTech and GREENTech participants agreed that Velocity Prep increased their confidence in participating in engineering activities and pursuing engineering-related careers. The majority of Velocity Prep participants (82.4 percent of ROBOTech and 90.0 percent of GREENTech) answered that Velocity Prep had increased confidence in their abilities to participate in engineering projects or activities either "moderately" or "a great deal." Over three-fourths of ROBOTech participants (76.5 percent) and 80.0 percent of GREENTech participants found that Velocity Prep made them more confident in their abilities to succeed in engineering or a technical field either "moderately" or "a great deal." Finally, 85.0 percent of GREENTech participants found that the program increased their confidence in succeeding in business fields "moderately" or "a great deal."

Conclusion

Although ROBOTech and GREENTech Velocity Prep programs displayed some different impacts on participants, a few similar impacts are evident. Both programs' participants expressed greater levels of interest in technical or trade schools following Velocity Prep, and larger numbers of both programs' participants named "engineering" as a top career choice following Velocity Prep. Additionally, both sets of program participants reported significant improvements in their abilities to use various computer software programs. However, in order to make Velocity Prep programs equally effective, Skillpoint should consider the following recommendations:

- Ask that site visit and guest speakers, as well as the college mentor and program facilitator, consistently speak with participants about various STEM careers, the STEM job market, and education requirements for STEM careers. While participants in one program heard more about various STEM careers, participants in the other program learned about the STEM job market. Participants in both programs still appeared confused about education requirements for STEM careers.

- Inform participants about connections between enrolling and succeeding in high school science and math courses and successfully pursuing STEM careers. While some participants expressed greater interest in science and math high school courses at the end of the program, levels of interest were not high enough, especially considering participants' desired careers. Asking site visit and guest speakers, as well as the college mentor, to speak more about the amount and types of math and science classes that engineering departments require incoming students to have taken might help participants see this connection.

- Continue to promote technical or trade schools and two-year community colleges as alternatives to beginning school at four-year colleges and universities. Most Velocity Prep participants began the program answering that they were either "somewhat likely" or "highly likely" to go on to four-year schools, but research suggests that many of them will not be able to do so for financial reasons. Velocity Prep participants should be encouraged to gather more information about a range of postsecondary education options, although with information about how to afford four-year schools.

- Expand the business plan writing requirement to other Velocity Prep programs and increase general writing requirements. As part of their project, GREENTech participants had to write lengthy business plans. ROBOTech participants reported low grades in English/Language Arts, and survey responses from both programs' participants indicate that many participants have low levels of writing ability. Velocity Prep participants should understand that being able to communicate in writing is a vital 21st Century skill, even for STEM professionals.

- Consider designing a marketing strategy to appeal more to students not previously interested in engineering or STEM careers. Many ROBOTech and GREENTech participants began the program with high levels of interest in STEM careers and even high science and math grades.