360 ATE Regional Center Evaluation

Third annual progress report (2014-2015)

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Summary

360 Manufacturing and Applied Engineering ATE Regional Center of Excellence (360) works collaboratively with partner institutions and industry representatives to inspire, recruit, and prepare students for manufacturing careers. The mission of 360 is to increase the quantity, quality, and diversity of skilled and knowledgeable workers in the field of manufacturing. As a recipient of the National Science Foundation (NSF) ATE Regional Center award, 360 is required to report its progress throughout the four-year grant; therefore, 360 contracted with Wilder Research (Wilder) to conduct an evaluation that will provide rigorous and unbiased information to multiple stakeholders, including Center leadership, NSF, and others in the field of advanced technical education.

Year three evaluation activities

The evaluation activities completed during year three of the grant are listed below. More detailed descriptions of each activity can be found in the body of the report.

- **2014 summer camp surveys:** Self-administered questionnaire completed by youth after they have completed their camp.
- **2014 VEX Robotics surveys:** Web-based survey completed by youth and adults (parents, teachers, and coaches) after they have participated in a tournament.
- **2014 Tour of Manufacturing participant and host surveys:** Self-administered questionnaire completed by those who attended a tour; and a web-based survey completed by businesses that hosted the tours.
- **Teacher toolkit survey:** Web-based survey completed by teachers who have downloaded a toolkit online.
- **Data from MnSCU's Integrated Statewide Record System (ISRS):** Data pulled for the students and graduates of Center-related programs.
- **Balanced Scorecard:** A dashboard of selected measures used to monitor performance.

The findings in this summary are organized around three of the primary goals of the Center: 1) Promoting the manufacturing industry, 2) Building youth interest in manufacturing, and 3) Developing the pipeline and increasing graduates and students.

Promoting the manufacturing industry

In order to consistently track perceptions of manufacturing and science, technology, engineering, and mathematics (STEM) over time, Wilder and the 360 Center developed a series of perceptions questions to be used across surveys, such as the Tour of Manufacturing, summer camp, and VEX Robotics surveys. The questions were first used in the 2013 summer camp survey. In all surveys, positive perceptions of manufacturing increased (Figure 1). It should be noted that the sample sizes, as well as the audiences, for each of these surveys are different; therefore, the results should not be compared to each other.

1. Perceptions of manufacturing careers

	Pre-event	Post-event
2014 summer camps	**(N=166)**	**(N=164)**
Think they are good	31%	59%
Think they are just OK	39%	29%
Don't think they are good	7%	4%
Don't think about them	16%	2%
I am not sure	8%	6%
VEX Robotics program (youth survey)	**(N=66)**	**(N=66)**
Think they are good	29%	64%
Think they are just OK	48%	27%
Don't think they are good	3%	2%
Don't think about them	18%	6%
I am not sure	2%	2%
VEX Robotics program (adult survey)	**(N=72)**	**(N=74)**
Think they are good	54%	90%
Think they are just OK	32%	7%
Don't think they are good	1%	0%
Don't think about them	10%	1%
I am not sure	3%	1%
2014 Tour of Manufacturing	**(N=374)**	**(N=377)**
Think they are good	53%	79%
Think they are just OK	31%	15%
Don't think they are good	2%	1%
Don't think about them	9%	2%
I am not sure	5%	3%

Event participants largely described manufacturing careers using positive adjectives. In all surveys, participants were asked to select words they felt best described manufacturing careers; the list included five positive and five negative adjectives. Almost always, the positive adjectives were selected more often than any of the negative adjectives; and "creative" was always in the top three response options (Figure 2).

2. Words that best describe manufacturing careers

	n	%
2014 summer camps (N=166)		
Creative	123	74%
Fun	108	65%
Exciting	95	57%
VEX Robotics program (N=61)		
Fun	43	70%
Creative	42	69%
Advanced	41	67%
2014 Tour of Manufacturing (N=372)		
Creative	210	57%
Advanced	183	49%
Exciting	136	37%

Note: *Percentages equal more than 100% as respondents were able to give multiple responses.*

Overall, the satisfaction level of survey respondents at all events was high: VEX Robotics program (81% of adults and 78% of youth were "very satisfied" with the event); Tour of Manufacturing (76% of participants were "very satisfied"); and summer camps (83% of attendees reported liking their camp "a lot").

Additionally, the majority (89%) of the 28 survey respondents who hosted a tour during the 2014 Tour of Manufacturing felt that their participation was worthwhile and reported that they plan to participate again (61% "certainly" and 29% "maybe"). Businesses were particularly pleased with the engagement of participants and the opportunity to build awareness of manufacturing careers.

Building youth interest in manufacturing

The Center has made youth outreach a primary focus of its work. Post-event surveys show that awareness of and interest in manufacturing careers has indeed increased among youth participants (Figure 3). (Both awareness and interest also increased among the adult participants of the Tour of Manufacturing survey.)

3. Awareness of manufacturing careers among youth

	Pre-event	Post-event
2014 summer camps	**(N=167)**	**(N=162)**
A lot	27%	51%
Some	36%	31%
Very little	26%	16%
Not at all	11%	3%
VEX Robotics program	**(N=66)**	**(N=66)**
A lot	24%	65%
Some	56%	26%
Very little	14%	6%
Not at all	3%	2%
Don't know	3%	2%

Given the increased awareness and positive perceptions of manufacturing careers, it is not surprising that interest in manufacturing careers also increased; however, this increase was less dramatic. In all surveys, the total percentage of participants answering "a lot" (after the event occurred) was less than 50 percent, which was not true for any of the other "perception of manufacturing questions" (e.g. awareness, positive perceptions, etc.) (Figure 4). This less-dramatic shift indicates that there is still some work to do in promoting manufacturing careers among youth.

4. Interest in manufacturing careers

	Pre-event	Post-event
2014 summer camps	**(N=168)**	**(N=162)**
A lot	25%	30%
Some	33%	42%
Very little	27%	24%
Not at all	16%	5%
VEX Robotics program	**(N=66)**	**(N=66)**
A lot	23%	45%
Some	41%	36%
Very little	23%	14%
Not at all	12%	5%
Don't know	2%	0%

4. Interest in manufacturing careers (continued)

2014 Tour of Manufacturing	Pre-event (N=361)	Post-event (N=357)
A lot	26%	39%
Some	39%	35%
Very little	22%	14%
Not at all	12%	12%

Developing the pipeline and increase graduates and students

Developing the pipeline and pathways for potential and current students to increase their skills, and become gainfully employed in the manufacturing industry, is another primary goal of the Center. However, it is also a lagging indicator of success because it can take years to recruit and move students through the programs. Even so, data from MnSCU's ISRS data show that there was a 36 percent increase in graduates of 360-related programs; up to 636 in 2014 from an average of 466 during the 2010-2012 baseline (and a 23% increase over the 516 graduates in 2013) (Figure 5).

This increase is driven by large increases in Certificates (+43% over baseline) and Diploma/ Associate graduates (+44% over baseline). The total number of system-wide graduates in the same 360-related programs (but not at 360 institutions) increased 14 percent from an average of 969 per year during 2010-2012 to 1,104 in 2014.

Student enrollments help to provide an early indication of successful inspiration and recruitment, and the Center-related programs have experienced increased enrollments during the last two years. Student enrollments averaged 3,192 per year between 2010 and 2012. Using this average as a baseline, student enrollments increased by seven percent in 2013 and 23 percent in 2014. In 2015, enrollment declined substantially from the previous year; Wilder is working with MnSCU to identify the source of this decline, which is likely incomplete data for 2015.

Furthermore, the significant focus on youth outreach and building youth interest in manufacturing education has coincided with larger enrollment increases for youth and high school students. Compared to the baseline average, the number of high school student enrollments increased by more than five times in 2014 and more than twelve times in 2015. Enrollments among students 18 years old or younger increased by 34 percent in 2013 and more than 200 percent over the baseline average in both 2014 and 2015.

5. 360-related program enrollments and graduates by year

	2010	2011	2012	2013	2014	2015
360 total enrollments	3,294	3,236	3,047	3,410	3,911	2,478
360 high school student enrollments	10	8	5	17	40	99
360 youth (18 or younger) enrollments	117	114	125	159	402	410
360 graduates	454	476	468	516	636	NA
Total graduates in 360 programs at non-partner institutions	936	961	1,011	1,020	1,104	NA

Note: *The list of 360-related programs was updated this year to better reflect the programs 360 is targeting; it reduced the number of previously considered 360 programs. This change has been applied to all program years, so data have changed from previous reports. "Enrollments" are a duplicated count of students. A single student could be enrolled in multiple programs for multiple terms during the school year. Therefore, these numbers should be considered a measure of "activity" rather than persons in the programs.*

Other evaluation activities

Balanced Scorecard

In addition to the data collection activities described above, the evaluation also worked to design a Balanced Scorecard dashboard to align the 360 Center's activities to its vision and strategy and to monitor performance. The evaluation selected the most important measures from an extensive list compiled over the first two years of the evaluation that fit in four distinct organizational perspectives – customer, financial, internal processes, and learning and growth. These measures are described briefly below.

Customer Perspective

- **Increased number of technicians:** Since 2010, 360-related programs have produced 2,550 graduates, including 636 graduates in academic year 2014.
- **Enrollment growth:** 360-related programs averaged 3,192 enrollments per year between the 2010 and 2012 academic years, and exceeded that average baseline by 7% in the 2013 academic year, and 23% in the 2014 academic year.
- **Youth engagement:** The Center counted a total of 3,162 youth engaged in 360-related content or the Dream It. Do It. message.
- **Increased youth interest in manufacturing:** 55% of youth surveyed at 360-sponsored events from June 2013 through November 2014 reported increased (or consistently high) interest in manufacturing careers before and after that youth engagement activity.

This represents 167 youth who reported increased interest and 106 who reported consistently high interest.

- **College students impacted:** The Center estimates that it directly impacted the education of 284 college students in the current academic year.

Financial Perspective

- **Number of funding sources:** The Center has seven funding sources that provided at least $5,000 in FY15.
- **Earned income:** The Center has six sources of earned income totaling $26,800 in FY15.
- **Sponsorships:** The Center had 11 sponsorships totaling $38,150 of direct (cash) support in FY15.
- **Quarterly cash flow:** The Center has secured more than $400,000 in cash flow per quarter for the next year, and has secured about $175,000 per quarter through the end of 2016.

Internal Processes Perspective

- **Quality of collaboration:** The Center had an average aggregate collaboration score of 4.22 in 2014. This score was based on 172 ratings (29 stakeholders responding to six questions) from the Wilder Collaboration Factors Inventory. The Collaboration Factors Inventory considers anything over a 4.0 to be a "strength."
- **Quality of operations:** The Center had an average aggregate operations score of 4.30 in 2014. This score was based on 230 ratings (29 stakeholders responding to eight questions) from the Wilder Collaboration Factors Inventory. The Collaboration Factors Inventory considers anything over a 4.0 to be a "strength."
- **College partner engagement:** The 15 college partners of the Center averaged 6.5 out of 11 possible engagement points in 2015.
- **Learning and growth:** This includes staff development, Strategy Council updates, and a review of industry needs; however, no data have been collected on these components yet.

Teacher toolkit survey

To help introduce students to careers in manufacturing, 360 (through Dream It. Do It.) offers a teacher toolkit called *Your Future is Made in Manufacturing*, which is a 54-page curriculum resource recommended for students in grades 6 through 12. Wilder sent a survey to those teachers who had received the toolkit, in order to better understand how they used it and how the materials can be improved for future use. Of the 22 individuals who accessed the teacher toolkit survey, 10 said that they had not received a toolkit, or perhaps did not remember accessing it online. Twelve respondents confirmed that they had received a toolkit.

Those who completed the survey taught subjects such as career and technical education, industrial technology, and science courses. Five educators had used the toolkit with students, reaching an estimated 118 students in 10th, 11th, and 12th grades. Those who had not used it said that they were planning to use it in the future, had passed it on to other staff, or had not yet had time for the packet.

All five educators who used the packet in the classroom utilized both the booklet and DVD, and four had used the posters with their students. Respondents found the DVD to be the most useful aspect of the materials; all five ranked the videos as "very useful" for their classes. One educator suggested creating additional exercises for students—such as a simulated cost spreadsheet for students to complete—and another suggested more challenging questions.

The toolkit seemed to have a positive impact on student and teacher perceptions of manufacturing. Four out of five educators said that "some" or "many" of their students expressed new interest in manufacturing careers after working with the toolkit. All five educators said they were more likely to recommend manufacturing careers to their students after using the toolkit.

Issues to consider

Overall, the 360 Center continues to make progress towards its goals and has been, by all accounts, successfully implementing its work and achieving proposed outcomes. Below are several overarching observations:

- **360 activities are producing positive perceptions**. Data from all of the 360-related activities included in this evaluation show that participants report their perceptions of manufacturing are improved after their participation. This shows that at the most basic level, the 360 activities are functioning as they are intended.

- **There has been a drop in 2015 enrollment.** Preliminary enrollment numbers for 360 programs show significant drops in 2015. These numbers are not yet final, and evaluators are investigating what may have caused this drop.

- **The numbers show increased youth enrollment.** Even with the drop in overall enrollment, the numbers of high school students and youth (<18) enrolled continued to climb in 2015**.** This is encouraging, given the Center's focus on building interest among youth through focused events like the summer camps and VEX robotics competition.

- **Graduate numbers continue to increase.** The Center-related programs show large increases in graduates over the baseline years and last year. Because this growth is in programs that generally take fewer than two years to complete and among younger students (both of which are targets of 360), it appears as though the promotion and pipeline development work done by 360 is paying off.

Introduction

In June of 2012, the 360 Manufacturing and Applied Engineering Center of Excellence (360) became the recipient of a National Science Foundation (NSF) Advanced Technological Education (ATE) Regional Center award. As an ATE Regional Center, 360 serves as a model for the education of manufacturing technicians and a clearinghouse for best practices. 360 works collaboratively with partner institutions in the Minnesota State Colleges and Universities (MNSCU) system to prepare students for careers and works with industry leaders to attract and develop the highly skilled workers needed to keep Minnesota businesses competitive, profitable, and growing. The overall mission of 360 is to increase the **quantity**, **quality**, and **diversity** of skilled and knowledgeable workers in the field of manufacturing. To accomplish this mission, 360 initially developed several program objectives to be implemented over the course of the grant; those objectives are to:

- Enhance the pipeline that prepares students for rigorous manufacturing technician-level programs and entices them to pursue manufacturing careers, while also implementing strategies to target under-represented student groups
- Refine industry-driven curricula that is relevant to today and tomorrow's manufacturing industry
- Assess student learning with both an internal focus – to drive ongoing program involvement – and an external focus – to provide accountability for all stakeholders and evidence of student achievement

Now in year three of its NSF award, 360 has begun to complete many of the activities needed to help fulfill the overall mission of the program. These activities are outlined and evaluated in this report.

Evaluation questions

As part of its evaluation, the 360 staff wanted to address the following questions.

- Is the Center progressing towards its goals?
- Are the Center operations and processes successful in supporting the goals? Is the Center communicating successfully with its stakeholders?
- What challenges, barriers, and lessons learned has the Center experienced?

Purpose of this report

As a recipient of the NSF ATE Regional Center award, 360 is required to evaluate and report its progress throughout the four-year grant period, ending in May 2016. To meet this requirement, and to help determine if the program is achieving its primary objectives, 360 contracted with Wilder Research (Wilder) to conduct an evaluation. The purpose of the evaluation is to provide rigorous and unbiased information to multiple stakeholders, including Center leadership, NSF, and others in the field of advanced technical education. By providing timely and useful evaluations of 360 activities, Wilder will help 360 to successfully shape the implementation of the ATE Center and assure its accountability through the documentation of its success in meeting intended outcomes.

Evaluation activities to date

As of March 2015, the following evaluation activities have been completed:

- **2014 summer camp surveys:** One important aspect of the 360 mission is to expose students to, and increase enthusiasm for, STEM and manufacturing careers; therefore, each year, 360 and its partners hold summer camps for youth. In order to evaluate the success of these camps in meeting their goals, 360 staff distribute self-administrated questionnaires, created by Wilder, to youth participants at the end of each camp. In the summer of 2014, a total of 184 youth completed the survey from nine different camps.

- **2014 VEX Robotics surveys:** Like the summer camps, the VEX Robotics program is intended to build awareness and interest in STEM and manufacturing careers, as well as the pipeline of manufacturing students and workers in Minnesota. Teams of youth work together to build robots from kits and then compete with other teams at scrimmages and tournaments. In February 2015, to help gauge the success of the VEX Robotics program as well as the satisfaction of participating youth and adults, Wilder sent a web-based survey to 174 adults, including parents, coaches, and teachers. To reach youth, evaluators sent the youth survey link to 224 e-mail addresses of youth or their parents. Parents were asked to forward the link to their children, and both groups were instructed to forward the survey to other adults or youth who may have been involved. In total, 76 adults and 74 youth completed the survey.

- **2014 Tour of Manufacturing participant and host surveys:** In fall 2014, 360 and its partners coordinated over 85 manufacturing businesses and three two-year colleges across Minnesota to provide tours of their facilities for students, educators, job seekers, other manufacturers, and the general public. This event, called the Dream It. Do It. Minnesota Statewide Tour of Manufacturing, took place from October 23-25. To help understand the impact of the tours, Wilder administered a paper-based survey to Tour

participants, and a web-based survey to the businesses that hosted the tours. A total of 391 people completed the participant survey, and 34 hosts completed the web survey (out of the 58 to whom Wilder emailed a survey link).

- **Teacher toolkit survey:** In 2014, 360 sponsored the production and dissemination of a toolkit for teachers, called *Your Future is Made in Manufacturing*. To help understand how teachers used the toolkit and how the materials might be improved, Wilder sent a survey link to a list of 46 educators who had downloaded a toolkit online. In total, 22 individuals accessed the survey.

- **Data from MnSCU's Integrated Statewide Record System (ISRS):** Wilder has also worked with the Center and MnSCU's research and assessment department to pull data for the students and graduates of Center-related programs. Selected data are used to create a Balanced Scorecard.

Outcomes of Center activities

This section provides a detailed examination of the activities and outcomes related to three of the primary goals of the 360 ATE Center of Excellence:

- Promote the manufacturing industry and manufacturing education
- Build youth interest in manufacturing
- Develop the pipeline to increase numbers of students and graduates

Promoting the manufacturing industry and manufacturing education

The 360 ATE Center has worked hard to promote the manufacturing industry and manufacturing education to the public. The value 360 provides in promoting the manufacturing industry is primarily related to two strategies implemented by the Center: the Dream It. Do It. statewide marketing campaign and the annual Tour of Manufacturing.

Tour of Manufacturing

The Dream It. Do It. Statewide Tour of Manufacturing is an annual weekend-long event sponsored by the 360 ATE Center. From October 23-25, 2014 approximately 85 manufacturing businesses and three two-year colleges across Minnesota opened their doors and invited community members to tour their facilities so they could better understand the manufacturing industry.

Methodology

With the goal of increasing participant response rates, Wilder and 360 staff asked sites to distribute self-administered questionnaires to tour participants through paper forms rather than a web survey, as was done in previous years. The survey had to be shortened to fit onto one page, so several questions from previous participant surveys were cut. The final survey focused primarily on a set of "perceptions of manufacturing" questions asked across all surveys of 360-related events. Completed, anonymous forms were mailed back to Wilder by 360 staff; a total of 391 people completed the survey, which was an increase from 28 people in 2013 and 117 in 2012. For the host survey, Wilder emailed a survey link to 58 businesses with an available email address; 34 people completed the survey for a response rate of 59 percent.

About tour participants

Based on estimates provided by the 34 host respondents, Tour of Manufacturing participation ranged from 0 to 350 people with an average of 78 participants per site. The total estimated number of attendees was 2,484 (Figure 6), which is up slightly from the estimate provided by businesses that participated in the survey in 2013 (2,377). It should be noted that Tour of Manufacturing hosts could estimate the number of attendees however they chose; therefore the method for estimation across sites is inconsistent. The most common method was a sign-in sheet or registration form.

At the tours, visitors were asked to provide their demographic information. Participants tended to be men (58%); the ages of visitors varied (Figure 7).

6. Estimated number of visitors (N=32)

Minimum	0
Maximum	350
Average (per respondent site)	78
Total (all respondent sites)	2,484

7. Participant respondent demographics (N=371)

	n	%
Gender		
Male	227	58%
Female	144	37%
Missing	22	6%
Age		
Under 18 years old	82	22%
18-25 years old	37	10%
26-45 years old	84	23%
46 and older	168	45%

Satisfaction with the Tour of Manufacturing

Overall, both participants and hosts of the 2014 Tour of Manufacturing reported high levels of satisfaction. Hosts were particularly pleased with the engagement of participants and the opportunity to build awareness of manufacturing careers.

- Nearly all of the participants surveyed (99%) were at least satisfied with their experience at the Tour of Manufacturing, and three-quarters (76%) reported that they were "very satisfied."

- Most of the surveyed hosts (89%) reported that their participation in the Tour of Manufacturing was at least somewhat worthwhile and 90% reported that they plan to participate again (61% "certainly" and 29% "maybe").

Perceptions of manufacturing

The 2014 participant survey focused on the "perceptions of manufacturing" questions developed in 2013, which ask participants to rate their interest in science, technology, engineering and math (STEM) and manufacturing careers, as well as their awareness and perceptions of those careers. Respondents were asked to recall their opinions of these factors before they attended the Tour of Manufacturing, as well as comment on their opinions after attending the event. In all areas, participant attitudes toward STEM and manufacturing were more positive after the Tour of Manufacturing. Eight in ten (79%) participants left the event with positive perceptions of manufacturing careers (meaning they thought they were good), and 74 percent left the event with either "a lot" (39%) or "some" (35%) interest in manufacturing careers.

Participants' positive perceptions of manufacturing careers also saw the greatest increase of any other pre-post survey question. Whereas 199 people said they thought manufacturing careers were "good" before the Tour of Manufacturing, 297 felt this away after attending the event (Figure 8). Overall, 31 percent of respondents experienced a positive change in their perceptions of manufacturing careers (this means movement from any lower category into a higher one), while another 55 percent maintained their already positive perceptions of manufacturing careers (Figure 9).

8. Perceptions of manufacturing careers (pre- and post-Tour of Manufacturing)

Perceptions of manufacturing careers	Before Tour (N=374)	After Tour (N=377)	Change
I thought/think they were/are good	199	297	+98 people
I thought/think they were/are just OK	115	57	-58 people
I didn't/don't think they were/are good	8	3	-5 people
I didn't/don't think about them	32	7	-25 people
I'm not sure	20	13	-7 people

9. Change in perceptions of manufacturing careers (N=347)

Positive perceptions of manufacturing careers	N	%
Increased	107	31%
Maintained high positive perceptions	192	55%
Maintained moderate or low perceptions	42	12%
Decreased	6	2%

Note: *"Maintained high positive perceptions" means that the participant's interest level was "good" both before and after the Tour of Manufacturing. "Maintained moderate or low perceptions" means that participant interest level was either "okay," "not good" or "didn't think about it" both before and after the Tour of Manufacturing.*

In general, respondents' awareness of (30% increase) and interest in (24% increase) manufacturing careers saw greater increases than interest in STEM (18% increase).

Changes in perception also differed by demographic group.

- Participants age 26 through 45 saw the largest increases in interest (33%) and awareness (35%) of manufacturing careers as a result of the Tour of Manufacturing.
- Participants age 18 through 25 reported the largest increase in positive perceptions about manufacturing careers (47%).
- Participants age 46 and older experienced the largest increase in STEM interest (22%).
- In all questions gauging participants' perceptions of manufacturing before and after the Tour of Manufacturing, women showed larger increases in interest and positive perceptions than men.
- For both men and women, the greatest categorical increase was positive perceptions towards manufacturing careers (28% and 36%, respectively).

Participants were asked to select words they felt best described manufacturing careers from a list of five positive and five negative adjectives that might be used to describe those careers (Figure 10). All five positive adjectives were selected more often than any of the negative adjectives. The most common selections were "creative" (57%), "advanced" (49%), and "exciting" (37%).

10. Descriptions of manufacturing careers (N=372)

Words that best describe manufacturing careers	n	%
Creative	210	57%
Advanced	183	49%
Exciting	136	37%
Modern	128	34%
Fun	118	32%
Noisy	111	30%
Hard	97	26%
Dangerous	47	13%
Dirty	46	12%
Dark	7	2%

Note: *Percentages equal more than 100% because respondents were able to give multiple responses.*

Experiences of the Tour of Manufacturing hosts

Tour of Manufacturing hosts were generally pleased with the level of engagement shown by participants and greatly valued the opportunity to build awareness of and interest in manufacturing careers. Manufacturers found the event to be valuable in several ways.

- The *most valuable* aspects (offered by respondents in an open-ended question) were increased awareness (48%) and informing participants about manufacturing careers or the industry of manufacturing (48%).
- When asked about five specific items related to the value of the Tour of Manufacturing, a majority of respondents reported that building awareness of or interest in manufacturing as a career option (60%) was a "very valuable" component of the event. Three in ten (30%) reported that marketing or building awareness of their business to the general public was "very valuable," and 23 percent reported that identifying potential employees was a "very valuable" component of the Tour of Manufacturing.
- When asked about three items related to the success of the Tour of Manufacturing, over half (57%) said that "the engagement of Tour of Manufacturing participants" was "very successful" this year, 43 percent reported that they were "very successful" in the type of people they got to attend their tour, and 43 percent reported they were "very successful" in the number of participants.
- The *most successful* aspects of the Tour of Manufacturing, according to hosts, were the number of people who attended (26%), as well as the general interest expressed in the

event from those who attended (26%). Twenty-two percent said that the most successful aspect was educating or informing the public.

There were also some challenges reported by the Tour of Manufacturing hosts.

- The biggest challenges reported by respondents were providing staff time to lead the tours (29% reported very or somewhat challenging), the interruption of manufacturing processes (22%), and interrupting front or back office business functions (not related to manufacturing) (11%).
- In an open-ended question, several hosts also talked about the logistical challenges of hosting a tour.

When asked about planning for 2015, 68 percent of hosts surveyed said they would prefer to have the Tour of Manufacturing during Minnesota Manufacturers' Week, rather than on National Manufacturing Day (32%). Note: After some discussion, 360 staff decided to align Minnesota Manufacturers' Week with the National Manufacturing Day.

Conclusions

Overall, the findings from the Tour of Manufacturing surveys are positive. Participants had a high level of satisfaction with the tours, indicating that they increased their awareness of and interest in manufacturing careers as well as their positive perceptions of those careers. The increase in responses allowed Wilder to run analyses on questions by gender and age. We found that younger people had a greater increase in positive perceptions about manufacturing careers than older age groups; however, older participants showed larger increases in interest in STEM and awareness of manufacturing careers. Women had larger increases than men in positive perceptions of manufacturing on all questions.

Hosts were also generally pleased with the event and appreciated the public awareness and participant engagement. Few challenges were reported; therefore 360 staff and host businesses should continue the good work that they are doing informing schools and the public about manufacturing careers.

Building youth interest in manufacturing

To help better understand the impact of the youth outreach activities, Wilder helped 360 administer surveys with youth who participated in camps or events and youth and parents of youth who participated in VEX Robotics. The remainder of this section outlines the findings from these surveys related to youth interest and knowledge of manufacturing education and careers.

Youth events and summer camps

An important aspect of the 360 mission is to expose students to and increase enthusiasm for STEM-related careers. To this end, 360 and its partners hold technology and manufacturing events for youth, including summer camps with a focus on specific STEM and manufacturing topics. Wilder tracks basic information on any event tailored to youth outreach and conducts a brief survey of youth who specifically attend the summer camps.

Overall, tracking of the 2014 youth events shows that nearly 1,000 students age 9 through 18 participated in 18 youth outreach events, including summer camps, from March through November. (Readers should note, however, that this number is not unduplicated.) Out of 997 event participants, 440 overall were female and 173 were students of color. Events ranged from four hours in length to approximately 60, as several events took place over the course of multiple days; some events occurred overnight (Figure 11).

11. Basic information from 2014 youth outreach events

Total # of participants	# of females	# of participants of color	Est. # of learning hours	Age range of participants
162	43	14	4.5	16-18 years old
150	10	10	4	15-18 years old
130	60	30	6.5	11-18 years old
128	128	5	4	11-12 years old
127	127	7	4	11-12 years old
39	15	18	60	14-15 years old
37	20	17	17.5	9-12 years old
37	3	4	35	12-16 years old
32	6	26	30	11-13 years old
32	6	26	30	11-14 years old
24	6	0	30	12-17 years old
20	10	3	21	12-15 years old
15	1	1	16	11-14 years old
14	0	0	32.5	13-18 years old
13	3	0	32	11-17 years old
13	1	0	32	13-16 years old
13	1	12	32	13-17 years old
11	0	0	16	11-14 years old
997	**440**	**173**	**407**	**9-18 years old**

Methodology

To help understand the impact of the summer camps, 360 staff members distributed self-administrated questionnaires to participants at the end of each camp. In general, the same questions were asked of campers, with the exception of those at the St. Cloud Technical and Community College and Minneapolis Community and Technical College (MCTC) camps, where staff changed several of the survey questions. The questions on St. Cloud's survey were different enough that they are not included in this report, and MCTC is excluded from several questions, because they did not ask them on their revised survey.

In total, 184 youth participants completed the survey from nine different camps, hosted by: Anoka-Ramsey Community College; Bemidji State University; Central Lakes College; Hennepin Technical College; Minneapolis Community & Technical College; Northland Community & Technical College at two locations: East Grand Forks campus and Thief River Falls campus; Riverland Community College, and Saint Paul College. Camp sizes ranged from 8 to 40 participants. Findings from the survey are outlined below and detailed data tables are appended to this report. Also, readers should bear in mind that the pre-post questions (which analyze changes in attitude over time) were asked during the same survey. Participants were asked to recall their opinions from a time before they attended camp.

About camp participants

Boys outnumbered girls in camp attendance (74% to 26%). Most of the individual camps had a male majority, with the exception of the Saint Paul-Imagine it, Design it, Make it camp (63% female).

The average age of youth who participated in the survey was 13 years old, and students ranged from grade four through college. Survey participants primarily identified themselves as white (59%); and 22 percent identified with another racial or ethnic group. About two in ten youth chose not to disclose their race or ethnicity (19%). The majority of participants (90%) reported that at least one of their parents had attended college, with nearly three-quarters (74%) saying that both had attended. Six percent were unsure whether or not their parents had attended college.

Satisfaction with camps

When asked their opinion of the camp they attended, nearly all youth (98%) said they liked it at least "a little bit," and 83 percent liked it "a lot." After attending, nearly half of youth said that the best thing about camp was building robots or doing other hands-on work (49%). The next most common response was "other camp things" not related to robotics, such as swimming, the food, or teachers/counselors (18%) (Figure 12).

12. Best thing about camp (N=181)

Best thing about camp	n	%
Hands-on work/Building robots	89	49%
Other camp things (e.g. swimming, food, counselors)	32	18%
Using the finalized product (e.g. demolition derby, dump buckets)	17	9%
Meeting new people/Making new friends	15	8%
Dissecting	10	6%
Learning something new	9	5%
Everything	7	4%
It was fun (unspecified)	7	4%
Staying in the dorms	4	2%
Trying different classes/projects	3	2%
Being creative/designing	2	1%
Other	19	11%

Note: *Percentages equal more than 100% as respondents were able to give multiple reasons; Open-ended responses to the questions were coded into the above categories.*

When asked if they would refer their friends to the summer camp they attended, 51 percent said "yes, definitely" and another 41 percent said "yes, maybe." Two percent would not recommend their camp and five percent were unsure if they would.

Interest and confidence in STEM

Although participants clearly entered camp with a strong interest in science, technology, engineering, and math (48% said they had a lot of interest), interest rose by 13 percentage points, to 61 percent, by the end of camp. This increase was more dramatic for girls than it was for boys, but girls also started out with a lower level of interest in STEM. Thirty-six percent of girls reported that they had a lot of interest in STEM at the beginning of camp and 64 percent said the same at the end (compared to 53% and 61% of boys).

Similarly, youth confidence in STEM abilities rose throughout their camp attendance. Less than four in ten (39%) reported they had "a lot" of confidence in their abilities before camp, while nearly six in ten (59%) reported the same after attending their camp. Boys were more confident at the beginning and end of camp than girls. Nearly half of boys (46%) started with high levels of confidence and 58 percent finished camp with high levels of confidence. In contrast, girls' confidence in their STEM abilities rose more over the course of their camp participation. Twenty-four percent said they had a lot of confidence at the beginning of camp; by the end, 62 percent felt this way.

Awareness and perceptions of manufacturing careers

In addition to increasing interest and confidence in STEM, the summer camps made youth more aware of manufacturing careers and greatly improved their perceptions of these careers (Figure 13). By the end, 51 percent of participants said they had "a lot" of awareness, versus 27 percent at the beginning of camp. This awareness increased for both boys (34% and 57%) and girls (10% and 53%); however, as with other categories, the increase was more notable for girls.

13. Awareness of manufacturing careers (pre- and post-camp)

Aware of manufacturing careers	Before camp (N=167)	After camp (N=162)	Change
A lot	27%	51%	+24
Some	36%	31%	-5
Very little	26%	16%	-10
Not at all	11%	3%	-8

Note: *The MCTC summer camp is excluded from these responses, as they did not ask these questions on their survey.*

Of all the pre-post questions asked in the survey, the greatest change came in the perceptions that youth have of manufacturing careers (This was also the case in the 2013 summer camp survey). Only 31 percent of youth reported that they thought of manufacturing careers as good before camp, while 59 percent said the same after attending camp (Figure 14). Over four in ten (43%) participants increased their positive opinion of manufacturing careers. "Increase" indicates movement upward from any level, whether that is "I didn't think about them" to "I think they are just OK" or "I thought they were just OK" to "I think they are good." Girls, in particular, experienced a jump in positive perceptions towards manufacturing careers, from 24 percent before camp to 64 percent after camp.

14. Perceptions of manufacturing careers (pre- and post-camp)

Perceptions of manufacturing careers	Before camp (N=166)	After camp (N=164)	Change
I thought/think they were/are good	31%	59%	+28
I thought/think they were/are just OK	39%	29%	-10
I didn't/don't think they were/are good	7%	4%	-3
I didn't/don't think about them	16%	2%	-14
I'm not sure	8%	6%	-2

Note: *The MCTC summer camp is excluded from these responses, as they did not ask these questions on their survey.*

Youth were also asked to consider adjectives that describe manufacturing careers. In a structured question that provided 10 adjectives (5 positive and 5 negative), the most common responses were that manufacturing careers are creative (74%) and fun (65%). Negative adjectives, such as dark, dangerous, or dirty, were not selected as often by participants. The negative adjective selected most often was "noisy" (54%).

Given their increased awareness and positive perceptions of manufacturing, it is not surprising that interest in manufacturing careers also increased; however, this increase was less dramatic. One-quarter of participants (25%) said they had a lot of interest in manufacturing careers before camp, whereas 30 percent said the same after camp (Figure 15). Both boys and girls increased their interest in manufacturing careers, with 34 percent of boys and 18 percent of girls expressing "a lot" of interest by the end of camp (compared to 29% of boys and 14% of girls before camp).

15. Interest in manufacturing careers (pre- and post-camp)

Interested in manufacturing careers	Before camp (N=168)	After camp (N=162)	Change
A lot	25%	30%	+5
Some	33%	42%	+9
Very little	27%	24%	-3
Not at all	16%	5%	-11

Note: *The MCTC summer camp is excluded from these responses, as they did not ask these questions on their survey.*

The length of a camp did not appear to make much difference in changing perceptions of STEM or manufacturing careers. Participants at shorter camps were slightly more likely to increase in the following areas: interest in STEM (+17 percentage points, versus +12 percentage points at longer camps); perception of manufacturing careers (shorter camps: +24, longer camps: +20); and interest in manufacturing careers (shorter camps: +9, longer camps: +4). Again, however, this is not a dramatic difference.

Conclusions

Overall, the findings from the summer camp surveys are positive. Respondents had a high level of satisfaction with the camps, youth are engaged and learning, and the camps appear to have a positive impact on perspectives regarding STEM and manufacturing careers, particularly for girls.

VEX Robotics program

The VEX Robotics program is the other primary activity for engaging youth. VEX Robotics engages teams of young people in building robot kits and competing with other teams at scrimmages and tournaments where their robots complete tasks. The program is intended to build technical and teamwork skills while also building interest and confidence in STEM and manufacturing fields.

Methodology

In order to help gauge the success of the VEX program at reaching its goals, as well as the satisfaction of participating youth and adults, Wilder sent a web-based survey to 174 adults involved with the VEX Robotics program, including parents, coaches, and teachers. To reach youth, evaluators sent the youth survey link to 224 e-mail addresses of youth or their parents. Parents were asked to forward the link to their children, and both groups were instructed to forward the survey to other adults or youth who may have been involved. In total, 76 adults and 74 youth completed the survey. The survey was sent to participants in February, following the final, statewide tournament that took place January 23-24.

About event participants

The average age of youth who participated in the survey was 14 years old; 68 percent of respondents were male. Most participants (86%) identified as white; another five percent said they were Asian American or Pacific Islander, three percent were American Indian or Native American, two percent stated they were Hispanic, and four percent said they did not know their race or preferred not to answer. Sixty-two percent had attended at least one VEX scrimmage. A majority of participants (60%) were competing with their high school team.

With respect to adult respondents, over half (57%) were female. Ninety-seven percent of adults identified as white and 3 percent of respondents said they preferred not to answer. When asked to define their primary role in the competition, 61 percent identified as parents, while 39 percent indicated they were primarily a teacher or coach. Only three percent played both roles. Eighty-six percent said their child or team participated in VEX through school, primarily high school. Another 10 percent said their child or team participated through Boy Scouts or Girl Scouts. Four percent participated through 4-H, and 7 percent participated another way.

Satisfaction with the program

Participants were "very satisfied" with the overall VEX Robotics program (81% of adults, 78% of youth), as well as the competitions themselves (78% of adults, 69% of youth; and most would "definitely" recommend the program to others (92% of adults, 85% of youth).

Youth changes in knowledge and skills

All respondents were asked about skills that youth might have learned through their participation in the program (Figure 16). Overall, youth were more likely than adults to report that they [youth] had learned these skills "very well." The top skills youth felt they had learned "very well" were working by trial and error (73% adults, 72% youth), imagination and creativity (58% adults, 74% youth), and problem solving (59% adults, 67% youth).

16. Skills learned by working with a VEX team, youth and adult perspectives

	Very well		Somewhat well		Not very well or not at all	
How well did youth learn…	**Adults**	**Youth**	**Adults**	**Youth**	**Adults**	**Youth**
Working by trial and error	73%	72%	27%	24%	0%	3%
Problem solving	59%	67%	38%	28%	1%	4%
Imagination or creativity	58%	74%	33%	24%	8%	2%
Visualizing (for example, seeing a concept or finding the solution to a problem in your mind)	48%	61%	41%	30%	8%	8%
Reaching agreement with your teammates	47%	59%	47%	32%	6%	9%
Keeping the team motivated	40%	52%	53%	35%	7%	14%
Leadership	40%	55%	49%	35%	7%	11%
Making the most of your time	27%	47%	55%	38%	16%	15%

Note: *N=73-74 for the adults survey and N=67 for the youth survey. Due to rounding, percentages may not add up to 100%. Some rows might be less than 100% because of respondents answering "don't know."*

Perceptions of manufacturing and STEM

The survey asked participants to describe how confident they are in their ability to do science, technology, engineering, or math (STEM). Only 39 percent said they had "a lot" of confidence in their abilities before participating, but after participating that number rose to 71 percent. Interest in STEM also increased. Before participating, 53 percent of participants said they had "a lot" of interest in STEM but 83 percent reported "a lot" of interest after participating.

Overall, youth were likely to consider taking classes or following careers in STEM, but were less likely to consider a career in manufacturing (Figure 17). Sixty-eight percent of participants said they were "very likely" to take a STEM course in high school and 60 percent said the same of studying a STEM field in college. Sixty-four percent of youth indicated they were very likely to consider a STEM career, whereas only 34 percent said the same of manufacturing careers. While youth were less likely to say they would consider a manufacturing career, the VEX program did increase awareness of these careers (24% of youth said they were aware of manufacturing careers before the program, while 65% said the same afterwards).

17. Youth's likelihood to consider science and manufacturing for the future

N=65	Very likely	Somewhat likely	Not very likely	Not at all likely	Not sure
Take elective science, technology, engineering, or math courses in high school?	68%	26%	2%	0%	5%
Consider a career in science, technology, engineering, or math?	64%	27%	6%	0%	3%
Consider studying science, technology, engineering, or math in college?	60%	34%	3%	0%	3%
Consider a career in manufacturing?	34%	38%	23%	2%	3%

Note: *Due to rounding, percentages may not add up to 100%.*

Overall, the VEX program increased positive perceptions of manufacturing careers in both youth and adults (Figure 18). After participating in the program, 90 percent of adults and 64 percent of youth thought manufacturing careers were "good." Adults had a more positive perception of manufacturing careers than youth both before and after VEX, though it should be noted that 53 percent were employed in a STEM field.

18. Perceptions of manufacturing careers, adults and youth

How do you feel about manufacturing careers…	Before		After		Change	
	Adults	Youth	Adults	Youth	Adults	Youth
Think they are good	54%	29%	90%	64%	+36	+35
Think they are just OK	32%	48%	7%	27%	-25	-21
Don't think they are good	1%	3%	0%	2%	-1	-1
Don't think about them	10%	18%	1%	6%	-9	-12
I am not sure	3%	2%	1%	2%	-2	0

Note: *N=72-74 for the adults survey and N=66 for the youth survey. Due to rounding, percentages may not add up to100%.*

When given a list of manufacturing-related words, participants much more frequently associated manufacturing careers with positive terms than negative ones (Figure 19). Seventy percent said manufacturing careers were "fun" and 69 percent said they were "creative."

19. Words that describe manufacturing careers

N=61	n	%
Fun	43	70%
Creative	42	69%
Advanced	41	67%
Exciting	34	56%
Modern	30	49%
Hard	24	39%
Noisy	24	39%
Dirty	20	33%
Dangerous	17	28%
Dark	5	8%

Note: *Percentages equal more than 100% as respondents were able to give multiple responses.*

Overall, the VEX program has successfully built awareness and positive perceptions in STEM and manufacturing careers. Youth also showed increased interest in studying and pursuing careers in STEM and manufacturing, and reported developing skills needed for these fields, such as problem solving and working through trial and error. While youth awareness of manufacturing careers and perceptions of those careers have increased, youth are not considering manufacturing careers in the same way they would STEM careers. In order to further increase interest in manufacturing careers, the VEX program may want to include more employers, provide more information about manufacturing careers, and incorporate practical manufacturing activities into the tournament.

Developing the pipeline to increase numbers of students and graduates

Building youth interest in manufacturing is only part of the work that the 360 Center has done through the NSF grant. The Center also provides better access to education through a more integrated curriculum, with the goal of increasing the number of students and graduates in 360-related programs (see an inventory of these programs appended to this report). This section outlines key findings from data pulled from MnSCU's Integrated Statewide Record System (ISRS) relating to students and graduates.

As 360 has grown, some changes have been made to the ISRS data. This year, 360 revised the list of academic programs related to its work by removing some academic programs that were not closely aligned with manufacturing. This change was applied across all years, so historical data may vary from what was reported previously. Data based on categories of less than 10 students are suppressed.

Though 360 has expanded to include new partner institutions, only original partners are included in the data shown here. New partners were omitted because they would not share the same kind of outcomes as older partners. Additional analyses for these partners may be available in the future.

Student enrollments

As part of the ISRS data received from MnSCU's Office of Research, Data Analysis, and Reporting, Wilder tracked student enrollments between 2010 and 2015 (the current school year); however, 2015 enrollment numbers should be considered preliminary, as it appears some institutions were missing data for Spring 2015. Student enrollments represent the number of students enrolled in each program for each term of the school year. The enrollment numbers are duplicated counts of the students in the 360-related programs. Therefore, enrollments should be considered a measure of activity in programs, not a definitive count of individuals participating in 360 programs.

Overall, enrollments increased during the last two years, and increased most among high school students. The following sections describe the findings related to enrollments.

Increased enrollments

Student enrollments in 360-related programs increased during 2013 and 2014. The average student enrollment between 2010 and 2012 school years was 3,192. Using this average as a baseline, student enrollments increased by seven percent in 2013 and 23 percent in 2014. In 2015, enrollment declined from the previous year (Figure 20). Wilder is working with MnSCU to identify the source of this decline, which is likely incomplete data for spring 2015 enrollment.

20. 360 program enrollment by year and program area

	2010	2011	2012	2013	2014	2015*
Engineering	59	52	49	84	146	100
Engineering technologies and engineering-related fields	1363	1368	1290	1323	1463	1095
Mechanic and repair technologies/technicians	215	208	183	147	153	90
Precision production	1562	1558	1461	1790	2096	1147
Business, management, marketing, and related support services	95	50	64	66	53	46
360 TOTAL	3294	3236	3047	3410	3911	2478

Note: *An "enrollment" is any time a student enrolled for coursework in a Center program for any term of the school year. A single student could be enrolled in multiple programs and in multiple terms within or across years, so enrollment numbers represent a duplicated student count.*

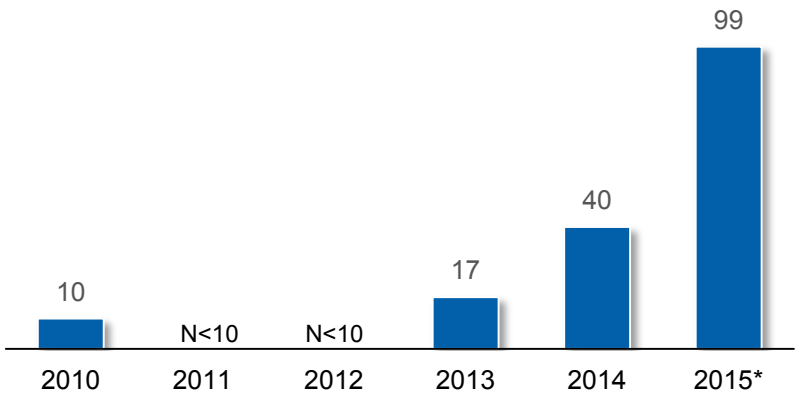
**Enrollment counts for 2015 are preliminary and may be incomplete.*

Large increases in enrollments among young people

The 360 ATE Center has focused significant resources and strategy on youth outreach and building interest in manufacturing careers and access to manufacturing education among young people, which makes enrollment changes in these populations a valuable measure.

To this end, the 360-related courses have experienced substantial enrollment increases among high school students and young people. Enrollments among high school students were almost nonexistent in the three years prior to the ATE grant. Compared to the baseline average, the number of high school student enrollments increased by more than five times in 2014 and more than twelve times in 2015 (Figure 21).

21. High school students enrolled in 360 courses



**Enrollment counts for 2015 are preliminary and may be incomplete.*

Compared to 2014, the total number of young people (age 18 or younger) has remained steady at 410 in 2015.

Slight increase in students of color, but other diversity measures unchanged

While overall enrollments numbers are up, the proportion of female students, students of color, and first-generation college students remains similar to the baseline years (Figure 22). Enrollment for students of color has increased slightly, a four percentage point increase from the baseline average of 19 percent.

22. Demographics of student enrollments (baseline, 2013, and 2014)

	Baseline (2010-2012)	2013	2014	2015*
Students of color	19%	21%	21%	23%
Female students	7%	7%	6%	7%
First-generation college students	26%	26%	26%	25%

**Enrollment counts for 2015 are preliminary and may be incomplete.*

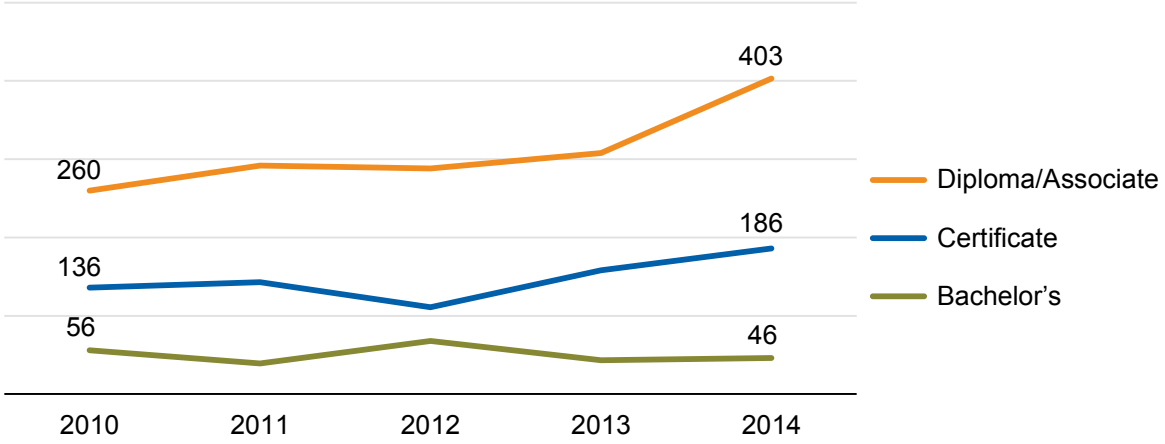
Graduates

The 360 ATE Center seeks to increase the number and diversity of graduates in 360-related programs at partner institutions. However, graduates represent a lagging indicator, since it can take years to inspire, recruit, and educate students before they obtain a degree. Even so, the number of graduates from these programs has increased considerably, while outcomes on diversity measures remain similar to baseline.

Increase in graduates at 360 partner institutions

In 2014, the number of graduates at 360 partner institutions increased by 36 percent, from an average of 466 degrees awarded per year between 2010 and 2012 to 636 in 2014. Three-fifths (61%) of the 2,550 degrees awarded during that time were diplomas or associates degrees, 29 percent were certificates, and 10 percent were bachelor degrees. Figure 23 shows the substantial increase in diploma/associate recipients between 2013 and 2014, whereas growth in certificates outpaced diploma/associate degrees in the year prior. Bachelor's degrees represent the only decrease from the baseline.

23. 360 ATE graduates by award level and year

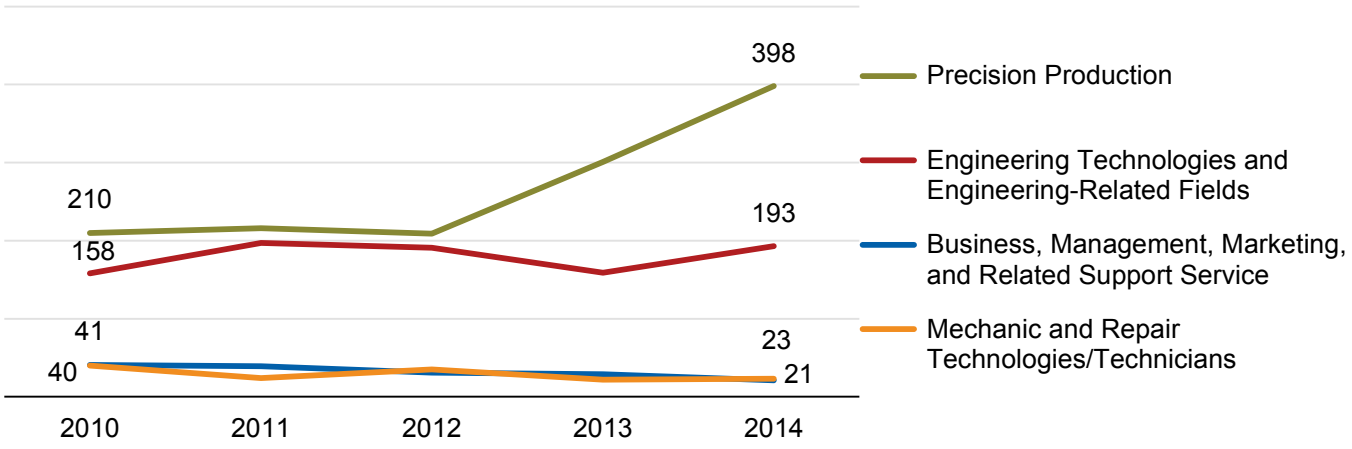


Note: *A small number of students graduated with master's degrees each year (N<10). They are omitted from this table.*

Precision Production is driving growth in graduates

In most fields, the number of graduates over time has remained fairly steady since baseline. However, there has been a substantial increase in Precision Production, which includes majors in welding, machining, and CNC operation/programming (Figure 24). In 2014, there were a total of 398 graduates in the field, an increase of 88 percent over the baseline average of 212. Across all MnSCU schools, the number of Precision Production graduates only increased by 48 percent during the same period. Additional information on program growth can be found in the Appendix.

24. 360 ATE graduates by program area and year



Note: *Due to the small number of graduates annually (N<10), engineering graduates have been omitted from the graph.*

Demographics of graduates

The 360 Center has identified three key groups in which it would like to increase diversity: female graduates, graduates of color, and first-generation college graduates. In 2014, the number of female graduates decreased slightly to six percent of all graduates. Graduates of color increased from an average of 12 percent during the three year baseline to 16 percent of total graduates in 2014. First-generation college graduates increased slightly, from an average of 23 percent during the baseline years to 26 percent in 2014.

The demographics of graduates vary by the type of award the graduate receives (Figure 25). The following bullets represent a few key findings to note from the graduate demographic data:

- At the Certificate and Diploma/Associate levels, diversity in 360 partner institutions is on par with or greater than that of 360-related programs at all MnSCU institutions.
- At 360 partner schools, women accounted for 17 percent of Certificate graduates, compared to 10 percent system-wide.
- Graduates from Certificate programs are generally more diverse than those in Diploma/Associate or Bachelor's programs.

Increased diversity in Certificate graduates is a positive sign and could be a leading indicator for increased diversity in Diploma/Associate programs. Certificates may be awarded after the first year of a two-year diploma or associate program, which could yield increased diversity for the Diploma/Associate group in the coming year.

25. Demographics of graduates from 360-related programs by award level

Graduates of 360-related programs at PARTNER institutions	Certificate	Diploma/ Associate	Bachelor's	All awards
Graduates of color	22%	14%	11%	16%
Female graduates	17%	5%	7%	9%
First-generation college	26%	28%	11%	26%
20 years old or younger	19%	28%	9%	24%
21-24 years old	18%	20%	57%	22%
25-34 years old	35%	28%	17%	29%
35+ years old	26%	24%	15%	24%
Graduates of 360-related programs at ALL institutions	**Certificate**	**Diploma/ Associate**	**Bachelor's**	**All awards**
Graduates of color	20%	14%	13%	15%
Female graduates	10%	7%	2%	8%
First-generation college	25%	23%	11%	23%
20 years old or younger	23%	30%	6%	28%
21-24 years old	20%	21%	56%	22%
25-34 years old	29%	27%	22%	27%
35+ years old	28%	21%	15%	23%

Note: *"All awards" column includes Master's degrees (N<10).*

Balanced Scorecard

As mentioned in the summary of this report, Wilder also designed a Balanced Scorecard dashboard to align the 360 Center's activities to its vision and strategy and to monitor performance. The evaluation selected the most important measures from an extensive list compiled over the first two years of the evaluation that fit in four distinct organizational perspectives – customer, financial, internal processes, and learning and growth. These measures are described briefly below.

Customer Perspective

- **Increased number of technicians:** Since 2010, 360-related programs have produced 2,550 graduates, including 636 graduates in academic year 2014.
- **Enrollment growth:** 360-related programs averaged 3,192 enrollments per year between the 2010 and 2012 academic years, and exceeded that average baseline by 7% in the 2013 academic year, and 23% in the 2014 academic year.

- **Youth engagement:** The Center counted a total of 3,162 youth engaged in 360-related content or the Dream It. Do It. message.
- **Increased youth interest in manufacturing:** 55% of youth surveyed at 360-sponsored events from June 2013 through November 2014 reported increased (or consistently high) interest in manufacturing careers before and after that youth engagement activity. This represents 167 youth who reported increased interest and 106 who reported consistently high interest.
- **College students impacted:** The Center estimates that it directly impacted the education of 284 college students in the current academic year.

Financial Perspective

- **Number of funding sources:** The Center has seven funding sources that provided at least $5,000 in FY15.
- **Earned income:** The Center has six sources of earned income totaling $26,800 in FY15.
- **Sponsorships:** The Center had 11 sponsorships totaling $38,150 of direct (cash) support in FY15.
- **Quarterly cash flow:** The Center has secured more than $400,000 in cash flow per quarter for the next year, and has secured about $175,000 per quarter through the end of 2016.

Internal Processes Perspective

- **Quality of collaboration:** The Center had an average aggregate collaboration score of 4.22 in 2014. This score was based on 172 ratings (29 stakeholders responding to six questions) from the Wilder Collaboration Factors Inventory. The Collaboration Factors Inventory considers anything over a 4.0 to be a "strength."
- **Quality of operations:** The Center had an average aggregate operations score of 4.30 in 2014. This score was based on 230 ratings (29 stakeholders responding to eight questions) from the Wilder Collaboration Factors Inventory. The Collaboration Factors Inventory considers anything over a 4.0 to be a "strength."
- **College partner engagement:** The 15 college partners of the Center averaged 6.5 out of 11 possible engagement points in 2015.
- **Learning and growth:** This includes staff development, Strategy Council updates, and a review of industry needs; however, no data have been collected on these components yet.

Considerations

The 360 ATE Center has now completed three years of its NSF ATE grant and is showing substantial progress toward its goals. The following have been identified as particularly positive aspects of the Center's work:

- **360 activities are producing positive perceptions.** Data from all of the 360-related activities – the Tour of Manufacturing, VEX Robotics, and summer camps – show that survey respondents report improved perceptions of STEM and manufacturing careers after their participation in an event.

- **The numbers show increased youth enrollment.** The numbers of high school students and youth (<18) enrolled in 360 programs continued to climb in 2015. This is encouraging, given the Center's focus on building interest among youth through focused events like the summer camps and VEX robotics competition.

- **Graduate numbers continue to increase.** The Center-related programs show large increases in graduates over the baseline years and last year. Because this growth is in programs that generally take fewer than two years to complete and among younger students (both of which are targets of 360), it appears as though the promotion and pipeline development work done by 360 is paying off.

- **Diversity among graduates has increased since baseline.** Graduates of color increased from an average of 12 percent during the three year baseline period to 16 percent of total graduates in 2014. In addition, first-generation college graduates increased slightly, from an average of 23 percent during the baseline years to 26 percent in 2014.

While the Center has seen many positive outcomes related to its work, the following represent issues to consider for continuous improvement:

- **There may have been a drop in 2015 enrollment.** Preliminary enrollment numbers for 360 programs show significant drops in 2015. These numbers are not yet final, and evaluators are investigating what may have caused this drop.

- **Decrease in female graduates.** While there were more students of color graduating from 360 programs, the number of female graduates decreased slightly from nine percent in 2013 to six percent of all graduates in 2014. However, demographics varied by type of award. For example, at 360 partner schools, women accounted for 17 percent of Certificate graduates, compared to 10 percent system-wide. Again, increased diversity in Certificate graduates is a positive sign and could be a leading indicator for

increased diversity in Diploma/Associate programs. Certificates may be awarded after the first year of a two-year diploma or associate program, which could yield increased diversity for the Diploma/Associate group in the coming year.

In conclusion, the 360 ATE Center is succeeding in its work to increase the number of skilled technicians in the Minnesota manufacturing sector, and is doing so through the strategies of promoting the manufacturing industry and education, improving pathways and options for potential students, and increasing the quality of programing available to those in the field.

Appendices

Tour of Manufacturing survey data tables

Participant survey

A1. How participants heard about the Tour (N=391)

	N	%
Newspaper	119	30%
School (e.g., fellow student or teacher)	99	25%
Family member or friend	78	20%
Work (e.g., employer or another employee)	48	12%
Tour of Manufacturing website	22	6%
Chamber of Commerce	21	5%
Signs or other marketing in town	9	2%
Manufacturer	7	2%
Radio	3	1%
Facebook	3	1%
Twitter	0	0%
Other (please specify)	36	8%
Other	19	5%
Central Minnesota Manufacturers Association	8	2%
An email/electronic newsletter	2	1%
Knew about it from last year	2	1%
Missing	3	1%
Social Media (other than Twitter and Facebook)	1	<1%
Internet search	1	<1%

Note: *Percentages may equal more than 100% as respondents were able to give multiple responses.*

A2. Overall satisfaction with the Tour (N=391)

	N	%
Very satisfied	296	76%
Satisfied	90	23%
Dissatisfied	2	1%
Very dissatisfied	3	1%

A3. Change in interest in STEM (N=372)

	N	%
Increased	66	18%
Maintained high interest	142	38%
Maintained moderate or low interest	147	40%
Decreased	17	5%

Note: *"Maintained high interest" means that the participant's interest level was "A lot" both before and after the Tour of Manufacturing. "Maintained moderate or low interest" means the participant's interest level was either "some", "very little" or "not at all" both before and after the Tour of Manufacturing.*

A4. Change in interest in manufacturing careers (N=355)

	N	%
Increased	85	24%
Maintained high interest	88	25%
Maintained moderate or low interest	171	48%
Decreased	11	3%

Note: *"Maintained high interest" means that the participant's interest level was "A lot" both before and after the Tour of Manufacturing. "Maintained moderate or low interest" means the participant's interest level was either "some", "very little" or "not at all" both before and after the Tour of Manufacturing.*

A5. Change in awareness of careers in manufacturing (N=359)

	N	%
Increased	106	30%
Maintained high awareness	114	32%
Maintained moderate or low awareness	127	35%
Decreased	12	3%

Note: *"Maintained high awareness" means that the participant's awareness level was "A lot" both before and after the Tour of Manufacturing. "Maintained moderate or low awareness" means the participant's awareness level was either "some", "very little" or "not at all" both before and after the Tour of Manufacturing.*

A6. Change in perceptions of manufacturing careers (N=347)

	N	%
Increased	107	31%
Maintain high positive perception	192	55%
Maintained moderate or low perception	42	12%
Decreased	6	2%

Note: *"Maintained high positive perception" means that the participant's perception level was "good" both before and after the Tour of Manufacturing. "Maintained moderate or low perception" means the participant perception level was either "okay", "not good" or "didn't think about it" both before and after the Tour of Manufacturing.*

A7. Interest in STEM (pre- and post-Tour)

Interested in science, technology, engineering, or math	Before Tour (N=361)	After Tour (N=374)	Change
A lot	154 (43%)	187 (50%)	+33 people
Some	160 (44%)	145 (39%)	-15 people
Very little	50 (14%)	27 (7%)	-23 people
Not at all	15 (4%)	15 (4%)	0 people

A8. Interest in manufacturing careers (pre- and post-Tour)

Interested in manufacturing careers	Before Tour (N=361)	After Tour (N=357)	Change
A lot	95 (26%)	139 (39%)	+44 people
Some	140 (39%)	126 (35%)	-14 people
Very little	81 (22%)	50 (14%)	-31 people
Not at all	45 (12%)	42 (12%)	-3 people

A9. Awareness of careers in manufacturing (pre- and post-Tour)

Aware of careers in manufacturing	Before Tour (N=366)	After Tour (N=361)	Change
A lot	121 (33%)	186 (52%)	+65 people
Some	154 (42%)	135 (37%)	-19 people
Very little	73 (20%)	24 (7%)	-49 people
Not at all	18 (5%)	16 (4%)	-2 people

A10. Perceptions of manufacturing careers (pre- and post-Tour)

Perceptions of manufacturing careers	Before Tour (N=374)	After Tour (N=377)	Change
I thought/think they were/are good	199 (53%)	297 (79%)	+98 people
I thought/think they were/are just OK	115 (31%)	57 (15%)	-58 people
I didn't/don't think they were/are good	8 (2%)	3 (1%)	-5 people
I didn't/don't think about them	32 (9%)	7 (2%)	-25 people
I'm not sure	20 (5%)	13 (3%)	-7 people

A11. Adjectives for manufacturing careers, open-ended (N=267)

	N	%
Hard-working/motivated/dedicated	48	18%
Interesting/fun/exciting	48	18%
Smart/educated	37	14%
Technological/good at math/science/programming/designing/	21	8%
Precision/detailed	21	8%
Creative/inventive/problem solver	18	7%
Talented/skilled	16	6%
Highly paid/good job/career	14	5%
Challenging/difficult/dangerous/intense	9	3%
Doing boring/dull/tedious/repetitive work	8	3%
Machines/metal	8	3%
Essential/important/needed/critical	5	2%
Hands-on/builder/welder/constructing things	3	1%
Someone I know (e.g., dad, mom, uncle, aunt)	2	1%
Dirty/smelly	2	1%
Nothing	2	1%
Tired	1	<1%
Other	44	17%

Note: *Percentages may equal more than 100% as respondents were able to give multiple responses; Open-ended responses to the questions were coded into the above categories.*

A12. Descriptions of manufacturing careers (N=372)

	N	%
Creative	210	57%
Advanced	183	49%
Exciting	136	37%
Modern	128	34%
Fun	118	32%
Noisy	111	30%
Hard	97	26%
Dangerous	47	13%
Dirty	46	12%
Dark	7	2%

Note: *Percentages may equal more than 100% as respondents were able to give multiple responses.*

A13. Gender (N=371)

	N	%
Male	227	58%
Female	144	37%
Missing	22	6%

A14. Age (N=371)

	N	%
Under 18	82	22%
18-25 years old	37	10%
26-45 years old	84	23%
46 and older	168	45%

Cross-tabs by age

Due to the higher number of survey responses, Wilder Research was able to run analyses on questions by age and gender. These crosstabs are reported below.

A15. Change in interest in STEM, by age

		Under 18 (N=77)	18-25 (N=37)	26-45 (N=84)	46 and older (N=155)
Increased (N=60)	%	12%	11%	16%	22%
	N	9	4	13	34
Maintained high interest (N=136)	%	33%	30%	41%	43%
	N	25	11	34	66
Maintained moderate or low interest (N=142)	%	52%	54%	41%	31%
	N	40	20	34	48
Decreased (N=15)	%	4%	5%	4%	5%
	N	3	2	3	7

Note: *"Maintained high interest" means that the participant's interest level was "A lot" both before and after the Tour of Manufacturing. "Maintained moderate or low interest" means the participant's interest level was either "some", "very little" or "not at all" both before and after the Tour of Manufacturing*

A16. Change in interest in manufacturing careers, by age

		Under 18 (N=80)	18-25 (N=36)	26-45 (N=80)	46 and older (N=141)
Increased (N=81)	%	21%	22%	33%	21%
	N	17	8	26	30
Maintained high interest (N=81)	%	20%	11%	28%	28%
	N	16	4	22	39
Maintained moderate or low interest (N=78)	%	58%	61%	36%	48%
	N	46	22	29	67
Decreased (N=11)	%	1%	6%	4%	4%
	N	1	2	3	5

Note: *"Maintained high interest" means that the participant's interest level was "A lot" both before and after the Tour of Manufacturing. "Maintained moderate or low interest" means the participant's interest level was either "some", "very little" or "not at all" both before and after the Tour of Manufacturing.*

A17. Change in awareness of careers in manufacturing, by age

		Under 18 (N=78)	18-25 (N=35)	26-45 (N=80)	46 and older (N=147)
Increased (N=99)	%	21%	23%	35%	32%
	N	16	8	28	47
Maintained high awareness (N=107)	%	26%	20%	39%	33%
	N	20	7	31	49
Maintained moderate or low awareness (N=122)	%	53%	51%	25%	29%
	N	41	18	20	43
Decreased (N=12)	%	1%	6%	1%	5%
	N	1	2	1	8

Note: *"Maintained high awareness" means that the participant's awareness level was "A lot" both before and after the Tour of Manufacturing. "Maintained moderate or low awareness" means the participant's awareness level was either "some", "very little" or "not at all" both before and after the Tour of Manufacturing.*

A18. Change in perceptions of manufacturing careers, by age

		Under 18 (N=74)	18-25 (N=30)	26-45 (N=78)	46 and older (N=159)
Increased (N=105)	%	30%	47%	26%	31%
	N	22	14	20	49
Maintained high perception- (N=190)	%	42%	33%	69%	60%
	N	31	10	54	95
Maintained moderate or low perception- (N=40)	%	26%	17%	5%	8%
	N	19	5	4	12
Decreased (N=6)	%	3%	3%	0%	2%
	N	2	1	0	3

Note: *"Maintained high perception" means that the participant's perception level was "good" both before and after the Tour of Manufacturing. "Maintained moderate or low perception" means the participant perception level was either "okay", "not good" or "didn't think about it" both before and after the Tour of Manufacturing.*

Cross-tabs by gender

A19. Change in interest in STEM, by gender

		Male (N=216)	Female (N=137)
Increased (N=61)	%	10%	29%
	N	21	40
Maintained high interest (N=135)	%	48%	23%
	N	104	31
Maintained moderate or low interest (N=142)	%	38%	45%
	N	81	61
Decreased (N=15)	%	5%	4%
	N	10	5

Note: *"Maintained high interest" means that the participant's interest level was "A lot" both before and after the Tour of Manufacturing. "Maintained moderate or low interest" means the participant's interest level was either "some", "very little" or "not at all" both before and after the Tour of Manufacturing.*

A20. Change in interest in manufacturing careers, by gender

		Male (N=206)	Female (N=132)
Increased (N=80)	%	18%	32%
	N	38	42
	%	31%	14%
Maintained high interest (N=82)	N	63	19
Maintained moderate or low interest (N=165)	%	47%	52%
	N	97	68
Decreased (N=11)	%	4%	2%
	N	8	3

Note: *"Maintained high interest" means that the participant's interest level was "A lot" both before and after the Tour of Manufacturing. "Maintained moderate or low interest" means the participant's interest level was either "some", "very little" or "not at all" both before and after the Tour of Manufacturing.*

A21. Change in awareness of careers in manufacturing, by gender

		Male (N=207)	Female (N=134)
Increased (N=98)	%	22%	39%
	N	46	52
Maintained high awareness (N=108)	%	38%	22%
	N	79	29
Maintained moderate or low awareness (N=123)	%	37%	34%
	N	77	46
Decreased (N=12)	%	2%	5%
	N	5	7

Note: *"Maintained high awareness" means that the participant's awareness level was "A lot" both before and after the Tour of Manufacturing. "Maintained moderate or low interest" means the participant's awareness level was either "some", "very little" or "not at all" both before and after the Tour of Manufacturing.*

A22. Change in perceptions of manufacturing careers, by gender

		Male (N=210)	Female (N=131)
Increased (N=105)	%	28%	36%
	N	58	47
Maintained high perception (N=190)	%	58%	52%
	N	122	68
Maintained moderate or low perception (N=40)	%	13%	10%
	N	27	13
Decreased (N=6)	%	1%	2%
	N	3	3

Note: *"Maintained high perception" means that the participant's perception level was "good" both before and after the Tour of Manufacturing. "Maintained moderate or low perception" means the participant's perception level was either "okay", "not good" or "didn't think about it" both before and after the Tour of Manufacturing.*

Host survey closed-ended question responses

A23. Days of Tour of Manufacturing participation (N=34)

	N	%
Tuesday, October 21	1	3%
Wednesday, October 22	2	6%
Thursday, October 23	19	56%
Friday, October 24	12	35%
Saturday, October 25	6	18%

Note: *Percentages may equal more than 100% as respondents were able to give multiple responses.*

A24. How hosts heard about the Tour of Manufacturing (N=32)

	N	%
Manufacturing association	9	28%
Received an email about the Tour	7	22%
Local chamber of commerce	6	19%
Tourofmanufacturingmn.com	1	3%
State Chamber of Commerce	1	3%
Other (please specify)	8	25%

Note: *"Other" common responses included: the Minnesota Department of Employment and Economic Development, John Klein, a local paper, grant, and having participated before.*

A25. Primary audience for your tour (N=32)

	N	%
Schools	13	41%
Community	6	19%
Both schools and community	13	41%

A26. Was your tour open to the public or was it closed (N=32)

	N	%
Open to the public	24	75%
Closed tour for schools	8	25%

A27. Estimated number of visitors (N=32)

	N
Minimum	0
Maximum	350
Average (per respondent site)	78
Total (all respondent sites)	2,484

***Note**: Five sites reported fewer than 10 visitors, including one that had no visitors.*

A28. Preferred time to host a tour in 2015 (N=25)

	N	%
Minnesota Manufacturers' Week	17	68%
National Manufacturing Day	8	32%

A29. Value of individual Tour of Manufacturing components

		Very valuable	Somewhat valuable	A little valuable	Not at all valuable	N/A
Building awareness of or interest in manufacturing as a career option (N=30)	%	60%	23%	7%	7%	3%
	N	18	7	2	2	1
Marketing or building awareness of your business to the general public (N=30)	%	30%	33%	23%	7%	7%
	N	9	10	7	2	2
Identifying potential employees or workers (N=30)	%	23%	20%	27%	17%	13%
	N	7	6	8	5	4
Employees interacting with people outside the organization (N=30)	%	17%	47%	20%	13%	3%
	N	5	14	6	4	1
Identifying potential customers (N=30)	%	3%	10%	30%	33%	23%
	N	1	3	9	10	7

A30. Success of individual Tour of Manufacturing components

		Very successful	Somewhat successful	A little successful	Not at all successful
The engagement of the tour participants (N=30)	%	57%	33%	3%	7%
	N	17	10	1	2
The people who attended the tour were who you wanted (N=30)	%	43%	27%	20%	10%
	N	13	8	6	3
The number of tour participants (N=30)	%	43%	27%	17%	13%
	N	13	8	5	4

A31. Challenges of individual Tour of Manufacturing components

		Very challenging	Somewhat challenging	A little challenging	Not at all challenging	Not applicable
Providing staff time to lead the tours (N=28)	%	4%	25%	46%	25%	0%
	N	1	7	13	7	0
Interrupting manufacturing processes (e.g., line shut down) (N=28)	%	4%	18%	21%	54%	4%
	N	1	5	6	15	1
Working with the coordinating organizations (e.g., associations, chambers, 360º Center, etc.) (N=28)	%	4%	4%	18%	68%	7%
	N	1	1	5	19	2
Assuring participant safety (N=28)	%	4%	4%	18%	75%	0%
	N	1	1	5	21	0
Interrupting front or back office business functions (not related to manufacturing) (N=28)	%	0%	11%	32%	54%	4%
	N	0	3	9	15	1
Coordinating the tour participants (e.g., parking) (N=28)	%	0%	4%	7%	82%	7%
	N	0	1	2	23	2

A32. Tour of Manufacturing participation worthwhile (N=28)

	N	%
Yes, very	14	50%
Yes, somewhat	11	39%
No	2	7%
Not sure	1	4%

A33. Likelihood of participating in Tour of Manufacturing again (N=28)

	N	%
Yes, certainly	17	61%
Yes, maybe	8	29%
Not sure	3	11%

A34. Participated in Tour of Manufacturing last year (N=28)

	N	%
Yes	10	36%
No	18	64%

A35. Materials used in preparation for your tour (N=34)

	N	%
Company listing on Tour of Manufacturing website	16	47%
Customizable flyers about your local event	9	27%
Low-cost option to purchase signage	8	24%
Letter to schools	7	21%
Press release template	6	18%
Customizable posts for social media	6	18%
Dream it. Do it. MN Giveaways	3	9%
Customizable radio ad	2	6%
Public service announcements	2	6%
Other	7	21%

Notes: *Percentages may equal more than 100% as respondents were able to give multiple responses*
"Other" category included Greater Mankato Growth promotional fliers.

A36. Most useful materials used in preparation for your tour (N=19)

	N	%
Company listing on Tour of Manufacturing website	6	32%
Letter to schools	4	21%
Customizable flyers about your local event	2	11%
Press release template	2	11%
Low-cost option to purchase signage	2	11%
Other	3	16%

A37. Region (N=28)

	N	%
Metro area	13	46%
Central	6	21%
Northwest	5	18%
West Central	2	7%
South Central	1	4%
Northeast	1	4%

Host survey open-ended question responses

A38. Method used to count the number of participants (N=31)

VERBATIM RESPONSES

Formal Participant counting strategy (N=17)
Sign-in sheet in reception.
Visitors signed-in.
Counted at welcome desk.
We had all seven participants sign in on a sheet; the front desk receptionist monitored this.
We had a guest book that we asked people to sign as they entered our facility. We also had a 40th Anniversary open house celebration concurrently for team members and their families.
Surveys and we took reservations for the tour with attendees.
Check in when they came through the door
Had them sign the guest book
Had a sign-up sheet for the community and counted the schools
We registered each person for a personalized, laser engraved key chain medallion as they entered the door. This gave us the names and number of people who toured.
Sign-in sheet
Guest book sign-in
Sign-in sheet
Sign-in sheet
Provided list of attendees up front
RSVP's
Label count of walk-in's
By the division of students for the tour
We had actual numbers from the schools
Informal Method of Counting Participants (N=8)
Small group, easy to count
Public visitors a close estimate
Count
We counted them
Hard count on high school attendees
Informal count - there was a guide on duty at the door during the entire tour
Head count
Kept a tally as they arrived

Note: *Six sites reported no method for counting participants, including one that had no visitors*

A39. Most valuable aspect of the Tour of Manufacturing (N=27)

Inform participants about manufacturing careers or the industry of manufacturing (N=13)
We thought it would be to encourage students in high school or in Tech school to get interested in micro machining
We feel it is helpful to bring awareness of the Manufacturing Industry
To introduce and inform students about the career possibilities in manufacturing and what type of continued education would be needed for those careers
The high school students, it gave us exposure to them and them to careers in manufacturing
Exposure to career opportunities in manufacturing
Having an opportunity to speak directly to the youth that will be soon entering the work force
Getting the students and community interested in manufacturing careers
Making our company and what we do accessible to young people whom are looking at career options
Creating an awareness about manufacturing education and career tracks in central Minnesota
General recruitment
Industry exposure
Allowing others to see what we do and opening their eyes to opportunities in their back yards
Exposure to future employees
Increased awareness about the manufacturing company (N=13)
Showing the community that the company started and stayed here in Bemidji
Having employees' family and friends tour. They promoted the event heavily to members of their circle and in turn then the community. We had a huge cross-section of age groups; which was also good
Letting the general public know what we do
We were able to showcase our facilities to both local schools and community members
Exposure to schools
General branding, awareness
Letting the community know we manufacture
Making awareness to those who wanted to learn more about the business
Just to let the community know we are here
Being able to showcase our facility, manufacturing line, engineering department, etc.
Community Outreach
Connections with local schools
Showing people all of our products
Did not have value from the Tour of Manufacturing (N=1)
Was none this year, very poor attendance

A40. Most successful aspect of the Tour of Manufacturing (N=23)

VERBATIM RESPONSES

The amount of people that attended (N=6)
We had about 100 high school employees attend which helps us for future employees
21 attendees
The amount of people that toured
The turn out from the prior year. We promoted
In 2013, we had 1 visitor tour our facility. This year we had 175 visitors
Actually had a few people stop by!
General interest expressed from those whom attended (N=6)
The students were engaged and seemed to enjoy the tour and presentation
The most successful aspect for us was the enthusiasm that a few of the student(s) exhibited. This meant to us that some real "seeds" were being planted that may someday result in future employees
Employee Engagement
The school tour from Pine River-Backus High School. We received communication from the instructors afterwards that indicated the students were very impressed and really "turned on to manufacturing" after the tour
The general interest by those who participated
Exposure to schools
Educating/informing the public (N=5)
Talking to participants about manufacturing careers that they are exploring
Educating the public
Showing off our business and helping visitors understand what we do
Having 350 [360] come through our doors and show them a new perspective of manufacturing
Proving information to people on what is available at our plant.
General positive feedback (N=6)
Seeing the opportunities available in manufacturing
Attendees saw a different side of manufacturing
We enjoyed opening our doors; we were extremely disappointed in the turn out, however
Many students attended with their families
Community familiar with us.
The question and answer sessions from the students

A41. Biggest challenge or barrier (N=23)

VERBATIM RESPONSES

General logistical challenges (N=13)
I wanted to make sure we had products running during the tour
Keeping the groups small enough to be able to communicate with them
Size of the audience
Our biggest challenge was getting all the hosts to have the same time frame available
Overall distance traveled to see the operation. May use golf carts to transport guests next time
Limited access to the facility for young children when the plant is in operation
Time & Business levels, we are very busy
Space for us is limited so we took people back two at a time
location - hard to find
Tight scheduling between the two afternoon tours
Keeping my management staff on task. (our own problem) :)
The guided tours lasted about an hour. This can be too long for some people, so with coaching we had our volunteer tour guides (employees) ask their group if they could spare up to an hour for the tour. If the visitors didn't have that much time, then the guide would move them through quicker. But with the technology we have, there is so much to see that it really does take an hour to do justice to the tour.
None, just needed more attendance
Other general challenges (N=10)
No schools called to participate
Knowing what they would like to hear
We had no barriers, and not really a challenge either; staff was lined up to give tours
The portion of the high school students who viewed it as time away from class and were disruptive to the students who were genuinely interested
We did not see enough middle school and/or junior high aged children with their families (other than our employees' children, grandchildren, etc.) We need to get this age group introduced to the possibilities in manufacturing! I sent press releases and personalized e-mails to a dozen area schools too
Getting the right people through the door. We had staffing agencies and a technology software company attend, which had no interest besides gaining business from [manufacturer]
Just getting prepared up front
Beautiful weather and a Friday afternoon.
Joining with industry partners in a coordinated effort to promote educational tours that correlated to industry partner tour days/times. Our marketing campaign could also be improved next year
There were some local schools that were not interested in touring due to budget constraints

A42. Why the Tour of Manufacturing was not worthwhile (N=2)

VERBATIM RESPONSES

General reasons the Tour of Manufacturing was not worthwhile
No visitors
Again there didn't seem to be the interest this year as there was in the past two years

A43. Why host would not participate in the Tour of Manufacturing again (N=2)

VERBATIM RESPONSES

General reasons the Tour of Manufacturing was not worthwhile
Lack of participants. For this being the 4th annual we expected a better turn out. Although we signed up later and personally invited 13 area schools, not many were aware of the program. We thought leveraging a 4th annual would have proved more fruitful. We even had radio coverage! Lots of planning and work, but little to show. It was a worthwhile experience that we planned this and know we have the capability to host such an event with short notice
We invited local companies early on to participate with us making for more of a draw to the community. They would have to step up with a commitment for future events

A44. Promotional materials used in preparation for the Tour of Manufacturing (N=7)

VERBATIM RESPONSES

General materials used
Created invite letters to schools
Custom advertisement in regional "shopper" paper
Colleges, Organizations, blogs
Chamber provided the promotions
Our Manufacturing Alliance also prepared a special color insert for the Sunday paper that promoted Manufacturing and the tours. This was very worthwhile
Rosedale LED sign
Links to the MN Tour of Manufacturing website

A45. Most useful promotional materials in preparation for the Tour of Manufacturing (N=2)

VERBATIM RESPONSES

General materials
Greater Mankato Growth Promotional Fliers
Only received the surveys

A46. Other types of support that would have been helpful (N=13)

VERBATIM RESPONSES

General support responses (N=7)
Could we have a prominent guest(s) (Governor, Senator, Representative, etc.) schedule a tour with one/some of the host companies to call attention to this event. It might help with the media message to MN residents.
The statewide site & social media templates were also beneficial! Possibly even an opportunity as an off-site career day. Advanced planning perhaps. I sent e-mails with information to a dozen schools but only heard back from two
More help advertising or directing people to come attend certain businesses
Continue the advertising
More mass media marketing on behalf of all participants in the MN manufacturing tours
Aitkin may be too far from the core of the Tour Area to be successful
More promotional and advertising support from the sponsoring organizations
Local promotion of Tour of Manufacturing (N=6)
Better promotion of the event and the participants to the local community (media, city government, chamber of commerce, etc.)
Promoting this program more in the area- make announcements to schools and encourage they set the week on the calendar
We would like to see more support working directly with schools to get more middle/junior high school students to participate in tours.
Maybe a map that is published locally so people know all the businesses involved
Money for local radio Ads and Newspaper Ads
Targeted emails based on location

A47. Additional comments (N=7)

VERBATIM RESPONSES

General suggestions (N=5)
It would be nice to have some feedback from the students
Have the local tech colleges have they students tour the open facilities/companies more upfront promoting of the week; high and middle schools involvement, perhaps work with the schools and arrange multi-stop tours as area businesses
Getting more companies to see the value of and participate in it would help show it is a vibrant industry with very good career opportunities
It would be great to have more local "clusters" of manufacturers participate in the event together. That way, if someone from an hour away wants to tour a facility, they would have at least two or three manufacturers to tour in one area -- gives them extra incentive to travel
We prefer to participate every other year. Next year we will focus on grade school tour groups and not hold the Community Wide open house
General comments (N=2)
I am glad we participated, we look forward to next year
We look forward to participating next year

Summer camp survey data tables

Demographics

A48. Number of participants (N=184)

	N	%
Anoka-Ramsey	17	9%
Bemidji State University	23	13%
Central Lakes College	37	20%
Hennepin Technical College	21	11%
MCTC	12	7%
Northland-East Grand Forks	11	6%
Northland-Thief River Falls	15	8%
Riverland College	40	22%
Saint Paul	8	4%

A49. Gender (N=177)

	N	%
Male	131	74%
Female	46	26%

A50. Camp by gender

	Male	Female
Anoka-Ramsey (N=16)	63%	38%
Bemidji State University (N=23)	74%	26%
Central Lakes College (N=33)	97%	3%
Hennepin Technical College (N=21)	71%	29%
MCTC (N=11)	73%	27%
Northland-East Grand Forks (N=10)	100%	0%
Northland-Thief River Falls (N=15)	93%	7%
Riverland College (N=40)	55%	45%
Saint Paul (N=8)	38%	63%

Note: *Percentages may equal more than 100% due to rounding.*

A51. Age (N=173)

	N	%
9 years old	7	4%
10 years old	27	15%
11 years old	13	7%
12 years old	22	12%
13 years old	26	14%
14 years old	46	25%
15 years old	20	11%
16 years old	6	3%
17 years old	6	3%

Average age
13 years old

A52. Grade level (N=184)

	N	%
Grade 4	9	5%
Grade 5	21	11%
Grade 6	17	9%
Grade 7	26	14%
Grade 8	28	15%
Grade 9	55	30%
Grade 10	14	8%
Grade 11	6	3%
Grade 12	7	4%
College	1	1%

A53. Race/Ethnicity (N=184)

	N	%
African American or Black	3	2%
American Indian or Native American	6	3%
Asian American or Pacific Islander	12	7%
Bi- or multi-racial	13	7%
Hispanic, Chicano, or Latino	6	3%
White or Caucasian	108	59%

A54. Camp by race/ethnicity

	Black	American Indian	Asian	Hispanic	White	Multi-racial	Missing/ Refused
Anoka-Ramsey (N=17)	0%	0%	12%	0%	59%	6%	24%
Bemidji State University (N=23)	0%	4%	0%	0%	83%	9%	4%
Central Lakes College (N=37)	0%	0%	3%	0%	60%	0%	38%
Hennepin Technical College (N=21)	14%	0%	5%	19%	48%	14%	0%
MCTC (N=12)	0%	0%	0%	0%	67%	8%	25%
Northland-East Grand Forks (N=11)	0%	0%	0%	0%	64%	27%	9%
Northland-Thief River Falls (N=15)	0%	0%	0%	0%	93%	7%	0%
Riverland College (N=40)	0%	13%	0%	5%	45%	5%	33%
Saint Paul (N=8)	0%	0%	100%	0%	0%	0%	0%

A55. Parents attended college (N=167)

	N	%
Yes, both	123	74%
Yes, one	26	16%
No, neither	18	11%

Note: *Ten students were not sure if their parents had attended college; they are excluded from these counts.*

Note: *Percentages may equal more than 100% due to rounding.*

Participant responses

A56. Overall opinion of camp (N=181)

Opinion of camp	N	%
I liked it a lot	150	83%
I liked it a little bit	28	15%
I did not like it very much	2	1%
I did not like it at all	1	1%

A57. Reasons for coming to summer camp (N=177)

Reasons for coming to camp	N	%
To learn something new	47	27%
It sounded fun/exciting	43	24%
I had previous interest in some aspect of the camp (e.g. robots, electronics, building)	43	24%
It was fun last year/I wanted to come back	15	9%
Someone made me go	15	9%
To build robots/Hands-on work	10	6%
Other	8	5%
My friend was attending	5	3%
To meet new people	3	2%
To get away from home	3	2%

Note: *Percentages may equal more than 100% as respondents were able to give multiple reasons. Open-ended responses to the questions were coded into the above categories.*

A58. Best thing about camp (N=181)

Best thing about camp	N	%
Hands-on work/Building robots	89	49%
Other camp things (e.g. swimming, food, counselors)	32	18%
Using the finalized product (e.g. demolition derby, dump buckets)	17	9%
Meeting new people/Making new friends	15	8%
Dissecting	10	6%
Learning something new	9	5%
Everything	7	4%
It was fun (unspecified)	7	4%
Staying in the dorms	4	2%
Trying different classes/projects	3	2%
Being creative/designing	2	1%
Other	19	11%

Note: *Percentages may equal more than 100% as respondents were able to give multiple reasons. Open-ended responses to the questions were coded into the above categories.*

A59. Referring friends (N=180)

Would you tell your friends to come?	N	%
Yes, definitely	91	51%
Yes, maybe	75	41%
No	4	2%
I'm not sure	10	5%

A60. Improving camp (N=178)

What could make camp better	N	%
Nothing	31	17%
If camp lasted longer	29	16%
More/different parts to work with	18	10%
Better food/sleeping arrangements	15	8%
More projects or activities	15	8%
Bigger/more advanced robots	10	6%
Having a different partner or team	9	5%
More time to build/hands-on time	9	5%
More free time/leisurely activities	8	4%
Different fieldtrip experience	7	4%
More knowledge about the campus	4	2%
Different class times (e.g. shorter, longer, different time of day)	4	2%
Don't know	13	7%
Other	18	10%

Notes: *Percentages may equal more than 100% as respondents were able to give multiple reasons. Open-ended responses to the questions were coded into the above categories.*

The following tables do not include the MCTC Welding Exploration camp, as those questions were excluded from their survey.

A61. Learning at camp

How much did you learn about the following at camp?	A lot	Some	Very little	Not at all
Manufacturing and making things (N=168)	48%	39%	13%	1%
Finding solutions to problems (N=168)	46%	37%	16%	1%
Working together in teams (N=170)	42%	40%	12%	6%
Science, technology, engineering, and math (N=169)	39%	49%	11%	1%
Careers in manufacturing (N=168)	37%	76%	17%	7%

A62. Interest in STEM (pre- and post-camp)

Interested in science, technology, engineering, or math	Before camp (N=171)	After camp (N=167)	Change
A lot	48%	61%	+13
Some	36%	35%	-1
Very little	12%	4%	-8
Not at all	4%	1%	-3

A63. Pre/Post interest in STEM for girls

Interested in science, technology, engineering, or math	Before camp (N=42)	After camp (N=42)	Change
A lot	36%	64%	+28
Some	45%	31%	-14
Very little	12%	5%	-7
Not at all	7%	0%	-7

A64. Pre/Post interest in STEM for boys

Interested in science, technology, engineering, or math	Before camp (N=155)	After camp (N=155)	Change
A lot	53%	61%	+8
Some	33%	35%	+2
Very little	12%	3%	-9
Not at all	2%	1%	-1

A65. Pre/Post interest in STEM by length of camp

Interested in science, technology, engineering, or math (% saying "a lot")	Before camp	After camp	Change
2-3 days (N=24-30)	56%	73%	+17
4-7 days (N=58-72)	45%	57%	+12

A66. Confidence in STEM abilities (pre- and post-camp)

Confident in ability to do science, technology, engineering, or math	Before camp (N=168)	After camp (N=164)	Change
A lot	39%	59%	+20
Some	41%	36%	-5
Very little	16%	4%	-12
Not at all	4%	2%	-2

A67. Pre/Post confidence in STEM abilities for girls

Confident in ability to do science, technology, engineering, or math	Before camp (N=41)	After camp (N=42)	Change
A lot	24%	62%	+38
Some	44%	31%	+13
Very little	27%	7%	-20
Not at all	5%	0%	-5

A68. Pre/Post confidence in STEM abilities for boys

Confident in ability to do science, technology, engineering, or math	Before camp (N=121)	After camp (N=120)	Change
A lot	46%	58%	+12
Some	39%	38%	-1
Very little	12%	2%	-10
Not at all	4%	3%	-1

A69. Pre/Post confidence in STEM abilities by length of camp

Confident in ability to do science, technology, engineering, or math (% saying "a lot")	Before camp	After camp	Change
2-3 days (N=20-27)	47%	66%	+19
4-7 days (N=45-69)	36%	56%	+20

A70. Awareness of manufacturing careers (pre- and post-camp)

Aware of manufacturing careers	Before camp (N=167)	After camp (N=162)	Change
A lot	27%	51%	+24
Some	36%	31%	-5
Very little	26%	16%	-10
Not at all	11%	3%	-8

A71. Pre/Post awareness of manufacturing careers for girls

Aware of manufacturing careers	Before camp (N=40)	After camp (N=40)	Change
A lot	10%	53%	+43
Some	35%	18%	-17
Very little	38%	28%	-10
Not at all	18%	3%	-15

A72. Pre/Post awareness of manufacturing careers for boys

Aware of manufacturing careers	Before camp (N=153)	After camp (N=152)	Change
A lot	34%	57%	+23
Some	40%	31%	-9
Very little	18%	7%	-11
Not at all	9%	5%	-4

A73. Pre/Post awareness of manufacturing careers by length of camp

Aware of manufacturing careers (% saying "a lot")	Before camp	After camp	Change
2-3 days (N=13-29)	30%	71%	+24
4-7 days (N=32-53)	26%	44%	+24

A74. Perceptions of manufacturing careers (pre- and post-camp)

Perceptions of manufacturing careers	Before camp (N=166)	After camp (N=164)	Change
I thought/think they were/are good	31%	59%	+28
I thought/think they were/are just OK	39%	29%	-10
I didn't/don't think they were/are good	7%	4%	-3
I didn't/don't think about them	16%	2%	-14
I am not sure	8%	6%	-2

A75. Pre/Post perceptions of manufacturing careers for girls

Perceptions of manufacturing careers	Before camp (N=38)	After camp (N=39)	Change
I thought/think they were/are good	24%	64%	+40
I thought/think they were/are just OK	42%	28%	-14
I didn't/don't think they were/are good	8%	5%	-3
I didn't/don't think about them	26%	3%	-23

A76. Pre/Post perceptions of manufacturing careers for boys

Perceptions of manufacturing careers	Before camp (N=115)	After camp (N=116)	Change
I thought/think they were/are good	37%	62%	+25
I thought/think they were/are just OK	42%	32%	-10
I didn't/don't think they were/are good	7%	3%	-4
I didn't/don't think about them	14%	3%	-11

A77. Pre/Post perceptions of manufacturing careers by length of camp

Perceptions of manufacturing careers (% saying "good")	Before camp	After camp	Change
2-3 days (N=18-28)	44%	68%	+24
4-7 days (N=34-69)	36%	56%	+20

A78. Adjectives for manufacturing careers, open-ended (N=151)

Words that come to mind when thinking of someone in a manufacturing career	N	%
Other	57	38%
Fun/exciting/awesome/amazing/cool/good/brave/interesting	31	21%
Technology/Robotics/Science/Math/Programming/ Medicine/Design/Robots/Engineering/Medicine	26	17%
Industry/Machine/Metal/Plastic/Tools/Computers/Factory/Electricity	17	11%
Smart/educational	16	11%
Hard-working	14	9%
Creative/problem solving/Full of ideas	14	9%
Hands-on/building/wielding	11	7%
Hard/difficult/tiring	6	4%
A good job/pay	4	3%
Boring/dull/tedious	3	2%
Repetitive	2	1%
Dirty/Smelly	2	1%
Nothing	2	1%

Note: *Percentages may equal more than 100% as respondents were able to give multiple reasons. Open-ended responses to the questions were coded into the above categories.*

A79. Descriptions of manufacturing careers (N=166)

Words that best describe manufacturing careers (select all that apply)	N	%
Creative	123	74%
Fun	108	65%
Exciting	95	57%
Noisy	90	54%
Advanced	83	50%
Modern	83	50%
Hard	80	48%
Dirty	54	33%
Dangerous	52	31%
Dark	10	6%

Note: *Percentages may equal more than 100% as respondents were able to give multiple reasons.*

A80. Interest in manufacturing careers (pre- and post-camp)

Interested in manufacturing careers	Before camp (N=168)	After camp (N=162)	Change
A lot	25%	30%	+5
Some	33%	42%	+9
Very little	27%	24%	-3
Not at all	16%	5%	-11

A81. Pre/Post interest in manufacturing careers for girls

Interested in manufacturing careers	Before camp (N=42)	After camp (N=40)	Change
A lot	14%	18%	+4
Some	38%	58%	+20
Very little	24%	18%	-6
Not at all	24%	8%	-16

A82. Pre/Post interest in manufacturing careers for boys

Interested in manufacturing careers	Before camp (N=120)	After camp (N=120)	Change
A lot	29%	34%	+5
Some	31%	37%	+6
Very little	27%	25%	-2
Not at all	13%	4%	+9

A83. Pre/Post interest in manufacturing careers by length of camp

Interested in manufacturing careers (% saying "a lot")	Before camp	After camp	Change
2-3 days (N=14-17)	33%	42%	+9
4-7 days (N=28-31)	22%	26%	+4

VEX Robotics program survey data tables

Youth survey data tables

A84. How satisfied are you with the VEX Robotics Program, including scrimmages and tournaments?

N=74	n	%
Very satisfied	58	78%
Somewhat satisfied	16	22%
Not very satisfied	0	0%
Not at all satisfied	0	0%

A85. Would you recommend participating in the VEX Robotics Program to other students your age?

N=72	n	%
Yes, definitely	61	85%
Yes, maybe	9	13%
No	1	1%
I'm not sure	1	1%

A86. How satisfied were you with the VEX Robotics tournament?

N=74	n	%
Very satisfied	51	69%
Somewhat satisfied	23	31%
Not very satisfied	0	0%
Not at all satisfied	0	0%

A87. If you attended a scrimmage, how many did you attend?

N=72	n	%
None	17	24%
1-3	36	50%
4-6	6	8%
7-9	1	1%
10 or more	2	3%
Don't know	10	14%

A88. Which tournament(s) did you attend? (Check all that apply)

N=68	n	%
December 6, 2014, VEX Robotics, hosted by Bemidji State University in Bemidji	23	34%
December 13, 2014, VEX Robotics, hosted by Riverland Community College in Albert Lea	30	44%
January 23-24, 2015, VEX Robotics, hosted by St. Cloud Technical & Community College in St. Cloud	53	78%
January 23, 2015, VEX IQ, hosted by St. Cloud Technical & Community College in St. Cloud	15	22%

Note: *Respondents could choose multiple responses, so percentages do not add up to 100%.*

A89. Here is a list of things you might have learned about from working on your robot. How well do you think you learned each one? (Please check one box for each line.)

N=69-70	Very well	Somewhat well	Not very well	Not at all
Making design changes	61%	32%	7%	0%
Building to specifications	59%	32%	4%	0%
Working with materials (metals, plastics, etc.)	53%	41%	6%	0%
Stability and weight distribution	41%	49%	10%	0%
Electricity, batteries, or charges	41%	43%	14%	1%
Gear ratios	37%	40%	16%	7%
Computer programing	33%	41%	14%	11%
Sensors or other electronic components	22%	36%	33%	9%

A90. Here is a list of skills you might have learned from working with your team. How well do you think you learned each one? (Please check one box for each line.)

N=66-67	Very well	Somewhat well	Not very well	Not at all
Imagination or creativity	74%	24%	2%	0%
Working by trial and error	73%	24%	2%	2%
Problem solving	67%	28%	4%	0%
Visualizing (for example, seeing a concept or finding the solution to a problem in your mind)	62%	30%	8%	0%
Reaching agreement with your teammates	59%	32%	9%	0%
Leadership	55%	35%	8%	3%
Keeping yourself and the team motivated	52%	35%	12%	2%
Making the most of your time	47%	38%	14%	2%

A91. Here is a list of statements about the tournament. For each one, tell us how much you agree or disagree.

N=65-66	Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree
The tournament made me want to be in the program next year.	83%	14%	3%	0%
I got some good ideas from studying other robots.	65%	31%	3%	2%
Our team worked to manage our time at the tournament.	65%	29%	6%	0%
I got some good ideas from talking to other competitors.	61%	24%	11%	5%
There was enough time between matches to make repairs, charge batteries, etc.	55%	36%	6%	3%

A92. Did one or more of your friends or family come to watch the competition?

N=66	n	%
Yes	55	83%
No	9	14%
I'm not sure	2	3%

A93. Here are some ways your parents or other adults might have helped you in this program.

N=59	n	%
Provided transportation	47	80%
Provided space for your team to meet	33	56%
Helped your team plan	27	46%
Helped you with research	23	39%
Worked with you on the robot	22	37%
Other	14	24%

Note: *Respondents could choose multiple responses, so percentages do not add up to 100%.*

A94. Interest in science, technology, engineering, or math

N=66	Before	After	Change
A lot	53%	83%	+30
Some	42%	17%	-25
Very little	3%	0%	-3
Not at all	0%	0%	0
Don't know	2%	0%	-2

A95. Confidence in ability to do science, technology, engineering, or math

N=66	Before	After	Change
A lot	39%	71%	+32
Some	36%	26%	-10
Very little	21%	3%	-18
Not at all	2%	0%	0
Don't know	2%	0%	0

A96. Interest in manufacturing careers

N=66	Before	After	Change
A lot	23%	45%	+22
Some	41%	36%	-5
Very little	23%	14%	-9
Not at all	12%	5%	-7
Don't know	2%	0%	-2

A97. Awareness of careers in manufacturing

N=66	Before	After	Change
A lot	24%	65%	+41
Some	56%	26%	-30
Very little	14%	6%	-8
Not at all	3%	2%	-1
Don't know	3%	2%	-1

A98. Impressions of manufacturing careers before and after competition

N=66	Before	After	Change
Thought they were good	29%	64%	+35
Thought they were just OK	48%	27%	-21
Didn’t think they were good	3%	2%	-1
Didn’t think about them	18%	6%	-12
I am not sure	2%	2%	0

A99. If you think about someone who works in a manufacturing career, what one or two words come to mind? (N=69)

advanced, technology	awesome
boring, imaginative	building
Building	building
building, math	challenging
clean, organized	complex
cool job	cool, fun
Creative	creative
Creative	creativity
Dad	dedicated
Determined	dirty
engineering	factory
Factory	fulfilling
Fun	fun
Fun	fun
good job	good pay
hands on	happily
hard	hard worker
hardworking	hardworking
hardworking	hardworking
hard-working	ingenuity
innovation	intelligent,
interesting	laborer, hard work
machine	machinery
math, problem solving	Minecraft
Mojang	money
money, pretty good job placement	problem solving
problem solving, hands on	robotics
smart	smart
smart	smart
smart	smart, hard working
smart, hard working	sweaty
teamwork	technology
the future	very smart
well paid	

A100. Which words best describe your thoughts about manufacturing careers? (Check as many as you would like.)

N=61	n	%
Fun	43	70%
Creative	42	69%
Advanced	41	67%
Exciting	34	56%
Modern	30	49%
Hard	24	39%
Noisy	24	39%
Dirty	20	33%
Dangerous	17	28%
Dark	5	8%

Note: *Respondents could choose multiple responses, so percentages do not add up to 100%.*

A101. After participating in the VEX Robotics program, how likely are you to…

N=64-65	Very likely	Somewhat likely	Not very likely	Not at all likely	I'm not sure
Take elective science, technology, engineering, or math courses in high school?	68%	26%	2%	0%	5%
Consider studying science, technology, engineering, or math in college?	60%	34%	3%	0%	3%
Consider a career in science, technology, engineering, or math?	64%	27%	6%	0%	3%
Consider a career in manufacturing?	34%	38%	23%	2%	3%

A102. Thinking about the VEX Robotics Program, how much would say you learned?

N=59	Learned a lot	Learned some	Learned a little	Did not learn anything
Thinking about the VEX Robotics Program, how much would say you learned?	80%	19%	2%	0%

A103. What was the most interesting thing you learned from working on your robot or participating in the tournament? (N=52)

Animation

All the interesting creative robot and designs.

Autonomous is very important

Design

Different varieties of gears (i.e. crown gear, planetary gear)

How electronics works, and that failure isn't always a bad thing.

How engineers work together

How friendly people really are at the tournaments

How many different ways you can accomplish a task

How much the jobs in Minnesota will revolve around manufacturing in the future

How much time it takes

How programs work

How robots work

How to be a good problem solver

How to calculate torque on a design

How to drive it

How to program

How to program a robot

How to program robots and a better understanding of manufacturing

How to program something and have it do what I want

How to work with others

I learned a little about computer programming

I learned about different ways of programming. And different methods for thinking around a problem.

I learned how to work with gears.

I learned how you could program your robot to do different things.

I learned that throughout the process of building the robot you need to work as a team.

I learned that trial and error is a big [thing] in manufacturing.

It takes time.

Learning more about gear ratios.

My ability to solve problems when the robot was malfunctioning

New ways of solving problems

Nothing really

People can build nice robots.

A103. What was the most interesting thing you learned from working on your robot or participating in the tournament? (continued)

Problem solving

Problem solving and you can always make your robot better and improving it in more efficient

Problem solving

Programing

Programming

Team work

Team work

Team work is everything, if one bolt falls, everything falls.

Teamwork is very important.

That it takes a lot of teamwork and when your team doesn't work together nothing gets done.

That not everything has to be a competition and to just have fun whatever you are doing.

That robots are being used to do lots of things

That we could of built it better

The fun that comes with it.

There was a huge variety of things I learned with all the designing, working with a team, strategizing with alliances, and computer programing.

Visualizing what will be built

What designs work better than others

Work with your teammates

You need to make quick repairs.

A104. Do you have any suggestions for how the program could be improved, other than the program rules?

Evenly space the finals for all the teams that are in it.

Fix issues with competition switches causing some robots to flat line.

Food at state

Have an after-party after the competition.

Have the other robots compete more. Such as making them go after an item in the court that there is only one of, after autonomous.

I love the way the VEX rules and games are set up. The only thing missing is more people to take part in it.

Judges to learn the ways that nationals and world's judges the teams.

Judging like you used to do it

A104. Do you have any suggestions for how the program could be improved, other than the program rules? (continued) (N=41)

Less firmware updates so programming is easier. There should be more tournaments in MN.

Let robots talk.

Make design challenges easier.

Make extra parts cheaper.

Maybe a little extra time in between matches, if at all possible, so that teams can work out their robot's problems.

More competitions

More materials

More scrimmage opportunities

More time between matches

More time between rounds

More tournaments

No (22 respondents)

A105. How could the VEX Program do a better job of showing you how robotics is related to manufacturing and STEM careers (STEM means science, technology, engineering, and math)? (N=39)

Bring college students to the kids instead of the kids going to the college.

By adding more advanced parts

By having the volunteers have some time to help us with problems in our robots.

By talking about it at the tournaments

Creating challenges with mathematical issues

Give lessons instructed by engineers on how each of the STEM components are incorporated in their job.

Have real life scenarios?

Have representatives from the manufacturing field come and talk during the opening ceremony.

Have them do something that basic engineers are given a task to accomplish.

Having a longer emphasis during a competition.

Having more exhibits.

Helps me think about stuff easier

How to problem solving

I don't know (6 respondents)

Make it a little more realistic.

Making a creative design challenge that shows creative designs that will make the creative minds of children grow.
More girls in the program
More science
None (8 respondents)
Offer more chances [so] kids can see what it is like
Other than involving a little more math, the Vex program does a great job of showing relation to STEM.
Show kids how the concepts we use relate to the field.
Show the actual creations of engineers in industry.
Speakers at the regional tournaments
Try to have the kids do more of the budgeting for the robot also. This is important when thinking about how much a manufacturing project will cost a company.
Videos
We could program better.

A106. What is your age?

N=60	n	%
8	1	2%
9	0	0%
10	2	3%
11	6	10%
12	4	7%
13	6	10%
14	11	18%
15	8	13%
16	10	17%
17	6	10%
18	6	10%

A107. What grade are you in at school?

N=60	n	%
5	6	10%
6	6	10%
7	3	5%
8	8	13%
9	11	18%
10	11	18%
11	6	10%
12	9	15%

A108. Gender

N=60	n	%
Male	41	68%
Female	19	32%

A109. Which of the following best describes you?

N=59	n	%
White or Caucasian	51	86%
Asian American or Pacific Islander	3	5%
American Indian or Native American	2	3%
Hispanic, Chicano, or Latino	1	2%
I don't know	1	2%
I don't want to answer	1	2%
African American or Black	0	0%
More than one of the above	0	0%

A110. Did you participate in VEX as part of...

N=60	n	%
An elementary school team	6	10%
A middle school team	12	20%
A high school team	36	60%
4-H	2	3%
Boy Scouts/Girl Scouts	3	5%
Other	2	3%

Note: *Respondents could choose multiple responses, so percentages do not add up to 100%.*

A111. What was the name of the school or organization that participated in VEX? (N=52)

4149C IRON CHARGERS

Bemidji Middle School

Bemidji Middle School

Boy Scout Troop 15

CA E & R 4 - The Champions

Concordia Academy

District 742

Eagan High School

Fairmont Jr./Sr. High School

Fisher Knights

Freeze Frame Robotics.

Grygla High School

Grygla High School

Grygla High School 4149G Iron Chargers

Grygla Public School, team 4149C, Iron Chargers

Heartland Christian

I.J. Holton Intermediate School

IJ Holton Engineers

IJ Holton Intermediate School

KaBuuM

Lego robotics, Neveln nights Vex robotics, Holton engineers 8440A

Mankato East High School

Mankato East High School

A111. What was the name of the school or organization that participated in VEX? (continued)

Mankato West

Mankato West

Mankato West High School

Mankato West High School

Mankato West High School. At west VEX isn't yet a sport but the teams make it a sport.

Marshall County Central

Marshall County Central

Marshall County Central

Marshall County Central Freeze Frame

Marshall County Central High school

Marshall County Central Schools

N/A

North Jr. High

North Junior High

North Junior High School

Polar phoenix

Robot-x club

Sartell High School

Somerset High School

Sts. Peter & Paul, Richmond

Troop 211

Troop 211

Windom Area High School

Windom Area High School

Windom Eagles 7192

Win-E-Mac

Win-E-Mac High School

Win-E-Mac High School

X-Bots

A112. How would you characterize your role in the VEX Robotics program? (select one)

N=76	n	%
Parent	46	61%
Teacher/Coach	30	39%

A113. Adults in both roles

	n	%
Parents who also coached (n=46)	2	4%
Coaches with participating children (n=28)	8	29%

Note: Parents were asked, "Did you coach a VEX Robotics team?" All replied to this question (n=46). Teachers/Coaches were asked "Did you have a child in the tournament?" Two people did not reply to this question (N=28).

A114. How satisfied are you with the overall VEX Robotics Program, including scrimmages and tournaments?

	Parent		Teacher/Coach		All Adults	
	N=46	%	N=28	%	N=74	%
Very satisfied	36	78%	24	86%	60	81%
Somewhat satisfied	10	22%	4	14%	14	19%
Not very satisfied	0	0%	0	0%	0	0%
Not at all satisfied	0	0%	0	0%	0	0%

A115. Would you recommend the VEX Robotics Program to other parents or teachers/coaches?

	Parent		Teacher/Coach		All Adults	
	N=46	%	N=28	%	N=74	%
Yes, definitely	41	89%	27	96%	68	92%
Yes, maybe	5	11%	1	4%	6	8%
No	0	0%	0	0%	0	0%
I'm not sure	0	0%	0	0%	0	0%

A116. How satisfied were you with the VEX Robotics tournament?

	Parent		Teacher/Coach		All Adults	
	N=46	%	N=28	%	N=74	%
Very satisfied	35	76%	23	82%	58	78%
Somewhat satisfied	11	24%	5	18%	16	22%
Not very satisfied	0	0%	0	0%	0	0%
Not at all satisfied	0	0%	0	0%	0	0%

A117. How many scrimmages did your child attend?

	Parent		Teacher/Coach		All Adults	
	N=46	%	N=28	%	N=74	%
None	10	22%	7	25%	17	23%
1-3	24	52%	12	43%	36	49%
4-6	5	11%	4	14%	9	12%
7-9	3	7%	4	14%	7	9%
10 or more	0	0%	1	4%	1	1%
Don't know	4	9%	0	0%	4	5%

A118. Which tournaments(s) did they attend? (check all that apply)

	Parent		Teacher/Coach		All Adults	
	N=45	%	N=28	%	N=73	%
December 6, 2014, VEX Robotics, hosted by Bemidji State University in Bemidji	6	13%	9	32%	15	21%
December 13, 2014, VEX Robotics, hosted by Riverland Community College in Albert Lea	20	44%	9	32%	29	40%
January 23-24, 2014, VEX Robotics, hosted by St. Cloud Technical & Community College in St. Cloud	37	82%	22	79%	59	81%
January 23, 2014, VEX IQ, hosted by St. Cloud Technical & Community College in St. Cloud	10	22%	11	39%	21	29%
Don't know	1	2%	0	0%	1	1%

Note: Respondents could choose multiple responses, so percentages do not add up to 100%.

A119. (Parents only) Here is a list of skills your child might have learned from working with their team. How well do you think they learned each one? (Please check one box for each line.)

N=46	Very well	Somewhat well	Not very well	Not at all	Don't know
Working by trial and error	71%	29%	0%	0%	0%
Imagination or creativity	62%	31%	2%	2%	2%
Problem solving	54%	41%	2%	0%	2%
Visualizing (seeing a solution in the mind)	49%	42%	2%	2%	4%
Keeping the team motivated	42%	53%	4%	0%	0%
Leadership	40%	44%	9%	4%	2%
Reaching agreement with teammates	36%	56%	9%	0%	0%
Making the most of time	33%	49%	13%	2%	2%

A120. (Teachers/Coaches only) Here is a list of skills your child might have learned from working with their team. How well do you think they learned each one? (Please check one box for each line.)

N=28	Very well	Somewhat well	Not very well	Not at all	Don't know
Working by trial and error	75%	25%	0%	0%	0%
Problem solving	68%	32%	0%	0%	0%
Reaching agreement with teammates	64%	32%	0%	4%	0%
Imagination or creativity	50%	36%	14%	0%	0%
Visualizing (seeing a solution in the mind)	46%	39%	14%	0%	0%
Leadership	39%	57%	4%	0%	0%
Keeping the team motivated	36%	54%	11%	0%	0%
Making the most of time	18%	64%	18%	0%	0%

A121. (All Adults) Here is a list of skills your child might have learned from working with their team. How well do you think they learned each one? (Please check one box for each line.)

N=73-74	Very well	Somewhat well	Not very well	Not at all	Don't know
Working by trial and error	73%	27%	0%	0%	0%
Problem solving	59%	38%	1%	0%	1%
Imagination or creativity	58%	33%	7%	1%	1%
Visualizing (seeing a solution in the mind)	48%	41%	7%	1%	3%
Reaching agreement with teammates	47%	47%	5%	1%	0%
Keeping the team motivated	40%	53%	7%	0%	0%
Leadership	40%	49%	7%	3%	1%
Making the most of time	27%	55%	15%	1%	1%

A122. How much was your child/team interested in science, technology, engineering, or math?

	Parent (N=44)			Teacher/Coach (N=28)			All Adults (N=72)		
	Before	After	Change	Before	After	Change	Before	After	Change
A lot	57%	93%	+36	36%	93%	+57	49%	93%	+44
Some	41%	7%	-34	54%	7%	-47	46%	7%	-39
Very little	2%	0%	-2	11%	0%	-11	6%	0%	-6
Not at all	0%	0%	0	0%	0%	0	0%	0%	0
Don't know	0%	0%	0	0%	0%	0	0%	0%	0

Note: *Due to rounding, percentages may not add up to 100%.*

A123. How much was your child/team confident in his/her/their ability to do science, technology, engineering, or math?

	Parent (N=44)			Teacher/Coach (N=28)			All Adults (N=72)		
	Before	After	Change	Before	After	Change	Before	After	Change
A lot	50%	86%	+36	29%	68%	+39	42%	79%	+37
Some	36%	11%	-25	36%	32%	-4	36%	19%	-17
Very little	11%	2%	-9	32%	0%	-32	19%	1%	-18
Not at all	2%	0%	-2	4%	0%	-4	3%	0%	-3
Don't know	0%	0%	0	0%	0%	0	0%	0%	0

Note: *Due to rounding, percentages may not add up to 100%.*

A124. How much was your child/team interested in manufacturing careers?

	Parent (N=44)			Teacher/Coach (N=28)			All Adults (N=72)		
	Before	After	Change	Before	After	Change	Before	After	Change
A lot	9%	36%	+27	7%	46%	+39	8%	40%	+32
Some	43%	52%	+9	39%	50%	+11	41%	51%	+10
Very little	36%	7%	-29	43%	4%	-39	39%	6%	-33
Not at all	9%	2%	-7	4%	0%	-4	7%	1%	-6
Don't know	2%	2%	0	7%	0%	-7	4%	1%	-3

Note: *Due to rounding, percentages may not add up to 100%.*

A125. How much was your child/team aware of careers in manufacturing?

	Parent (N=44)			Teacher/Coach (N=27-28)			All Adults (N=71-72)		
	Before	After	Change	Before	After	Change	Before	After	Change
A lot	11%	41%	+30	4%	52%	+48	8%	45%	+37
Some	32%	50%	+28	43%	48%	+5	36%	49%	+13
Very little	45%	7%	-38	43%	0%	-43	44%	4%	-40
Not at all	11%	0%	-11	7%	0%	-7	10%	0%	-10
Don't know	0%	2%	+2	4%	0%	-4	1%	1%	0

Note: *Due to rounding, percentages may not add up to 100%.*

A126. How did you feel about manufacturing careers before and after the VEX Robotics Program?

	Parent (N=44)			Teacher/Coach (N=26-28)			All Adults (N=72-74)		
	Before	After	Change	Before	After	Change	Before	After	Change
Thought they were good	41%	86%	+45	75%	96%	+21	54%	90%	+36
Thought they were just OK	43%	9%	-34	14%	4%	-10	32%	7%	-25
Didn't think they were good	0%	0%	0	4%	0%	-4	1%	0%	-1
Didn't think about them	14%	2%	-12	4%	0%	-4	10%	1%	-9
I am not sure	2%	2%	-0	4%	0%	-4	3%	1%	-2

Note: *Due to rounding, percentages may not add up to 100%.*

A127. (Parents only) Please tell us how much you agree or disagree with the following statements about the tournament.

N=46	Strongly agree	Somewhat agree	Somewhat disagree	Strongly Disagree	Don't know
The tournament made my child want to be in the program next year.	81%	14%	5%	0%	0%
My child got some good ideas from studying other robots.	64%	31%	2%	0%	2%
My child got some good ideas from talking to other competitors.	49%	46%	2%	0%	2%
My child worked to manage their time at the tournament.	45%	48%	2%	0%	5%
There was enough time between matches for teams to make repairs, charge batteries, etc.	43%	40%	2%	0%	14%

Note: *Due to rounding, percentages may not add up to 100%.*

A128. (Teachers/Coaches only) Please tell us how much you agree or disagree with the following statements about the tournament.

N=28	Strongly agree	Somewhat agree	Somewhat disagree	Strongly Disagree	Don't know
The tournament made my team members want to be in the program next year.	86%	14%	3%	0%	0%
My team members got some good ideas from studying other robots.	82%	18%	0%	0%	0%
My team members got some good ideas from talking to other competitors.	71%	29%	0%	0%	0%
There was enough time between matches for teams to make repairs, charge batteries, etc.	61%	25%	14%	0%	0%
My team members worked to manage their time at the tournament.	46%	54%	0%	0%	0%

Note: *Due to rounding, percentages may not add up to 100%.*

A129. (All Adults) From your observations, what was the most important science, technology, engineering, and math (STEM) skill your child or team members learned from working on their robot? (N=48)

Ability to program the robot and interest in taking his skills further.
Coding
Coding
Compromise
Designing & programing
Engineering because this is something that they are not exposed to as much as the others in the classroom.
I think it's all used working on the bot. Equally important was learning to work with a group of people for a common goal. It's good practice for the workplace.
I would say...teamwork and realizing what VEX can offer for students in terms of social skills.
Iteration as a path to improvement
It's hard to decide what [is] the most important skill learned as my child learned a lot of different ones. However, one that stands out is learning about angles and turning radiuses and how they relate to programming.
Just beginning to learn how to program.
Leadership and teamwork - mechanical workings

A129. (All Adults) From your observations, what was the most important science, technology, engineering, and math (STEM) skill your child or team members learned from working on their robot? (N=48) (continued)

Learning from trial and error

Learning how to fix problems, technical skills and learning programming skills

Learning to try and change, and retry things that didn't work. Experimentation and team building.

Mechanical structure

My child was not allowed to work with the robots as she is a girl and the boys on her team were the only members allowed to work with the robots. The girls were working in a separate room doing scrapbooking and making signs and other aspects involved with being "cheerleaders" for the boys.

Our team learned that just putting parts together didn't mean it would lift the objects. They also learn to do some preplanning and research before getting started.

Personal research and teamwork

Problem solving

Problem solving

Problem Solving

Problem Solving

Problem solving

Problem solving

problem solving and lessons learned

Problem solving and teamwork

Problem solving on the go

Problem solving skills

Problem solving...It was good for them to work together

Programing

Programming

Programming

Programming

Programming

Solving problems on the fly.

Team work

Team work, trial and error

Teamwork

Teamwork and problem solving

The combination of the skills rather the a focus on one particular skill (application of skills)

A129. (All Adults) From your observations, what was the most important science, technology, engineering, and math (STEM) skill your child or team members learned from working on their robot? (N=48) (continued)

The engineering was the area where they developed their skills.

They saw how math is used in regards to technology and how important it is to do the little things to make the big things work.

Things are a work in progress.
Teamwork is crucial and fun.
Mutual respect was truly displayed by this group.
Girls can love robotics.

Trial and error

Trouble shooting

Uncertain

Understanding how the dynamics of limited resources (parts) and using their imagination to figure out the best way to put the robot together.

A130. (All Adults) Do you have any suggestions for how the program could be improved, outside of the VEX Robotics Program rules? (N=43)

A practice area for them to work on at MCC that is like the ones used in competition

Add a middle school division.

Allow less expensive parts to be used.
Offer a plug-in transformer as a battery alternative for testing purposes.

Allow newer students more opportunities to participate instead of observing.

At the tournaments, skills kept being brought up as being very important. But, yet at the tournaments it was extremely difficult for teams to do skills. The fields generally weren't ready on time or manned full time. And also as soon as the championship matches were over, the skills fields were the first thing being taken down. My team was only able to compete a couple of times the entire season even though they went to all the tournaments including the Albany tournament.

Better set of rule and game procedures

Coach should make sure one person does not monopolize the robot and intimidate the other players.

Coaches collaboration time

Don't have the same announcer at the St. Cloud tournament again. The female from St. Cloud was rather rude when talking about the portion of the state where the northern teams came from. Asking if they had T.V. etc. Also, she asked some girls who were part of a drive team whether they were there to help or distract the boys.

For the students to have some kind of props, etc., to help simulate enough of the playing field so that they can know they are on the right track and that their robot can do the task

Generally program structure looks good. Our local group just needs to work on better communication of events and schedules.

A130. (All Adults) Do you have any suggestions for how the program could be improved, outside of the VEX Robotics Program rules? (N=43) (continued)

Have a backup computer running to immediately switch to if there is an issue.

Have an evening social event the first night of the state competition. It would be nice for the teams to hang out some in a non-competitive atmosphere.

Having more scrimmages, spread out through Fall Semester.

Help line, talk to a live person

I have 3 children in robotics. Is there more information/camps about VEX IQ?

I think the information about advancing and what awards are needed should be distributed to the teams before the start of season. I think a hospitality room for the coaches would be appreciated by all. This would be a place the coaches could get something to eat and converse about robotics. I think all teams should get feedback from the judges on what they liked and what they didn't like, so the teams have an opportunity to improve for the next tournament and for the next season.

I think the rules were fair.

I would love to see more VEX IQ tournaments and/or scrimmages. I know the program is relatively new and growing, but it would be great for the kids to have more opportunities to compete instead of just the one tournament. I would also like to see VEX IQ promoted more. There was no mention of IQ or the IQ tournament on the Dream It Do It web site, and the media articles prior to the state tournament also only discussed VEX and nothing about IQ. More promotion might be helpful in creating awareness about the opportunities for elementary students and also help in fundraising efforts for teams.

I don’t know

If it were made to be a part of the MSHSL events. I say this because then we would be able to get some funding from our school. It cost us over $4,000.00 just for transportation.

It will get better with experience - it already is a great challenge and great fun! Geeks are cool!

It would be nice to have a tournament in the Mankato area as then we would not have to worry about travel at least for one tournament.

Make sure that teams are only paired with another team ONCE per competition.

More awareness with more advertising/awareness
Having more schools get involved with offering scrimmages that are open to the public

More feedback on where the team finished in each category. It would not have to be exact but rather a high, medium or low, so they know where to improve the most.

More practice competitions.

More smaller tournaments before the state competition. The kids work all year on this robot and then only get to use it 2-3 times at competition. (there are more competitions than that, but not all of them are drivable for everyone)

A130. (All Adults) Do you have any suggestions for how the program could be improved, outside of the VEX Robotics Program rules? (N=43) (continued)

My child knows how to program and build the robots. She began the season in this role. It would be great if the learning opportunity was extended to ALL members of the team. My daughter has ended the year being told she cannot touch anything along with the other girls and has come home in tears countless times and will not be participating next year. The fact that the coach is female and has allowed the 100% participation by the boys to be hands on building and programming of the equipment and every girl is in another room doing every secretarial duty needed for the team. She learned how to make a large sign and cheer loudly at competitions. The sign was not allowed to be touched or carried by the girls after it was made as the boys determined they were the only trustworthy team members to handle it. My daughter is not a cheerleader. She is not a secretary. She is very smart and her time was wasted as was mine as a parent. I am tired of girls being moved to the background and being called pushy or clumsy or bossy and not allowed the opportunity EQUALLY. We are in the year 2015 not 1955!!!
No (9 respondents)
Perhaps have some building, programming, and design seminars that students could attend. Some socials to get students talking with each other would be good too.
The kids said the game was not as fun this year. It was not head to head competition as much as a skills competition. Should be more like a game.
The program is great. I love the evolution with causing increased interest.
T-shirts for sale for students to buy while at the tournaments
When teams are competing, make sure the view point is clear of people.

A131. (All Adults) In what ways, if any, could the VEX Robotics Program better incorporate information about manufacturing and STEM careers? (N=35)

Anything that the kids can see and learn they have the opportunity to do in the future is great.

Bring sample robots from real world to the competition.
Have speaker provide power point of a development process for a manufacturing product.

Continue to get the support of Manufacturing. Provide coaches with good statistics that we can use to give to our students and local manufacturers. We have gained good support but will need to show manufacturers that what we are doing truly will benefit them.

Continued sponsorship/more sponsorships by manufacturing companies

Handouts re: how to use robotics skills in manufacturing - tell some good stories, what are the possibilities? Especially in design.

Have more corporate displays at the tournaments.

Have more manufacturing reps walking around talking to teams.

Having some information available at the IQ tournament would be helpful. I felt there was a very clear connection between participation in robotics and STEM careers at the state VEX tournament, but not the IQ one.

I believe if the manufacturers would bring what they manufacture and some sample equipment, it would promote them. Also be able to offer tours of the facilities.

I like what has been done, various booths at the state event to show real manufacturing robots.

I think the organization does a great job of getting the community involved especially in the judging. This sets the VEX program apart from all others.

I think they are doing a great job as the program has grown.

I think they do a great job. Getting companies involved and showing what they do is awesome.

I thought the vendors and the video from our politicians were great for the students.

I would not know and neither would my daughter. Ask the boys and their families.

I don't know

Incorporate more of a career fair at the state competition.

Info packets about specific jobs

Job shadowing opportunities, tours of facilities

Keep having those demos...perhaps put them in plain sight?

Make a list of all the people in manufacturing willing to help or come in and explain things in each team's area.

Maybe by providing lists of potential manufacturing careers along with explanations for the students

Maybe have an industry person present what they do in their job at the tournament

Maybe provide videos of career opportunities in manufacturing. Shows like "How it's Made" could be shown while students are waiting to take their turns. There are many complex machines highlighted in demonstration shows.

More specifics on what professions or careers are available in the robotics field.

More vendors with demos.

A131. (All Adults) In what ways, if any, could the VEX Robotics Program better incorporate information about manufacturing and STEM careers? (N=35) (continued)

None
Perhaps do an online course or series of seminars that students could take to learn about these - then award a badge or some sort of recognition when they finish.
Require a basic knowledge test in order to compete at State Level.
Require teams to meet with someone in that line of work before attending a tournament.
Show more correlations to what they are doing and what jobs this would apply to - as well as the $ they could potentially earn.
Sponsors at the meets
Unknown

A132. (All adults) How many children under 18 do you have?

N=70	n	%
0	6	9%
1	11	16%
2	24	34%
3	8	11%
4	8	11%
5	1	1%
6	2	3%
7	3	4%
9	1	1%
12	1	1%
14	2	3%
15	1	1%
17	1	1%

A133. Are you currently employed in a field related to science, technology, engineering, math, or manufacturing?

N=70	n	%
Yes	37	53%
No	33	47%

A134. Gender

N=69	n	%
Female	39	57%
Male	30	43%

A135. Which of the following best describes you?

N=69	n	%
White or Caucasian	67	97%
Prefer not to answer	2	3%
African American or Black	0	0%
American Indian	0	0%
Asian American or Pacific Islander	0	0%
Hispanic, Chicano, or Latino	0	0%
More than one of the above	0	0%

A136 Did your child/team members participate in VEX as part of... (check all that apply)

N=70	n	%
A high school team	32	46%
A middle school team	19	27%
An elementary school team	9	13%
Boy Scouts/Girl Scouts	7	10%
4-H	3	4%
Other	5	7%

Note: *Respondents could choose multiple responses, so percentages do not add up to 100%.*

Other Responses*:*

Group of boys that created a team
High school neighborhood team who also competes in FTC
Homeschool/Christian school team
Private Christian School
The team was put together on their own and coached by themselves

A137. What was the name of the school or organization that participated in VEX?

742 School district	Austin Public Schools IJ Holton Intermediate School	Bemidji Middle School
Bemidji Middle School Polar Phoenix	Boy Scout Troop 99	Boy Scout Troop 99
Concordia Academy	Eagan HS (Eagan HS does not support VEX, rather, they promote FTC and FRC)	East High School in Mankato, MN
Fairmont	FREEZE FRAME ROBOTICS	Grygla Public School Iron Chargers
Hayfield High School	Heartland Christian	Heartland Christian Academy
Heartland Christian Academy	Herman-Norcross Community School	Holton Engineers
I.J. Holton Austin, MN	Kaylene Jensen	IJ Holton
IJ Holton Engineers	IJ Holton Intermediate School Austin, MN	ISD47
It was listed under Eagan however Eagan high school did not give any financial support.	Kato Public Charter School Coyotes 8112A	Lancaster School
Mankato East	Mankato East High School	Mankato West
Mankato West High School	Mankato West High School	Marshall County Central High School
Marshall County Central High School of Newfolden, Minnesota	Marshall County Freeze	Menahga High School
Mysterious George (Homeschool students)	North Jr High	North Jr. High
North Junior High	North Junior High	North Junior High
Osseo	Pine City ALC	Princeton
Richmond elementary	Sartell High School	South High
South High School	South Tigers	St. Peter and Paul
Stearns County 4H Robotics Club	Stearns County 4-H Robot-X Club	Stearns County Robot X 4-H Club
Sts. Peter & Paul School	Sts. Peter & Paul School, Richmond	Troop 211
Troop 99	Troop 99	Troop 99, Elk River (elk river robotics inc)
West High School in Mankato	Windom Area Schools Two teams and 26 students	Win-E-Mac High School

Note: *This table includes both "Teacher/Coach" and "Parent" responses.*

A138. (Teachers/Coaches only) Did your team receive a sponsorship?

N=29	n	%
No	16	55%
Yes	13	45%
How much did your team receive in sponsorships? (n=13)		
Less than $500	3	23%
$501 to $1,500	4	31%
$1,501 to $2,000	0	0%
$2,001 to $2,500	2	15%
Over $2,500	4	31%

Note: *This table includes both "Teacher/Coach" and "Parent" responses.*

ISRS data tables

Programs

A139. 360° ATE programs by award level and institution (2015)

Institution	Certificate	Diploma	Associate	Bachelor's	Master's	Total
Bemidji State University	0	0	0	10	1	11
Central Lakes College	13	12	8	0	0	33
Lake Superior College	20	9	12	0	0	41
Minneapolis Community and Technical College	3	3	1	0	0	7
Northland Community and Technical College	13	5	10	0	0	28
Northwest Technical College - Bemidji	6	4	4	0	0	14
Pine Technical College	7	8	8	0	0	23
Riverland Community College	10	12	5	0	0	27
Saint Paul College	19	11	10	0	0	40
St. Cloud Technical and Community College	12	13	10	0	0	35
Total	**103**	**77**	**68**	**10**	**1**	**259**

A140. 360° ATE programs by award level and program area (2015)

	Certificate	Diploma	Associate	Bachelor's	Master's	Total
Business, Management, Marketing, and Related Support Services	4	2	4	0	0	10
Engineering	0	0	2	0	0	2
Engineering Technologies and Engineering-Related Fields	48	28	47	10	1	134
Mechanic and Repair Technologies/Technicians	3	8	3	0	0	14
Precision Production	48	39	12	0	0	99
Total	**103**	**77**	**68**	**10**	**1**	**259**

A141. 360° ATE programs by program area

Business, Management, Marketing, And Related Support Services
Electronic Technology Marketing, I & II
Lean Manufacturing/Continuous Improvement
Manufacturing Engineering Technician
Manufacturing Technical Specialist
Production and Inventory Management
Engineering
Engineering
Pre-Engineering
Engineering Technologies And Engineering-Related Fields
3D Model Development and Design
Advanced Inventor (CAD)
Applied Engineering
Applied Engineering Technology
Automated Manufacturing Technology
Automation Technologies
Basic Electronics
Biomedical Engineering Technology
Computer Aided Design Engineering Technology
Computer Aided Design Manufacturing Technology
Computer Aided Drafting and Design
Computer-Aided Drafting and Design Technology
Control Engineering Technololgy
Electronic Engineering Technology
Electronic Engineering Technology - Digital Communication
Electronic Engineering Technology - Industrial Controls
Electronic Engineering Technology - Wireless Communications
Electronic Nanotechnology
Electronic Technology
Electronics Manufacturing Technology
Electronics Technician - Computer Networking
Electronics Technician I
Electronics Technology
Electronics Technology/Automated Systems

Engineering CAD Technician

Engineering CAD Technology

Engineering Technology

Industrial Electronics

Industrial Electronics Technician

Industrial Technology

Industrial/Manufacturing Technology/Tech

Instrumentation and Process Control Technology

Integrated Manufacturing - Engineering CAD Technology

Integrated Manufacturing Technology - Computer Aided Design Fundamentals

Integrated Manufacturing Technology - Mechanical Drafting and Design CAD Fundamentals

Integrated Manufacturing Technology - Microstation (CAD)

Manufacturing Engineering Technology

Manufacturing Engineering Technology - Manufacturing

Manufacturing Principles

Manufacturing Technical Specialist

Manufacturing Technician

Manufacturing Technology

Mechanical Design

Mechanical Design and Manufacturing Technology

Mechanical Design Technology (Detail Drafting, CADD Specialties)

Mechanical Drafting

Mechanical Drafting & Design Technology

Mechanical Drafting and Design

Mechatronics

Mechatronics Technology

Microstation (CAD)

Microstation CAD

Naval Technology - Electronics

Naval Technology - Machinist

Performance Improvement

Production Technologies

Prototype Engineering Technology

Quality and Productivity

Robotic Human Machine Interface Advanced

Robotic Manufacturing

Robotic Offline Programming Advanced

Robotic Vision Advanced

Robotic Welding Advanced

Robotics and Automation Technology

Robotics Technology/Automated Systems

Robotics/Automated Systems Technology

Robotics/Automation Technology

Solidworks (CAD)

Technology Management

Mechanic And Repair Technologies/Technicians

High Performance Engine Machinist

Industrial Electronic Maintenance

Industrial Machine Maintenance

Industrial Machine Testing/Trouble Shooting

Industrial Maintenance and Mechanics

Industrial Mechanical Maintenance

Manufacturing Maintenance Technician

Manufacturing Technology - Prototyping Gunsmith

Micro Mechanical Technology

Production Technician I

Precision Production

Advanced CNC Machine Tool Technology

Advanced Manufacturing Technology

Biomedical Precision Machining Specialist

CNC Operations Specialist

CNC Operator

CNC Programming

CNC Programming Specialist

CNC Toolmaking

Computer Aided Design Engineering Technology

Computer Controlled Precision Machining

Computer Controlled Precision Manufacturing

Computer Numerical Control Operator

Computer Numerical Control Specialist

Gas Metal Arc Welding Production Welder

Gas Tungsten Arc Welding Production Welder

Gas Tungsten Arc/Gas Metal Arc

Gas Tungsten Arc/Shielded Metal Arc

Industrial Welding Technology

Integrated Manufacturing Technology - Automated Machining

Integrated Manufacturing Technology - CNC Machine Programmer

Integrated Manufacturing Technology - CNC Operator

Integrated Manufacturing Technology - Machine Tool Operator

Integrated Manufacturing Technology - Manual Machinist

Integrated Manufacturing Technology - Rapid Prototyping and Design

Integrated Manufacturing Technology - Welding

Machine Operator

Machine Tool Operator/CNC Operator

Machine Tool Processes

Machine Tool Technologies

Machine Tool Technology - Precision Machining

Machine Tool Technology - Tool and Die Moldmaking

Machine Tool Technology-Machine Operator

Machining

Machinist I & III

Manufacturing Technology - Prototype/Reverse Engineering

Manufacturing Welding Technician

Microstation CAD

Precision Machining

Production Welding

Robotic Welding

Shielded Metal Arc/Gas Metal Arc

Tool and Die Making Specialist

Welding

Welding - Metal Fabrication

Welding - Production

Welding and Fabrication

Welding and Fabrication Technology

Welding and Metal Fabrication

Welding Process Technology

Welding Technology

Welding/Robotics Technology

A142. 360° program enrollment by year and program area

ATE	2010	2011	2012	2013	2014	2015	Total
Business, Management, Marketing, and Related Support Service	95	50	64	66	53	46	374
Engineering	59	52	49	84	146	100	490
Engineering Technologies and Engineering-Related Fields	1,363	1,368	1,290	1,323	1,463	1,095	7,902
Mechanic and Repair Technologies/Technicians	215	208	183	147	153	90	996
Precision Production	1,562	1,558	1,461	1,790	2,096	1,147	9,614
360° total	**3,294**	**3,236**	**3,047**	**3,410**	**3,911**	**2,478**	**19,376**

Note: *An "enrollment" is any time a student enrolled for coursework in a Center program for any term of the school year. A single student could be enrolled in multiple programs and in multiple terms within or across years, so enrollment numbers represent a duplicated student count.*

A143. 360° program enrollment by year and award level

	Certificate	Diploma/ Associate	Bachelor's	Master's	Total
2010	598	2,200	464	32	3,294
2011	502	2,220	478	36	3,236
2012	461	2,101	470	15	3,047
2013	535	2,466	399	10	3,410
2014	673	2,769	466	*	*
2015	320	1,792	365	*	*
360° total	**3,089**	**13,548**	**2,642**	**97**	**19,376**

Note: *An "enrollment" is any time a student enrolled for coursework in a Center program for any term of the school year. A single student could be enrolled in multiple programs and in multiple terms within or across years, so enrollment numbers represent a duplicated student count. Asterisks indicate suppression for groups of less than 10 students.*

A144. 360° ATE students by award level and institution (2015)

Institution	Certificate	Diploma/ Associate	Bachelor's	Master's
Bemidji State University	0	0	365	*
Central Lakes College	22	273	0	0
Lake Superior College	67	361	0	0
Minneapolis Community and Technical College	80	94	0	0
Northland Community and Technical College	20	100	0	0
Northwest Technical College - Bemidji	*	29	0	0
Pine Technical and Community College	30	50	0	0
Riverland Community College	54	58	0	0
Saint Paul College	36	438	0	0
St. Cloud Technical and Community College	*	389	0	0

Note: *This is an unduplicated count of any student who took coursework in any Center program for at least one term during the school year. Asterisks indicate suppression for groups of less than 10 students.*

A145. 360° ATE students by award level and degree area (2015)

Program area	Certificate	Diploma/ Associate	Bachelor's	Master's
Business, Management, Marketing, and Related Support Service	16	30	0	0
Engineering	0	100	0	0
Engineering Technologies and Engineering-Related Fields	30	699	365	*
Mechanic and Repair Technologies/Technicians	0	90	0	0
Precision Production	274	873	0	0

Note: *This is an unduplicated count of any student who took coursework in any Center program for at least one term during 2015. Asterisks indicate suppression for groups of less than 10 students.*

A146. 360° ATE students by gender

	2010	2011	2012	2013	2014	2015	Total
Female	7%	7%	7%	7%	6%	7%	7%
Male	93%	93%	92%	93%	94%	93%	93%
360° total	**3,294**	**3,236**	**3,047**	**3,410**	**3,911**	**2,478**	**19,376**

Note: *For a small number of students (N<10), gender was unknown. These students are excluded from the chart but included in the total, so percentages may not sum to 100%.*

A147. 360° ATE students by race, detailed

	2010	2011	2012	2013	2014	2015	Total
American Indian	1%	1%	2%	1%	1%	1%	1%
Asian	4%	4%	4%	4%	6%	7%	5%
Black or African American	7%	7%	8%	8%	7%	7%	7%
Hispanic of any race	3%	3%	3%	3%	4%	4%	3%
Two or more races	3%	4%	3%	3%	4%	4%	4%
Unknown	3%	3%	3%	2%	2%	2%	2%
White	79%	79%	77%	77%	77%	75%	77%
360° total	**3,294**	**3,233**	**3,047**	**3,409**	**3,907**	**2,478**	**19,368**

Note: *Students of Native Hawaiian or Pacific Islander descent are omitted from these calculations and the total number of 360 students due to small sample size (N<10) each year.*

A148. 360° ATE students by race, condensed

	2010	2011	2012	2013	2014	2015	Total
Students of color	18%	18%	20%	21%	21%	23%	20%
White	79%	79%	77%	77%	77%	75%	77%
Unknown	3%	3%	3%	2%	2%	2%	2%
360° total	**3,294**	**3,236**	**3,047**	**3,410**	**3,911**	**2,478**	**19,376**

A149. 360° ATE students by first generation college student status

	2010	2011	2012	2013	2014	2015	Total
First generation	27%	25%	25%	26%	26%	25%	26%
Not first generation	67%	71%	71%	71%	71%	72%	71%
Unknown	6%	4%	4%	3%	3%	3%	4%
360° total	**3,294**	**3,236**	**3,047**	**3,410**	**3,911**	**2,478**	**19,376**

A150. 360° ATE students by age

	2010	2011	2012	2013	2014	2015	Total
18 years old or younger	4%	4%	4%	5%	10%	17%	7%
19-24 years old	43%	41%	43%	41%	38%	39%	41%
25-34 years old	28%	30%	30%	31%	30%	27%	29%
35+ years old	25%	25%	23%	23%	22%	18%	23%
360° total	**3,294**	**3,236**	**3,047**	**3,410**	**3,911**	**2,478**	**19,376**

Note: *A small number of students ages were not known (N<10) and were excluded from the table. Students whose age is unknown are included in the total, so percentages may not sum to 100%.*

Graduates

A151. 360° ATE graduates by institution

	2010	2011	2012	2013	2014	2015
Bemidji State University	58	41	69	50	47	265
Central Lakes College	61	58	40	36	99	294
Lake Superior College	40	57	56	57	57	267
Minneapolis Community and Technical College	20	17	21	27	*	99
Northland Community and Technical College	82	55	59	72	51	319
Northwest Technical College - Bemidji	*	29	29	20	*	92
Pine Technical College	*	16	19	21	26	92
Riverland Community College	44	59	42	59	44	248
Saint Paul College	79	81	73	95	160	488
St. Cloud Technical and Community College	55	63	60	79	129	386
360° total	**454**	**476**	**468**	**516**	**636**	**2,550**

Note: *Asterisks indicate suppression for groups of less than 10 students.*

A152. 360° ATE graduates by program area

ATE	2010	2011	2012	2013	2014	Total
Business, Management, Marketing, and Related Support Service	41	39	*	29	*	161
Engineering	*	*	*	*	*	13
Engineering Technologies and Engineering-Related Fields	158	197	191	159	193	898
Mechanic and Repair Technologies/Technicians	*	*	35	*	23	144
Precision Production	210	216	209	301	398	1,334
360° total	**454**	**476**	**468**	**516**	**636**	**2,550**

Note: *Asterisks indicate suppression for groups of less than 10 students.*

A153. 360° System-wide graduates by program area

System-wide	2010	2011	2012	2013	2014	Total
Business, Management, Marketing, and Related Support Service	56	63	58	58	59	294
Engineering	98	86	102	67	113	466
Engineering Technologies and Engineering-Related Fields	510	610	642	578	622	2,962
Mechanic and Repair Technologies/Technicians	207	130	165	137	167	806
Precision Production	519	548	512	696	779	3,054
System-wide total	**1,390**	**1,437**	**1,479**	**1,536**	**1,740**	**7,582**

A154. 360° ATE graduates by gender

	2010	2011	2012	2013	2014	Total
Female	9%	11%	9%	9%	6%	9%
Male	91%	88%	90%	90%	94%	91%
360° total	454	476	468	516	636	2550

Note: *A small number of students whose gender is unknown are omitted from this table but included in the total, so percentages may not sum to 100%.*

A155. System-wide graduates in 360°-related programs by gender

	2010	2011	2012	2013	2014	Total
Female	10%	9%	8%	9%	8%	9%
Male	90%	91%	92%	91%	92%	91%
System-wide total	**1,389**	**1,432**	**1,475**	**1,531**	**1,735**	**7,562**

Note: *A small number of students whose gender is unknown are omitted from this table but included in the total, so percentages may not sum to 100%.*

A156. 360° ATE graduates by race, detailed

	2010	2011	2012	2013	2014	Total
American Indian	*	*	*	*	*	1%
Asian	3%	5%	4%	4%	6%	4%
Black or African American	3%	*	3%	4%	2%	3%
Hispanic of any race	*	4%	*	3%	4%	3%
Two or more races	2%	3%	3%	3%	3%	3%
Unknown	4%	2%	2%	*	*	3%
White	86%	84%	85%	81%	82%	83%
360° total	**454**	**476**	**468**	**516**	**636**	**2,550**

Note: *Asterisks indicate suppression for groups of less than 10 students.*

A157. System-wide graduates in 360°-related programs by race, detailed

	2010	2011	2012	2013	2014	Total
American Indian	0%	1%	1%	0%	1%	1%
Asian	5%	5%	4%	5%	4%	5%
Black or African American	3%	3%	4%	4%	3%	3%
Hispanic of any race	2%	2%	3%	3%	3%	3%
Two or more races	2%	2%	3%	3%	3%	3%
Unknown	2%	2%	1%	3%	1%	2%
White	85%	84%	84%	83%	84%	84%
System-wide total	**1,390**	**1,437**	**1,479**	**1,536**	**1,740**	**7,582**

A158. 360° ATE graduates by race, condensed

	2010	2011	2012	2013	2014	Total
Students of color	10%	14%	13%	16%	16%	14%
White	86%	84%	85%	81%	82%	83%
Unknown	4%	2%	2%	3%	2%	3%
360° total	**454**	**476**	**468**	**516**	**636**	**2,550**

A159. System-wide graduates in 360°-related programs by race, condensed

	2010	2011	2012	2013	2014	Total
Students of color	14%	14%	15%	16%	15%	15%
White	85%	84%	84%	83%	84%	84%
Unknown	1%	1%	1%	1%	1%	1%
System-wide total	**1,390**	**1,437**	**1,479**	**1,536**	**1,740**	**7,582**

A160. 360° ATE graduates by first generation college student status

	2010	2011	2012	2013	2014	Total
First generation	20%	26%	22%	23%	26%	24%
Not first generation	69%	67%	74%	72%	71%	70%
Unknown	11%	7%	4%	5%	3%	6%
360° total	**454**	**476**	**468**	**516**	**636**	**2,550**

A161. System-wide graduates in 360°-related programs by first generation college student status

	2010	2011	2012	2013	2014	Total
First generation	23%	24%	24%	23%	23%	24%
Not first generation	71%	71%	72%	74%	74%	72%
Unknown	6%	5%	4%	3%	3%	4%
System-wide total	**1,390**	**1,437**	**1,479**	**1,536**	**1,740**	**7,582**

A162. 360° ATE graduates by age

	2010	2011	2012	2013	2014	Total
Under 21	26%	17%	19%	23%	24%	22%
21-24 years old	25%	22%	29%	26%	22%	25%
25-34 years old	24%	30%	29%	27%	29%	28%
35+ years old	23%	32%	22%	23%	24%	25%
360° total	**454**	**476**	**468**	**516**	**636**	**2,550**

Note: *System-wide graduates currently unavailable by the age breakdown used throughout the rest of the report (18 and under, 19-24 years, etc.); this chart includes the breakdown used in the system-wide graduates file.*

A163. System-wide graduates in 360°-related programs by age

	2010	2011	2012	2013	2014	Total
Under 21	28%	25%	24%	24%	28%	26%
21-24 years old	24%	22%	23%	26%	22%	23%
25-34 years old	25%	27%	29%	28%	27%	27%
35+ years old	23%	26%	24%	22%	23%	23%
System-wide total	**1,390**	**1,437**	**1,479**	**1,536**	**1,740**	**7,582**

Note: *System-wide graduates currently unavailable by previous age breakdown (18 and under, 19-24 years, etc.).*

A164. 360° ATE graduates by award level and year

	Certificate	Diploma/ Associate	Bachelor's	Total
2010	136	260	56	452
2011	143	292	39	474
2012	111	288	68	467
2013	158	308	43	509
2014	186	403	46	635
360° total	**734**	**1,551**	**252**	**2,537**

Note: *A small number of students graduated with master's degrees each year (N<10). They are omitted from the total column.*

A165. 360° ATE graduates by award level and program area (2014)

	Certificate	Diploma/ Associate	Bachelor's	Total
Business, Management, Marketing, and Related Support Services	20	*	0	*
Engineering	*	*	0	*
Engineering Technologies and Engineering-Related Fields	26	120	46	192
Mechanic and Repair Technologies/Technicians	*	22	0	23
Precision Production	139	259	0	398
360° total	**186**	**403**	**46**	**635**

Note: *A small number of students graduated with master's degrees (N<10). They are omitted from the total column. Asterisks indicate suppression for groups of less than 10 students.*

A166. System-wide graduates in 360°-related programs by award level and program area (2014)

	Certificate	Diploma/ Associate	Bachelor's	Total
Business, Management, Marketing, and Related Support Services	172	64	0	236
Engineering	0	452	0	452
Engineering Technologies and Engineering-Related Fields	388	1,880	216	2,484
Mechanic and Repair Technologies/Technicians	124	544	0	668
Precision Production	1,032	2,084	0	3,116
System-wide total	**1,716**	**5,024**	**216**	**6,956**

Note: *A small number of students graduated with master's degrees (N<10). They are omitted from the total column.*

A167. Goal table

Goal	Measures	From X to Y by When	Status to share with NVC
15 – 30 % increase in the number of graduates	Graduate data provided by MnSCU system office Integrated Student Records System (ISRS)	The number of ATE graduates increased by 40% from 2010 (454) to 2014 (636). The number of system-wide graduates in the same program areas (CIP2) increased by 25% between 2010 (1390) and 2013 (1740)	We will be tracking this information each year.
Increased wages/salaries for graduates	Comparison of wage and salary data collected by MnSCU system office and Department of Employment and Economic Development (DEED) and analyzed by Wilder Research	Despite emphasizing the need for these data, we did not receive them again this year.	We are following up with Craig.
25 % increase in the number of female graduates	Graduate data provided by MnSCU system office Integrated Student Records System (ISRS)	The number of female graduates decreased by 15% from 2010 (41) to 2014 (35). The proportion of total graduates went from 9% in 2010 to 6% in 2014.	We will be tracking this information each year.
25 % increase in the number of minority graduates	Graduate data provided by MnSCU system office Integrated Student Records System (ISRS)	The number of graduates of color increased by 115% from 2010 (47) to 2013 (101). The proportion of graduates of color went from 10% in 2010 to 16% in 2014.	We will be tracking this information each year.

Common perspectives questions

The follow questions are included on all data collection instruments, and are intended to provide common measures regarding individual perspectives about manufacturing and manufacturing careers. These commons questions were developed in the early months of 2013, so any data collection before 2013 does not include the questions (but may include similar questions).

1. Think about BEFORE you went to [EVENT]. How much were you…	**A lot**	**Some**	**Very little**	**Not at all**
a. Interested in science, technology, engineering, or math?	❒1	❒2	❒3	❒4
b. Confident in your ability to do science, technology, engineering, or math?	❒1	❒2	❒3	❒4
c. Interested in manufacturing careers?	❒1	❒2	❒3	❒4
d. Aware of careers in manufacturing?	❒1	❒2	❒3	❒4

2. Think about NOW (after going to [EVENT]). How much are you…	**A lot**	**Some**	**Very little**	**Not at all**
a. Interested in science, technology, engineering, or math?	❒1	❒2	❒3	❒4
b. Confident in your ability to do science, technology, engineering, or math?	❒1	❒2	❒3	❒4
c. Interested in manufacturing careers?	❒1	❒2	❒3	❒4
d. Aware of careers in manufacturing?	❒1	❒2	❒3	❒4

3. How did you feel about manufacturing careers BEFORE the [EVENT]?

❒1 I thought they were good
❒2 I thought they were just OK
❒3 I didn't think they were good
❒4 I didn't think about them
❒5 I am not sure

4. How do you feel about manufacturing careers NOW?

❒1 I think they are good
❒2 I think they are just OK
❒3 I don't think they are good
❒4 I don't think about them
❒5 I am not sure

5. **Now that you have been to [EVENT], if you think about someone who works in a manufacturing career, what one or two words come to mind?**

6. **Now that you have been to [EVENT], which of the following words best describe your thoughts about manufacturing careers? (Check as many as you would like.)**
   - ❒1 Fun
   - ❒2 Dirty
   - ❒3 Exciting
   - ❒4 Noisy
   - ❒5 Creative
   - ❒6 Hard
   - ❒7 Advanced
   - ❒8 Dark
   - ❒9 Dangerous
   - ❒10 Modern

Youth outreach event tracking form

Hello! The 360 Center requests that you complete the following form because your school hosted a youth outreach event with funds from 360. This survey will help us track important information, including the length of each event, how many youth participated, and what kind of experience they gained. We also use this information to report on grant progress and to apply for additional funding. Please complete the form for each youth event that your school has hosted. Thank you!

1. Name of school:

2. Name of event:

3. Start and end dates of event (enter same date for single day events):

Start: MM[ ] /DD[ ] /YYYY[ ]

End: MM[ ] /DD[ ] /YYYY[ ]

4. Approximate number of instructional/working/learning hours related to manufacturing for participants:

5. In what city was the event held?

6. Was this an overnight event?

- ○ Yes
- ○ No

7. Ages of participants (check all that apply):

- ☐ 8
- ☐ 9
- ☐ 10
- ☐ 11
- ☐ 12
- ☐ 13
- ☐ 14
- ☐ 15
- ☐ 16
- ☐ 17
- ☐ 18

Other (please specify)[ ]

8. Please provide the number of participants.

Total participants:

Female participants:

Participants of color:

9. Please describe the experience gained by the participants:

10. Please indicate the types and amount of funding this event received (leave blank if no funding was received):

360 ATE Center:

Partner institution:

Outside grants (list):

Industry (list):

Other:

11. Industry engagement:

- ☐ Judges
- ☐ Tour
- ☐ Planning

Other (please specify)

12. Media coverage (please provide a web link to the coverage if available):

Radio:

Newspaper:

Television

Other: