Wilder Research

360 ATE Regional Center Evaluation

Summary of progress for Year Four

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 provides rigorous and unbiased information to multiple stakeholders. This summary highlights data collected between April 2015 and March 2016, including:

- **2015 summer camp surveys:** 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 2015, a total of 197 youth participants from 11 different camps completed the survey.

- **2016 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 2016, 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 442 adults, including parents, coaches, and teachers. To reach youth, evaluators sent the youth survey link to 257 e-mail addresses of youth or their parents. Parents were asked to forward the link to their children. In total, 161 adults and 112 youth completed the survey.

- **2015 Tour of Manufacturing surveys:** In fall 2015, 360 and its partners coordinated over 80 manufacturing businesses and five colleges across Minnesota to provide tours of their facilities for students, educators, job seekers, other manufacturers, and the general public. The official dates for this event, called the Dream It. Do It. Minnesota Statewide Tour of Manufacturing, were October 1 to October 10, 2015; however, some tours took place throughout October and into early November. To 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 239 people completed the participant survey, and 58 hosts completed the web survey (out of the 91 to whom Wilder emailed a survey link). In addition to the post-event surveys, Wilder sent a brief web survey to eight regional coordinators to learn about the resources that organizations contributed to their local Tour of Manufacturing effort; seven out of the eight coordinators responded.

- **Teacher Guide survey:** In 2015, 360 sponsored the production and dissemination of a guide for teachers, called *An Introduction to Manufacturing in Minnesota Teacher Guide*. To help understand how teachers used this guide, as well as how the materials might be improved, Wilder sent a survey link to a list of 147 educators who had downloaded the guide online. In total, 18 individuals responded to the survey.

- **Career Success Skills survey:** 360 also created 26 Career Success Skills learning modules to provide educators and industry with more resources to help students and employees develop their professional skills. To understand how people used the learning modules, Wilder sent a survey to Intermediaries – the faculty and professionals who access the learning modules to use with students and employees – and End Users – the students, employees, or others with whom the Intermediaries share the modules. A web survey was emailed to 75 End Users and 197 Intermediaries; 10 End Users and 21 Intermediaries responded.

- **Data from MnSCU's Integrated Statewide Record System (ISRS) and the Minnesota Department of Employment and Economic Development (DEED):** Wilder has also worked with the Center and MnSCU's research and assessment department to select programs that are likely to be affected by Center activities. Data were pulled for the graduates of Center-related programs, including number of graduates and wage information for program graduates.

Promote the manufacturing industry

In order to consistently track perceptions of manufacturing and science, technology, engineering, and mathematics (STEM) over time, Wilder Research and the 360 Center developed a series of perceptions questions to be used across surveys; the questions were first used in the 2013 summer camp survey. In all surveys, perceptions of manufacturing improved (Figure 1). It should be noted that the sample sizes and 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
2015 summer camps (N=193-194)		
Think they are good	27%	62%
Think they are just OK	36%	29%
Don't think they are good	8%	3%
Don't think about them	17%	2%
I am not sure	11%	4%
2016 VEX Robotics (youth) (N=105-106)		
Think they are good	23%	51%
Think they are just OK	45%	31%
Don't think they are good	4%	2%
Don't think about them	19%	7%
I am not sure	9%	9%
2016 VEX Robotics (adult) (N=149)		
Think they are good	50%	89%
Think they are just OK	35%	8%
Don't think they are good	2%	0%
Don't think about them	9%	1%
I am not sure	4%	1%
2015 Tour of Manufacturing (N=222)		
Think they are good	51%	80%
Think they are just OK	30%	14%
Don't think they are good	7%	1%
Don't think about them	9%	3%
I am not sure	5%	2%

Note: *Percentages do not equal 100% due to rounding.*

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; "creative" and "advanced" were always in the top three response options, and "fun" was always in the top three options for youth-only surveys (Figure 2).

2. Words that best describe manufacturing careers

	N	%
2015 summer camps (N=196)		
Fun	142	72%
Creative	141	72%
Advanced	122	62%
2016 VEX Robotics (youth) (N=103)		
Advanced	71	69%
Creative	71	69%
Fun	54	52%
2015 Tour of Manufacturing (N=223)		
Creative	111	50%
Advanced	102	46%
Modern	91	41%

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

Overall, the satisfaction of survey respondents at all events was high, including at the VEX Robotics program (80% of adults and 57% of youth were "very satisfied" with the event, although it should be noted that the youth number is down from 78% last year; researchers are unsure why); Tour of Manufacturing (86% of participants were "very satisfied"); and summer camps (90% of attendees liked their camp "a lot"). Also, the majority (90%) of respondents who hosted a tour felt that their participation was worthwhile and said they plan to participate again (65% "certainly" and 27% "maybe"). Businesses were particularly pleased with the engagement of participants and the opportunity to build awareness of manufacturing careers.

Build 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 increased among youth participants (Figure 3). (Both awareness and interest also increased among Tour of Manufacturing survey participants.)

3. Awareness of manufacturing careers among youth

	Pre-event	Post-event
2015 summer camps (N=194-196)		
A lot	36%	71%
Some	37%	23%
Very little	21%	6%
Not at all	5%	1%

3. Awareness of manufacturing careers among youth (continued)

	Pre-event	Post-event
VEX Robotics (youth) (N=105)		
A lot	31%	50%
Some	41%	39%
Very little	12%	8%
Not at all	10%	3%
Don't know	5%	0%

Note: *Percentages do not equal 100% due to rounding.*

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 reporting "a lot" of interest in manufacturing careers (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
2015 summer camps (N=194-196)		
A lot	23%	45%
Some	38%	37%
Very little	30%	12%
Not at all	9%	5%
VEX Robotics (youth) (N=105)		
A lot	27%	41%
Some	31%	31%
Very little	29%	19%
Not at all	9%	8%
Don't know	5%	1%
2015 Tour of Manufacturing (N=208-210)		
A lot	30%	49%
Some	38%	34%
Very little	21%	7%
Not at all	12%	11%

Note: *Percentages do not equal 100% due to rounding.*

Increase the number of graduates

Increasing the quantity of high-quality graduates is a primary goal of the Center. It is also a lagging indicator of success, because it can take years to recruit and move students through programs. MnSCU's 2015 ISRS data show there was a 33 percent increase in graduates from the 10 original partner institutions (referred to here as "360 Core" schools) over the 2010-12 baseline, up to 606 from an average of 457 during 2010-12 (Figure 5). Compared to 2014, there was a 5 percent decrease in the number of graduates, which equates to 31 fewer total graduates. The decline between 2014 and 2015 was driven by fewer Certificate (26 fewer) and Diploma/Associate graduates (15 fewer), and offset by an increase in the number of Bachelor's/Master's graduates (10 more). Precision Production saw the largest decline in graduates (66 fewer graduates), while there were substantial gains in Business, Management, Marketing, and Related Support Services (18 more) and Engineering Technologies and Engineering-Related Fields (18 more).

The number of system-wide graduates in the same 360-related programs, but not at 360 Core schools, increased 20 percent from an average of 1,094 per year during 2010-12 to 1,314 in 2015. Compared to 2014, non-Core graduates increased by 9 percent. Though non-360 Core institutions made a larger year-over-year gain, 360's original partners have achieved a greater increase over their baseline average (33% for 360 Core versus 20% for non-360 Core). Interestingly, 360's new partner institutions contributed substantially to the increases in non-Core graduates. As of 2015, new partner institutions demonstrated an increase of 71 percent over the baseline average of 535 graduates. Gains at South Central (+91% from 2014) and Hennepin Tech (+40% from 2014) drove this change. If 360's new partner institutions are removed from the non-partner counts, the number of non-partner graduates has decreased 29 percent over baseline, and 23 percent compared to 2014.

5. 360-related program graduates by year

	2010-2012 Baseline	2013	2014	2015
360 core partner graduates	457	525	637	606
Total graduates in 360 programs at non-core or non-partner institutions	1,094	1,066	1,208	1,314

Note: *The list of 360-related programs was updated this year to better reflect the programs 360 is targeting. This change has been applied to all program years, so data have changed from previous reports. FY2015 graduate data are preliminary, as graduation numbers are frozen July 15th of the following fiscal year.*

Increase graduate wages

One of 360's goals is that program graduates will receive increased wages. During 2015, Wilder received wage data through MnSCU's partnership with DEED. These data compare employment and wages among 360 programs to graduates from the same programs at schools system-wide. Data are available for two periods: aggregate data for students who graduated between 2010 and 2012—the 360 baseline years—and for all students who graduated during 2013, which corresponds to the first year of 360 implementation. All wages are adjusted for inflation and provided in 2013 dollars.

At baseline, 360 Core and system-wide graduates had similar employment rates and wages, though graduates from 360 Core institutions had a higher rate of initial employment (76% employed within six months of graduation) than those system-wide (64%). 360 Core graduates had an average initial median wage of $16.80 per hour, compared to an average of $16.77 for same-program graduates system-wide.

Just as in the baseline data, 2013 360 Core graduates were more likely to be employed than system graduates during the six months following graduation (85% for 360 Core versus 74% system-wide). The gap between 360 Core graduates and graduates system-wide was similar to the gap at baseline (12 percentage point difference at baseline versus 11 point difference in 2013). Both groups had a similar proportion of students remain employed six months later (94% for 360 Core versus 96% for system-wide graduates).

With respect to wages, 360 Core 2013 graduates earned slightly more per hour, on average, ($18.13/hour) than 2013 graduates system-wide ($17.99/hour). After six months, 360 Core graduates earned $0.14 more per hour ($19.49 versus $19.17, 1% more) than those in the same programs system-wide. After six months, they earned an average of $0.32 more per hour (2% more) than their counterparts. Both groups saw a seven percent average wage increase after six months of employment.

To better examine the impact of 360 on its partner programs, we limited the dataset to the nine 360 Core programs with data available for both 2010-12 and 2013 graduates—these are generally the largest and longest-running affiliate programs. 360 Core students who graduated in 2013 were similarly likely to be employed (84% versus 81% for 2010-12 cohort) and retained after six months (94% versus 95% for 2010-12 cohort). In terms of wages, the initial average median wage for 2013 graduates was $1.48 per hour higher than for 2010-12 graduates ($18.12/hour versus $16.64/hour). After six months, this difference increased to an average of $1.86 more per hour for those who graduated in 2013 compared to those who graduated in 2010-12 ($19.68/hour versus $17.82/hour). Average wages for the 2010-12 cohort increased by 7 percent over the six-month period, compared to 9 percent for the 2013 cohort.

Other evaluation activities

Teacher Guide survey

Of the 18 individuals who accessed *An Introduction to Manufacturing in Minnesota Teacher Guide*, two said that they had not received the guide, or perhaps did not remember accessing it online. Sixteen respondents confirmed that they had received a guide; however, only 15 respondents went on to complete the survey. The majority (80%) of those who completed the survey were middle or high school teachers. Only two educators had used the guide with students; however, those who had not used the guide with students or employees said that they were either planning to use it in the future or were using it for their own learning.

Because of the extremely low response rate, it is difficult to glean more information from the survey responses. For example, when asked how to improve the guide, most of the 15 respondents said they were unsure or had no opinion. This particular survey has been administered over the past two years and has had a low response rate both times. 360 may want to re-consider conducting this survey until the teacher's guide is more established.

Career Success Skills survey

In order to provide educators and industry with more resources to help students and employees develop their professional skills, 360 created 26 Career Success Skills learning modules. These modules were developed with industry and faculty feedback to improve the abilities of employees, and include topics such as: verbal communication, reliability, having a positive attitude, responsibility and accountability, problem solving, continuous learning, and critical thinking. Two types of groups can receive the modules: 1) Intermediaries – the teachers, faculty, industry professionals, and others who access the modules and then use them with students, employees, or others; and 2) End Users – the students, employees, or others with whom the Intermediaries share the modules. To better understand how both groups used the 360 Career Success Skills

learning modules, how the modules can be improved, and the possible impact the skills are having on students and employees, Wilder sent a survey to each group.

Intermediaries: The majority of respondents (81%) felt that the 360 Career Success Skills learning modules were easy to access online, and the same percentage (81%) had already recommended the modules to their colleagues. Over half (57%) of respondents had used the modules with End Users, who were most often students (67%). Respondents were asked about the effectiveness of the modules in helping End Users improve their skills in specific areas. Respondents were most likely to say that the modules were at least somewhat effective in helping End Users with the following skills: problem solving (91% very or somewhat effective), verbal communication (91%), critical thinking (82%), having a positive attitude (82%), and responsibility (82%).

Several respondents had suggestions for how the modules could be improved, including ways to track if students have completed the quizzes or watched the videos; having a more polished presentation of the modules, with correct grammar, spelling, and uniformity; and more interactive elements, such as assessments and role playing.

End Users: Nine of the 10 End Users who completed the survey were employed full time, while the remaining respondent was unemployed. All respondents felt that the Career Success Skills learning modules were effective. Respondents were asked about the effectiveness of the modules in helping End Users improve their skills (the same set of skills listed in the Intermediary survey). End Users were most likely to say that the modules were at least somewhat effective in helping them improve their skills in the following areas (9 respondents each): continuous learning, critical thinking, verbal communication, and flexibility. When asked which skill they were most interested in improving, the majority said verbal communication (78%), followed by continuous learning (67%).

Tour of Manufacturing coordination survey

As mentioned in the introduction, Wilder sent a brief web survey to eight regional coordinators who had organized the Tour of Manufacturing in their area. The intent of the survey was to gauge the amount and types of resources that organizations had contributed to their local Tour of Manufacturing effort. The seven coordinators who responded to the survey said that organizations used a variety of tools to market the Tour of Manufacturing in their region, particularly school outreach.

Several organizations provided financial and in-kind support to local Tour of Manufacturing efforts, particularly chambers of commerce and manufacturing businesses. Other local businesses that provided support included accounting firms, banks, media outlets, and printing shops. The total amount of financial support was estimated at $29,200.

Balanced Scorecard

In addition to the data collection activities described above, a Balanced Scorecard dashboard was designed to align 360's activities to its vision and strategy and to monitor performance. The evaluators selected the most important measures from an extensive list compiled over the first four 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. Note that this summary report only includes data from 360 Core partners, unless otherwise specified.

Customer Perspective

- **Increased number of technicians:** Since 2010, 360 Core partner programs have produced 3,140 graduates, including 606 graduates in academic year 2015.[1]
- **Enrollment growth:** 360-related programs averaged 1,112 enrollments per year between the 2010 and 2012 academic years, and exceeded the baseline by 20 percent in the 2013 academic year and 40 percent in the 2014 academic year. Data for the 2015 academic year are not yet available.[2]
- **Youth engagement:** Between July 2015 and March 2016, approximately 818 youth participated in 360-supported activities. Of those, 639 participated in VEX (78%), 100 students taught with the Center's "Teacher Guide" (12%), and 79 participated in summer camps (10%). Tallies of youth Tour of Manufacturing participants and high school eTECH students will be added as counts become available.
- **Increased youth interest in manufacturing:** Sixty-two percent of the 392 youth surveyed at 360-sponsored events between December 2014 and February 2016 reported increased or consistently high interest in manufacturing careers before and after that youth engagement activity. This represents 154 youth (39%) who reported increased interest and 90 youth (23%) who reported consistently high interest.
- **College students impacted:** The Center estimates that it directly impacted the education of 626 college students during the 2015 academic year.

Financial Perspective

- **Number of funding sources:** The Center has seven funding sources that provided at least $5,000 in FY2015.
- **Earned income:** The Center has six sources of earned income totaling $27,000 in FY2016.
- **Sponsorships:** The Center had 11 sponsorships totaling $38,150 of direct (cash) support in FY2015.
- **Quarterly cash flow:** The Center secured more than $400,000 in cash flow per quarter for FY2015, and has secured about $175,000 per quarter through the end of FY2016.

Internal Processes Perspective

- **Quality of collaboration:** The Center had an average aggregate collaboration score of 4.04 in 2015. This score was based on 120 ratings (20 stakeholders responding to 6 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 4.09 in 2015. This score was based on 160 ratings (20 stakeholders responding to 8 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 ten 360 Core institutions averaged 6.8 out of 11 possible points in 2015. All 15 college partners averaged 6.5 out of 11 points during the same period.

Learning and Growth

- **Staff development:** The 360 Center has outlined a development plan for each of its staff members. Each staff person has a professional development effort based on his or her interests, and an organizational improvement effort that supports the progress of the Center.
- **Review of industry needs:** The 360 Center has begun tracking the number of quarterly manufacturing job openings in Minnesota through Wanted Analytics. During the third quarter of FY2015, there were approximately 17,302 total manufacturing openings, which includes 4,262 technician openings. The Center will also track openings for machine tool and welding positions. During Q3 of FY2015, there were 999 machine tool openings and 343 welding openings.
- **Strategy council updates:** These updates are provided regularly to the 360 Center's partners, but are not measured.

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1 Data for all years are updated annually to reflect the best available data, so prior year counts may change over time.

2 Enrollment numbers are now collected directly from partner programs by 360, instead of via ISRS. Data for Lake Superior College are not available for the 2010 academic year; Bemidji State data are not collected.

Summary and issues to consider

Overall, the 360 ATE Center continues to make progress towards their goals and it has been, by most accounts, successfully implementing their work and achieving their proposed outcomes. The following represent key considerations and recommendations the evaluation has identified.

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.

Slight decline in annual graduates. Center partners experienced a slight 5 percent decline in the number of 360 program graduates from 2014 to 2015, compared to a 9 percent increase among non-360 Core. There were declines at both the Certificate and Diploma/Associate levels, but an increased number of graduates with Bachelor's degrees. Precision Production saw the largest decline in the number of graduates.

360 maintained strong growth in graduates relative to baseline. The number of 2015 graduates remained much higher than in the baseline years (+33% over 2010-12 average). Though non-360 Core institutions made a larger year-over-year gain, 360's original partners have achieved a greater increase over their baseline average (+33% for 360 Core versus +20% for non-360 Core).

Increase in graduate wages relative to baseline. Following graduation, 2013 360 graduates earned an average of $1.48/hour more than 2010-12 360 graduates in the same programs, and $1.86/hour more after six months of work. Average wages for the 2010-12 cohort increased by 7 percent over the six-month period, compared to 9 percent for the 2013 cohort. On average, graduates from 360 programs earn slightly more than graduates system-wide ($0.14 to $0.32/hour in 2013).

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