



360 Summer Camps – 2015

Survey of Youth Participants



LEADING THE
MANUFACTURING
TALENT REVOLUTION

F E B R U A R Y 2 0 1 6

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Introduction

An important aspect of the 360 Manufacturing and Applied Engineering ATE Regional Center of Excellence (360) mission is to expose students to and increase enthusiasm for manufacturing careers. To this end, 360 and its partners hold STEM and manufacturing summer camps for youth.

Survey methodology

To help understand the impact of these summer camps, 360 staff members distributed self-administrated questionnaires, developed by Wilder Research, to participants at the end of each camp. In total, 197 youth participants from 11 different camps completed the survey. The 11 camps were held at seven different locations, hosted by: Anoka-Ramsey Community College; Bemidji State University; Lake Superior College; Central Lakes College; Hennepin Technical College (at two locations); Northland Community & Technical College (at two locations); East Grand Forks campus and Thief River Falls campus; Saint Cloud Technical College; and Saint Paul College. Camp sizes ranged from 7 to 31 participants. Wilder did not receive forms from Anoka-Ramsey Community College in time for the analysis; therefore, those numbers are not included in this report. Their data, however, will be included in the final aggregate 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.

Demographics

Boys outnumbered girls in camp attendance (81% to 19%). Most of the individual camps had a male majority, with the exception of the two camps from Hennepin Technical College.

The average age of youth who participated in the survey was 14 years old, and students ranged from grades 6 through 12. Survey participants primarily identified themselves as white (82%).

The majority of participants (93%) reported that at least one of their parents had attended college, with nearly three-quarters (74%) saying that both had attended.

Summary

This section outlines key findings from the survey.

- Nearly all youth said they liked their camp, with the majority saying they liked it a lot.
- Slightly more than half of the participants said that the best thing about camp was building robots or doing other hands-on work.
- Twenty-four percent of participants said there was nothing they would do to make the camp they attended camp better, but for those who offered suggestions, the top recommendation was to make the camp longer in duration.
- Interest in STEM and confidence in personal ability rose as a result of the camps.
- Awareness and perceptions of manufacturing careers also increased.
- Youth most often described manufacturing careers as fun, creative, and advanced; very few used negative adjectives.
- Along with awareness and perceptions of manufacturing careers, interest in manufacturing careers also rose.
- Boys' personal confidence, perceived ability, and interest in STEM as well as their perceptions of manufacturing careers were more positively influenced by the camp. In contrast, girls displayed a more significant increase in their awareness of and interest in manufacturing careers.

Findings

This section provides more detailed results from the summer camp surveys, specifically satisfaction with the summer camps, the knowledge and skills that youth developed through their participation, and how the camps changed interest and confidence in STEM, as well as perceptions of manufacturing careers.

Additional data tables are appended to this report.

Satisfaction with camps

When asked about their overall opinion of the camp they attended, nearly all youth (98%) said they liked it at least a little bit, and 90 percent liked it a lot.

The survey asked participants to explain why they initially wanted to attend their camp, and the most common answer was because of interest in some aspect of the camp (e.g. robots, electronics, building, medical things, and camp teachers) (31%). Other top answers were because it sounded fun or interesting (25%) and to learn something new (22%).

After attending, slightly more than half of the youth said that the best thing about camp was building robots or doing other hands-on work. The next most common response was “other camp things” not related to robotics, such as swimming, the food, or teachers/ counselors (19%) (Figure 1).

1. Best thing about camp (N=195)

	N	%
Hands-on work/building robots (building robots, making things, programming, robots in general, making pens, 3D printing/editing)	99	51%
Other camp things (e.g., swimming, food, counselors, teachers, fieldtrips, tours)	37	19%
Using the final product (e.g., demolition derby, dump buckets, wrestling)	28	14%
Learning something new	20	10%
Meeting new people/making new friends/working with new people	19	10%
Everything	6	3%
Learning about, applying, or preparing for jobs/careers	4	2%
Being with my friend	3	2%
Being creative/designing/ problem-solving	2	1%
It was fun (unspecified)	1	<1%
Trying different classes/projects/things	1	<1%
Other	14	7%

Note: Total may not add up to 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, 69 percent of youth participants said “yes, definitely,” and another 23 percent said “yes, maybe.” Four percent would not recommend their camp and four percent were unsure if they would.

Twenty-four percent of youth participants said there was nothing they would do to make their camp better. For those who offered suggestions, the top recommendations were extending the duration of the camp (18%), followed by having more classes, projects, or activities (10%).

Learning from camp

When asked about what they learned at their respective camps, youth were most likely to say they learned a lot about manufacturing and making things (Figure 2). Following closely, 49 percent of youth reported learning a lot about finding solutions to problems and 44 percent stated that they learned a lot about careers in manufacturing.

2. How much did you learn about the following at camp?

	A lot	Some	Very little	Not at all
Manufacturing and making things (N=195)	54%	41%	4%	2%
Finding solutions to problems (N=195)	49%	40%	8%	3%
Careers in manufacturing (N=193)	44%	38%	12%	5%
Working together in teams (N=195)	38%	42%	17%	3%
Science, technology, engineering, and math (N=196)	36%	53%	9%	3%

Note: Totals may not add up to 100% due to rounding.

Interest and confidence in STEM

In general, the 360 summer camps did a lot to increase interest and confidence in STEM for youth participants.

Although all participants entered camp with a strong interest in science, technology, engineering, and math (55% said they had a lot of interest), this interest rose by 15 percentage points, to 70 percent, by the end of camp.

This increase in interest was slightly greater for boys than it was for girls, with each starting out with the same level of interest in STEM. At the end of camp, 72 percent of boys said they were interested in science, technology, engineering, or math, compared to 67 percent of girls. This is a change from previous years, when girls started out with a

lower level of interest in STEM but had a greater increase in interest between the beginning and end of camp.

Similarly, youth confidence in STEM abilities rose throughout their camp attendance. About four in ten (43%) reported they had “a lot” of confidence in their abilities before camp, while nearly seven in ten (68%) reported the same after attending their camp.

Boys were more confident at the beginning and end of camp than girls. Nearly half (47%) started with high levels of confidence and 69 percent finished camp with high levels of confidence. In contrast, while girls’ confidence in their STEM abilities was lower at the beginning of camp, it rose more over the course of their participation, from 29 percent to 69 percent (Figure 3).

3. Confidence in STEM abilities for girls (pre- and post-camp)

Girls' confidence	Before camp (N=35)	After camp (N=35)	Change
A lot	29%	69%	+40%
Some	54%	29%	-25%
Very little	11%	3%	-8%
Not at all	6%	0%	-6%

Boys' confidence	Before camp (N=157)	After camp (N=158)	Change
A lot	47%	69%	+22%
Some	43%	26%	-17%
Very little	9%	4%	-5%
Not at all	2%	1%	-1%

Note: Totals may not add up to 100% due to rounding.

Awareness and perceptions of manufacturing careers

In addition to increasing interest and confidence in STEM, the summer camps had the most influence on youth awareness of manufacturing careers (Figure 4). By the end of camp, 71 percent of participants said they had “a lot” of awareness, versus 36 percent at the beginning of camp. This awareness increased for both boys (39% to 70%) and girls (25% to 75%); however, the increase was more notable for girls.

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

Aware of manufacturing careers	Before camp (N=196)	After camp (N=194)	Change
A lot	36%	71%	+35%
Some	37%	23%	-14%
Very little	21%	6%	-15%
Not at all	5%	1%	-4%

Note: Totals may not add up to 100% due to rounding.

Regarding manufacturing career perceptions, only 27 percent of youth reported they thought of manufacturing careers as good before camp, while 62 percent said the same after attending camp (Figure 5). Boys, in particular, experienced a jump in positive perceptions towards manufacturing careers, from 30 percent before camp to 66 percent after camp.

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

Perceptions of manufacturing careers	Before camp (N=194)	After camp (N=193)	Change
I thought/think they were/are good	27%	62%	+35%
I thought/think they were/are just OK	36%	29%	-7%
I didn't/don't think they were/are good	8%	3%	-5%
I didn't/don't think about them	17%	2%	-15%
I am not sure	11%	4%	-7%

Note: Totals may not add up to 100% due to rounding.

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 (72%) and fun (72%). Negative adjectives, such as dark, dangerous, or dirty, were not selected as often by participants. The negative adjective selected most often was “dangerous” (36%).

Given the increased awareness and positive perceptions of manufacturing, it is not surprising that interest in manufacturing careers also increased. Nearly one-quarter of participants (23%) said they had a lot of interest in manufacturing careers before camp, whereas 45 percent said the same after camp (Figure 6). Both boys and girls increased their interest in manufacturing careers, with nearly half expressing “a lot” of interest by the end of camp (compared to 26% of boys and 11% of girls before camp).

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

Interest in manufacturing careers	Before camp (N=196)	After camp (N=194)	Change
A lot	23%	45%	+22%
Some	38%	37%	-1%
Very little	30%	12%	-18%
Not at all	9%	5%	-4%

Note: Totals may not add up to 100% due to rounding.

Conclusion

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. The camp more positively influenced boys' personal confidence, perceived ability, and interest in STEM as well as their perceptions of manufacturing careers. In contrast, girls showed a larger increase in their awareness of and interest in manufacturing careers.

Appendix

Demographics

1. Number of participants (N=197)

	N	%
Saint Cloud Technical and Community College	31	16%
Central Lakes College	25	13%
Northland-Thief River Falls (a)	24	12%
Bemidji State University	24	12%
Hennepin Technical College (b)	23	12%
Lake Superior College	18	9%
Saint Paul	18	9%
Northland-East Grand Forks	15	8%
Northland-Thief River Falls (b)	12	6%
Hennepin Technical College (a)	7	4%

Note: Total may not add up to 100% due to rounding.

2. Gender (N=194)

	N	%
Male	158	81%
Female	36	19%

3. Camp by gender

	Male	Female
Northland-East Grand Forks (N=14)	100%	0%
Central Lakes College (N=24)	100%	0%
Saint Paul (N=18)	100%	0%
Northland-Thief River Falls (a) (N=24)	92%	8%
Lake Superior College (N=18)	89%	11%
Saint Cloud Technical and Community College (N=31)	84%	16%
Bemidji State University (N=24)	75%	25%
Northland-Thief River Falls (b) (N=11)	55%	45%
Hennepin Technical College (b) (N=23)	48%	52%
Hennepin Technical College (a) (N=7)	43%	57%

4. Age (N=193)

	N	%
10 years old	2	1%
11 years old	23	12%
12 years old	37	19%
13 years old	31	16%
14 years old	30	16%
15 years old	43	22%
16 years old	15	8%
17 years old	12	6%

Average age

14 years old

Note: Total may not add up to 100% due to rounding.

5. Grade level (N=196)

	N	%
Grade 6	14	7%
Grade 7	43	22%
Grade 8	39	20%
Grade 9	26	13%
Grade 10	46	24%
Grade 11	15	8%
Grade 12	13	7%

Note: Total may not add up to 100% due to rounding.

6. Race/Ethnicity (N=172)

	N	%
White or Caucasian	141	82%
Asian American or Pacific Islander	13	8%
African American or Black	11	6%
Bi- or multi-racial	11	6%
Hispanic, Chicano, or Latino	5	3%
American Indian or Native American	3	2%

Note: Responses add up to more than 100%, as respondents were able to elect more than one race or ethnicity. 25 respondents (13%) chose not to provide their race or ethnicity.

7. Camp by race/ethnicity

	White	American Indian	Asian	Black	Hispanic	Multi-racial	Missing/Refused
Bemidji State University (N=24)	96%	4%	0%	0%	0%	0%	0%
Northland-Thief River Falls (b) (N=12)	92%	0%	0%	0%	0%	0%	8%
Hennepin Technical College (a) (N=7)	86%	0%	0%	0%	0%	14%	0%
Central Lakes College (N=25)	80%	0%	12%	4%	0%	4%	0%
Lake Superior College (N=18)	78%	0%	11%	0%	0%	0%	11%
Northland-Thief River Falls (a) (N=24)	75%	0%	0%	0%	0%	4%	21%
Saint Paul (N=18)	67%	0%	17%	6%	0%	6%	6%
Northland-East Grand Forks (N=15)	53%	0%	7%	0%	0%	13%	27%
Saint Cloud Technical and Community College (N=31)	45%	3%	0%	6%	0%	13%	32%
Hennepin Technical College (b) (N=23)	35%	1%	9%	26%	13%	9%	9%

Note: Totals may not add up to 100% due to rounding.

8. Parents attended college (N=172)

	N	%
Yes, both	128	74%
Yes, one	33	19%
No, neither	11	6%

Note: Twenty-two students (11%) were not sure if their parents had attended college; they are excluded from these counts.

Participant responses

9. Overall opinion of camp (N=195)

	N	%
I liked it a lot	176	90%
I liked it a little bit	15	8%
I did not like it very much	2	1%
I did not like it at all	2	1%

10. Reasons for coming to summer camp (N=189)

	N	%
Previous interest in some aspect of the camp (e.g., robots, electronics, building, medical things, teachers)	59	31%
It sounded fun/exciting/interesting/cool	48	25%
To learn something new	42	22%
To build robots/for hands-on learning	21	11%
It was fun last year/I wanted to come back	7	4%
A friend/family member was attending camp	7	4%
Someone made me go	6	3%
To learn about career options/a specific career	6	3%
To get away from home/something to do for the summer	3	2%
To stay in a dorm/learn more about college	4	2%
To meet new people/make new friends	2	1%
Other	7	4%

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.

11. Best thing about camp (N=195)

	N	%
Hands-on work/building robots (e.g., building robots, making things, programming, 3D printing)	99	51%
Other camp things (e.g., swimming, food, counselors, teachers, fieldtrips, tours)	37	19%
Using the final product (e.g., demolition derby, dump buckets, wrestling)	28	14%
Learning something new	20	10%
Meeting new people/making new friends/working with new people	19	10%
Everything	6	3%
Learning about, applying, or preparing for jobs/careers	4	2%
Being with my friend	3	2%
Being creative/designing/ problem-solving	2	1%
It was fun (unspecified)	1	<1%
Trying different classes/projects/things	1	<1%
Other	14	7%

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.

12. Would refer friends to camp (N=193)

	N	%
Yes, definitely	134	69%
Yes, maybe	44	23%
No	8	4%
I'm not sure	7	4%

13. What could make this camp better (N=177)

	N	%
Nothing	42	24%
If camp lasted longer	31	18%
More classes/projects/activities	17	10%
More/different kinds parts to work with	18	10%
More time to build/hands-on experiences	7	4%
Longer/better lunches/ better food/more food	6	3%
Bigger/more advanced robots	5	3%
Having a better partner	3	2%
Different fieldtrip experience	4	2%
Generally doing better	4	2%
More free time/leisurely activities	2	1%
Getting my own supplies	1	<1%
Learning more about college	1	<1%
Winning/performing better	2	1%
Other	37	21%

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.

Manufacturing and STEM careers

14. How much did you learn about the following at camp?

	A lot	Some	Very little	Not at all
Manufacturing and making things (N=195)	54%	41%	4%	2%
Finding solutions to problems (N=195)	49%	40%	8%	3%
Careers in manufacturing (N=193)	44%	38%	12%	5%
Working together in teams (N=195)	38%	42%	17%	3%
Science, technology, engineering, and math (N=196)	36%	53%	9%	3%

Note: Totals may not add up to 100% due to rounding.

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

Interested in science, technology, engineering, or math	Before camp (N=197)	After camp (N=196)	Change
A lot	55%	70%	+15%
Some	33%	24%	-9%
Very little	9%	5%	-4%
Not at all	3%	1%	-2%

Note: Totals may not add up to 100% due to rounding.

16. Interest in STEM for girls (pre- and post-camp)

Interested in science, technology, engineering, or math	Before camp (N=36)	After camp (N=36)	Change
A lot	56%	67%	+11%
Some	36%	28%	-8%
Very little	6%	6%	0%
Not at all	3%	0%	-3%

Note: Totals may not add up to 100% due to rounding.

17. Interest in STEM for boys (pre- and post-camp)

Interested in science, technology, engineering, or math	Before camp (N=158)	After camp (N=158)	Change
A lot	56%	72%	+16%
Some	32%	23%	-9%
Very little	10%	4%	-6%
Not at all	3%	1%	-2%

Note: Totals may not add up to 100% due to rounding.

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

Confident in ability to do science, technology, engineering, or math	Before camp (N=195)	After camp (N=195)	Change
A lot	43%	68%	+25%
Some	44%	27%	-17%
Very little	10%	4%	-6%
Not at all	3%	2%	-1%

Note: Totals may not add up to 100% due to rounding.

19. Confidence in STEM abilities for girls (pre- and post-camp)

Confident in ability to do science, technology, engineering, or math	Before camp (N=35)	After camp (N=35)	Change
A lot	29%	69%	+40%
Some	54%	29%	-25%
Very little	11%	3%	-8%
Not at all	6%	0%	-6%

Note: Totals may not add up to 100% due to rounding.

20. Confidence in STEM abilities for boys (pre- and post-camp)

Confident in ability to do science, technology, engineering, or math	Before camp (N=157)	After camp (N=158)	Change
A lot	47%	69%	+22%
Some	43%	26%	-17%
Very little	9%	4%	-5%
Not at all	2%	1%	-1%

Note: Totals may not add up to 100% due to rounding.

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

Interest in manufacturing careers	Before camp (N=196)	After camp (N=194)	Change
A lot	23%	45%	+22%
Some	38%	37%	-1%
Very little	30%	12%	-18%
Not at all	9%	5%	-4%

Note: Totals may not add up to 100% due to rounding.

22. Interest in manufacturing careers for girls (pre- and post-camp)

Interest in manufacturing careers	Before camp (N=36)	After camp (N=35)	Change
A lot	11%	46%	+35%
Some	28%	23%	-5%
Very little	39%	23%	-16%
Not at all	22%	9%	-13%

Note: Totals may not add up to 100% due to rounding.

23. Interest in manufacturing careers for boys (pre- and post-camp)

Interest in manufacturing careers	Before camp (N=157)	After camp (N=157)	Change
A lot	26%	46%	+20%
Some	41%	41%	0%
Very little	27%	10%	-17%
Not at all	6%	4%	-2%

Note: Totals may not add up to 100% due to rounding.

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

Aware of manufacturing careers	Before camp (N=196)	After camp (N=194)	Change
A lot	36%	71%	+35%
Some	37%	23%	-14%
Very little	21%	6%	-15%
Not at all	5%	1%	-4%

Note: Totals may not add up to 100% due to rounding.

25. Awareness of manufacturing careers for girls (pre- and post-camp)

Aware of manufacturing careers	Before camp (N=36)	After camp (N=36)	Change
A lot	25%	75%	+50%
Some	39%	22%	-17%
Very little	33%	3%	-30%
Not at all	3%	0%	-3%

Note: Totals may not add up to 100% due to rounding.

26. Awareness of manufacturing careers for boys (pre- and post-camp)

Aware of manufacturing careers	Before camp (N=157)	After camp (N=156)	Change
A lot	39%	70%	+31%
Some	36%	22%	-14%
Very little	19%	6%	-13%
Not at all	6%	1%	-5%

Note: Totals may not add up to 100% due to rounding.

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

Perceptions of manufacturing careers	Before camp (N=194)	After camp (N=193)	Change
I thought/think they were/are good	27%	62%	+35%
I thought/think they were/are just OK	36%	29%	-7%
I didn't/don't think they were/are good	8%	3%	-5%
I didn't/don't think about them	17%	2%	-15%
I am not sure	11%	4%	-7%

Note: Totals may not add up to 100% due to rounding.

28. Perceptions of manufacturing careers for girls (pre- and post-camp)

Perceptions of manufacturing careers	Before camp (N=36)	After camp (N=36)	Change
I thought/think they were/are good	17%	47%	+30%
I thought/think they were/are just OK	39%	44%	+5%
I didn't/don't think they were/are good	11%	6%	-5%
I didn't/don't think about them	25%	3%	-22%
I am not sure	8%	0%	-8%

Note: Totals may not add up to 100% due to rounding.

29. Perceptions of manufacturing careers for boys (pre- and post-camp)

Perceptions of manufacturing careers	Before camp (N=156)	After camp (N=155)	Change
I thought/think they were/are good	30%	66%	+36%
I thought/think they were/are just OK	35%	25%	-10%
I didn't/don't think they were/are good	8%	2%	-6%
I didn't/don't think about them	15%	2%	-13%
I am not sure	12%	5%	-7%

Note: Totals may not add up to 100% due to rounding.

30. Adjectives for manufacturing careers, open-ended (N=179)

Words that come to mind when thinking of someone in a manufacturing career

	N	%
Fun, exciting, cool	36	20%
Items used in manufacturing (e.g. machines, metal, plastic, computers)	33	18%
Hard-working, active, strong	28	16%
Smart	26	15%
Manufacturing fields (e.g. technology, robotics, science)	20	11%
Creative	13	7%
Hands-on (e.g. welding, construction, creating)	12	7%
Someone I know (e.g. dad, mom, uncle, aunt, friend)	9	5%
Talented, skilled	4	2%
Good job, career, money	3	2%
Hard, tiring, a lot of work	4	2%
Dirty, smelly	2	1%
Repetitive	1	<1%
Boring, tedious	1	<1%
Normal, simple	2	1%
Other	23	13%

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.

31. Descriptions of manufacturing careers (N=196)

(select all that apply)

	N	%
Fun	142	72%
Creative	141	72%
Advanced	122	62%
Exciting	112	57%
Noisy	101	52%
Modern	97	50%
Hard	77	39%
Dangerous	70	36%
Dirty	51	26%
Dark	8	4%

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