



# DEVELOPING YOUTH TALENT INITIATIVE (DYTI)

## **2020-2021 Legislative Report**

Submitted September 2021

Anthony L. Goins, Director

**NEBRASKA**

Good Life. Great Opportunity.

DEPT. OF ECONOMIC DEVELOPMENT

## INTRODUCTION

Implemented in 2015, LB 657 — the Nebraska Developing Youth Talent Initiative (DYTI) — created an industry-defined approach to introduce 7<sup>th</sup> and 8<sup>th</sup> grade students to occupations in the manufacturing and information technology (IT) sectors. The program has since expanded in focus to include careers in health care and engineering. By piquing interest among students in high-skill, high-demand industries and occupations at an early age, DYTI seeks to develop a youth talent pipeline into high school career and technical academies, post-secondary programs and employment across the state.

Workforce needs across the industry spectrum are evolving. Within manufacturing, for example — which alone contributes over \$13.5 million<sup>1</sup> to Nebraska's gross domestic product annually — looming retirements, public career misconceptions and the demand for advanced skillsets pose a talent shortage that requires collaboration on multiple fronts to address. To use another example, the IT industry and other sectors with high IT occupational densities will see an estimated 15% to 31%<sup>2</sup> increase in the demand for new employees by 2024. DYTI is intended to address such looming shortages while creating rewarding opportunities for the next generation of career-goers.

Eligible DYTI applicants include for-profit businesses or consortiums of businesses working in partnership with the public school system. Applying businesses must outline their goals and strategies for developing the future workforce by generating exposure and interest in the focus occupations — and their related skills, technologies and careers — among 7<sup>th</sup> and 8<sup>th</sup> grade students.

Applications to the DYTI program are independently scored by a committee of leaders from the Nebraska Departments of Economic Development (DED), Education (NDE) and Labor (NDOL). Scoring criteria include demonstration of the following:

- Impact on businesses, communities and students
- Program sustainability
- Evidence of regional workforce need and relevance of the proposed project to the need
- Clear goals and projected outcomes
- External evaluation plan
- Budget and project timeline

## DYTI AWARDS AND DISBURSEMENTS

DED awards and administers \$250,000 in DYTI grants each year. Since 2015, 12 companies and three consortiums have been awarded a grant (see below).

---

<sup>1</sup> US Department of Commerce, Bureau of Economic Analysis, <https://www.bea.gov/iTable/iTable.cfm?reqid=70&step=1&isuri=1&acrdn=2#reqid=70&step=1&isuri=1>

<sup>2</sup> NDOL, Office of Labor Market Information <https://networks.nebraska.gov/gsipub/index.asp?docid=4401>

**2015-2016 Disbursements**

Hollman Media (Kearney)	\$117,148
Flowserve (Hastings)*	<u>\$120,881</u>
TOTAL:	\$238,029

**2016-2017 Disbursements**

Distefano (Omaha)*	\$120,500
MetalQuest (Hebron)	<u>\$121,343</u>
TOTAL:	\$241,843

**2017-2018 Disbursements**

Aulick (Scottsbluff)	\$107,960
Becton Dickinson (Broken Bow)*	\$67,133
Cyclonaire (York)	<u>\$59,847</u>
TOTAL:	\$234,967

**2018-2019 Disbursements**

Nucor Detailing Center (Norfolk)	\$132,286
Reinke Manufacturing (Deshler)	<u>\$132,224</u>
TOTAL:	\$264,510

**2019-2021 Awards**

Orthman Manufacturing (Lexington)	\$125,000
Reinke Manufacturing (Deshler)	\$22,000
Vistabeam (Gering)	<u>\$103,000</u>
TOTAL:	\$250,000

**2020-2022 Awards**

CLAAS Omaha Inc. (Omaha)	\$92,300
Kawasaki Motors Mfg. Corp. USA (Lincoln)	\$117,300
Nucor Detailing Center (Norfolk)	<u>\$40,400</u>
TOTAL:	\$250,000

(\*) indicates consortium

Data on program impact is collected by the applicants and/or by external third-party evaluators. Schools collect quantitative data on enrollments and qualitative data on impacted areas difficult to examine numerically. External evaluators conduct pre- and post-project surveys to assess the program's impact on participating students' perceptions and knowledge of, as well as interest in pursuing careers in, the focus occupations.

In 2019, contract periods were extended to allow companies two years for planning, training, purchasing equipment, creating curriculum, accomplishing milestones and measuring project impact. Orthman Manufacturing, awarded in 2019, was provided a second contract extension through June 2022. Reinke Manufacturing and Vistabeam have submitted their final reports. CLAAS Omaha Inc., Kawasaki Motors Mfg. Corp.

USA and Nucor Detailing Center, all awarded in 2020, have submitted a mid-project report. All projects have been notably impacted by the COVID-19 pandemic.

## **2019-2021 PROJECT EVALUATIONS**

The following are overviews of DYTI program outcomes for the 2019 DYTI recipients Orthman Manufacturing, Reinke Manufacturing and Vistabeam.

### **Orthman Manufacturing (Lexington); \$125,000:**

The DYTI project implemented by Orthman Manufacturing — the “Mid-Nebraska Makerspace Lab (MNM)” — seeks to increase exposure to STEM and the manufacturing sciences among students, especially young women, attending schools in 11 south-central Nebraska counties. The project has also established connections between schools and businesses to enhance student awareness surrounding careers and educational requirements in the STEM and manufacturing sciences. Specifically, the project brings in area STEM professionals to coach students in the areas of college and career opportunities and completing STEM projects.

The project exposes students to STEM and manufacturing technologies via three mobile trailers transported to participating schools. The trailers contain 10 labs featuring STEM/Maker equipment, including but not limited to a vinyl cutter, CNC router, 3D printer, UAVs and a welding simulator. The Labs encourage students to develop STEM skills in the areas of communication, collaboration, creativity, critical thinking and innovation. Each trailer remains at the school for two weeks, when students participate in hands-on projects and establish coaching relationships with professionals from area businesses. An emphasis on fostering young women’s interest in STEM is supported by encouraging them to work together on activities. Prior to engaging with the trailers, teachers are provided training and instruction regarding project activities.

Original plans for the project involved 11 schools in the first year, including Burwell, Centura, Cozad, Gibbon, Grand Island, Kearney, Lexington, Northwest, Pleasanton, Riverside and SEM public schools. MNM was launched at six of the 11 schools between January 13, 2020, and March 17, 2020. Following March, the project was postponed due to the COVID-19 pandemic. However, at least 1,179 7<sup>th</sup> and 8<sup>th</sup> grade students were able to access MNM’s trailers and activities during their two months of operation in the 2019-20 academic school year. During the 2020-21 school year, MNM remained challenged with local health restrictions and schools’ health measures to combat the impact of the pandemic. As such, the MNM Labs were not widely distributed until late in the spring of 2021. For the 2021-22 school year, Orthman Manufacturing anticipates the MNM Labs will be available to all 33 public schools and 12 private schools in south-central Nebraska.

Students were administered a pre- and post-survey to measure attitudes and thoughts regarding STEM, manufacturing and related careers. There was a slight increase from the pre/post survey in students’ confidence in STEM or manufacturing related careers, which may help to bolster students’ interest in these college/career fields. There was a

modest decline in other questions from the pre- to post- assessments. Based on observations and discussions with teachers, Orthman believes these declines are a result of students encountering projects that challenged their confidence, skills and knowledge of STEM and the manufacturing sciences. For some students, failing at completing a project caused them to lose confidence, although Orthman stressed that failing is part of the manufacturing and engineering process in order for improvements in products and processes to continue to be made.

Orthman reported that the COVID-19 pandemic has been a major challenge to MNM, which is structured to encourage collaboration through teams of students working together to complete projects and activities. Schools' health policies (such as social distancing) and concerns with sterilizing work surfaces have created barriers to the success of the MNM Labs. According to Orthman, MNM was meeting and surpassing expectations for student and business engagement and learning in the manufacturing sciences prior to the pandemic. However, the pandemic caused schools to prohibit visitor entry, to carefully control small group activities, and to cancel field trips or out-of-school activities. As such, Orthman has not yet been able to bring in mentors to coach students, encourage collaboration and critical thinking among groups of students, or hold the planned capstone event at Central Community College in Kearney, Nebraska.

Successes were still shared by Orthman, including the following two examples:

At Shelton, a student confided in an Orthman staff member that he struggles with day-to-day academic tasks and would spend his whole day in the STEM lab if he could. He said he loves taking apart and building things. His favorite workstation was the 3D printer. "We had students interested in all of the MNM Labs," a representative said.

At Northwest, a student wanted to print a 3D image on the "DOBOT" using the pen feature. She showed an Orthman staff member that the machine wouldn't allow her to use the format she downloaded. The staff member spent time troubleshooting with her, without success. Undeterred, the student used her own time to overcome this challenge and, after researching and some failures, was able to come up with a solution by converting the image to a different format and downloading it to the DOBOT, when it was able to print the image.

Orthman Manufacturing was granted an additional contract extension through June 30, 2022. A report was submitted by Orthman, and is provided in the Appendix of the current document. Orthman will submit its final report in July 2022.

### **Reinke Manufacturing (Deshler); \$22,000:**

The DYTl project planned by Reinke featured a mobile trailer to facilitate hands-on engagements, giving 7<sup>th</sup> and 8<sup>th</sup> grade students from 10 area schools across three counties the opportunity to raise their levels of career awareness, especially within manufacturing and STEM base careers. Ten schools were initially targeted, including Beatrice, Southern, Freeman, Tri County, Diller-Odell, Meridian, Fairbury, Thayer

Central, Deshler and Bruning-Davenport public schools.

Between July 1, 2019, and June 30, 2020, Reinke purchased an augmented reality welder to be included in the mobile trailer. This would allow Reinke and partners to give younger students the opportunity to explore welding as a career choice. The machine can also be utilized to help beginning welders learn technique, including travel speed, travel angle, work angle, body position and contact to work distance. The Miller AugmentedArc welder can perform multiple weld processes including Flux Cored (FCAW), MIG (GMAW), TIG (GTAW) and Stick (SMAW).

COVID-19 significantly impacted the implementation of the project, and limited Reinke to focus on one of the identified schools rather than transporting a mobile trailer between districts. Southern was chosen as the school of focus because it was the only school that did not already have a welding program available to students. Southern began using the augmented reality welder immediately in the required shop exploratory classes for 7<sup>th</sup> and 8<sup>th</sup> graders. Each 7<sup>th</sup> and 8<sup>th</sup> grade student had the opportunity to interact with the unit and explore a welding career. To date, 65 students have engaged with the project and curriculum. Plans still include the further development of a mobile trailer. The trailer will give students an opportunity to explore equipment, which does not exist in their schools, connected to high-demand occupations. One of the central components of the project involves fostering communication and connectivity between schools and local employers, including a consortium of 27 area businesses.

A dedicated staff member will continue to develop hands-on curriculum, train teachers, instruct teachers and students on the use of equipment, and organize and maintain said equipment. The dedicated instructor attended a welding class taught by Reinke at Southeast Community College; that instructor is now certified in welding. Reinke has also met with the Miller Welding Education Department to learn about its online curriculum and determine how it can best be applied in schools. Reinke and partners have developed an additional partnership with Matheson Gas to assist with the project.

Reinke experienced significant hurdles in implementing the project. Even with pivoting plans to focus on one school, Reinke staff were not allowed to work with students directly, and the district had little willingness to complete pre- and post-assessments. Even with those big challenges, Reinke sensed a lot of excitement generated around welding. Reinke shared that they are working with Southern to fully launch a welding program, and that there are a number of students interested and excited to take that course. Businesses that surround the school that need welders were also very positive about the opportunities for students. Reinke was also successful in introducing female students to welding careers. It plans to implement the system into additional schools this fall and continue the project for years to come.

The Reinke DYTl contract ended on June 30, 2021.



## **Vistabeam (Gering); \$103,000:**

The DYTI project implemented by Vistabeam created an intentional, targeted IT career program at Gering Jr. High School. With funding made available through its 2019 DYTI grant, Gering Jr. High was able to completely retrofit an existing classroom into a STEM learning lab that served as a setting for seven courses, including three semester-long courses in grade 8 and two quarter-long courses in grade 7. Equipment includes innovative educational resources such as Lego Education and VEX Robotics classroom kits. The tailored curriculum focuses on the development of critical, innovative and creative thinking skills.

The project plans also featured programming involving guest speakers, student field trips/tours and week-long teacher externships at Vistabeam. While COVID-19 impacted the implementation of these industry engagement experiences, Vistabeam and Gering Jr. High plan to incorporate them in the future. Project goals include an increase in the number of students who ultimately pursue careers in IT and STEM related occupations; growth in the participation of women and minorities in IT and STEM fields in the region; an increase in IT and STEM literacy among all students, including those who do not pursue IT or STEM related careers; and, ultimately, an expansion of the IT workforce at Vistabeam Internet.

Prior to the project's postponement due to the COVID-19 pandemic, 200 students spent approximately two hours on field trips to Vistabeam to tour the office and tower site. Students were able to see and experience the range of operations at Vistabeam. Vistabeam's Chief Operations Officer and Gering Jr. High's STEM teacher collaborated on curriculum development, which will hopefully be implemented as students return to in-classroom learning.

Vistabeam's report details that despite unprecedented challenges, the DYTI grant has supported activities that have led to a richer STEM learning environment; alignment of curriculum between the junior high and high school's STEM programs; and increased industry involvement.

The Vistabeam DYTI contract ended on June 30, 2021. A report was submitted by Vistabeam, and is included in the Appendix of this document. Vistabeam plans to submit a final report incorporating additional pre- and post-assessment data in December 2021.

## **2020-2022 PROJECT UPDATES**

The following are project overviews and updates for the 2020 DYTI recipients CLAAS Omaha Inc., Kawasaki Motors Manufacturing Corporation USA and Nucor Detailing Center.

**CLAAS Omaha Inc. (Omaha); \$92,300:**

In partnership with Metro Community College (MCC) and other Omaha manufacturers, CLAAS Omaha Inc. is working to create a formal pathway to a career in manufacturing for students in a North Omaha after-school program managed by Partnership 4 Kids at five Omaha middle schools. Programming includes virtual and in-person tours of CLAAS and MCC, industry and career videos, activity boxes produced by CLAAS and supported by CLAAS career coaches, an industry education networking dinner, CLAAS Q&A sessions, CLAAS Industry Family Night, and two summer workshops including similar programming.

Many of CLAAS' planned activities shifted initially to virtual implementation, and CLAAS engineers have been integral to helping students succeed while calming frustrations. CLAAS and partners pivoted plans to accommodate the challenges of remote project facilitation, supply expense and availability, low summer project attendance and difficulty in measuring remote learning student participation. That said, many successes were identified, including consistent positive student feedback and summer project proficiency. It was reported that 100% of students participating in the summer activity have been successful in the project exercises. Assessments also show a significant increase in positive attitudes towards STEM and STEM careers. For example, 91.7% of participating girls responded "yes" to the prompt "I would like to know more about STEM or manufacturing careers" on the post-assessment — a 13 percentage point increase from the pre-assessment.

A full mid-year project report, including results from a pre- and post-assessment, was submitted by CLAAS and is contained in the Appendix of this document.

**Kawasaki Motors Manufacturing Corp. USA (Lincoln); \$117,300:**

The project planned by Kawasaki Motors Manufacturing Corp. USA involves a wide variety of activities. To start, Kawasaki purchased equipment and began collaborating with teachers to modify curriculum for the Skilled and Technical Science (STS) courses at 12 Lincoln Public School (LPS) middle schools.

Teachers were invited to Kawasaki this summer to observe engineering design and manufacturing processes to prepare them for the curriculum design and modifications. Seven teachers convened for three days of curriculum writing to incorporate the new equipment and ideas from the Kawasaki tour into the LPS middle school STS curriculum.

The LPS video production crew spent three days at Kawasaki taking video and interviewing Kawasaki employees regarding manufacturing concepts and careers. The LPS video production crew is in the process of creating videos that will be incorporated into the middle school STS curriculum during the 2021-2022 school year. Kawasaki also plans to conduct virtual field trips for STS students.



During this recent academic year, about 1,000 students were given the opportunity to use the Virtual Reality Welders and 3D printers. Due to the fact that LPS received materials during the second semester of the 2020-2021 school year, there was not an opportunity to conduct a pre- and post-assessment this school year. Assessments will be given during the 2021-2022 school year.

**Nucor Detailing Center (Norfolk); \$40,400:**

Nucor Detailing Center's DYTII project planned to create new curriculum on additive manufacturing, also known as 3D printing, and purchase 3D printers to be used in five Norfolk area middle schools and on a temporary basis for any interested school district in the surrounding ESUs. Teachers from the five middle schools will collaborate with Nucor on the curriculum so the same material is used in each school.

During the 2020-2021 academic year, Nucor saw the program rolled out in three of the five planned school districts. All of the 3D printers have been purchased and distributed to the schools. Teachers from the five participating school districts worked together remotely to create curriculum that can be modified for use by any educator. This material will be made available to any ESU or school district interested in adding a 3D printing module to its curriculum.

Teachers in Stanton, Norfolk and Madison were able to utilize the curriculum module with their students in the last few weeks of the school year. Nucor will be collecting feedback from teachers to make modifications as needed. The number of students impacted in that short time is just over 200. Pre- and post-assessments will be conducted during the 2021-22 academic year.

## **Appendix**

1. Orthman Manufacturing Developing Youth Talent Initiative Mid-Project Report
2. Nebraska Developing Youth Talent Initiative Vistabeam Final Report
3. CLAAS Omaha Inc. Developing Youth Talent Initiative Mid-Project Report

# Orthman Manufacturing Developing Youth Talent Initiative Mid-Project Report

## **Project Overview**

The DYTl project implemented by Orthman Manufacturing, called the Mid-Nebraska Makerspace Lab (MNM), seeks to increase exposure for students, especially young women, attending schools across 11 south-central Nebraska counties to STEM and the manufacturing sciences. During the 2020-21 school year, MNM was challenged with the local health restrictions and schools' health measures to combat the impact of the COVID-19 pandemic. As such, the MNM Labs were not widely distributed until late in the spring of 2021. For the 2021-22 school year, we anticipate the MNM Labs will be available to all 33 public schools and 12 private schools in south-central Nebraska.

MNM is structured to increase students' exposure to STEM and the manufacturing sciences. Students are exposed to STEM and manufacturing technologies by using three mobile trailers transported to participating schools. The three trailers have 10 labs of STEM/Maker equipment including, but not limited to, a vinyl cutter for marketing, CNC router, 3D printer, UAVs, smart home, and welding simulator. The Labs demand students to develop STEM skills in the areas of communication, collaboration, creativity, critical thinking, and innovation. Each trailer remains at the school for two weeks where students participate in hands-on projects and establish coaching relationships with professionals from area businesses. An emphasis is provided on the importance of fostering young women's interest in STEM by encouraging them to work together on the activities. Prior to engaging with the trailers, teachers are provided with training and project activities.

	Academic Year 1 (July 2019 – June 2020)		Academic Year 2 (July 2020 – June 2021)	
Experience	Number of Students	Average Hours per Student	Number of Students	Average Hours per Student
Lab 1 - Branding & Marketing Lab	NA	NA	169	3
Lab 2 - Control Systems Lab	NA	NA	116	3
Lab 3 - CNC Router Lab	NA	NA	202	3
Lab 4 - Engineering Lab	NA	NA	216	3
Lab 5 - Precision Ag & Drone Programming Lab	NA	NA	210	3
Lab 6 - Robotics Lab	NA	NA	207	3
Lab 7 - Sustainable Smart Home - Internet of Things Lab	NA	NA	208	3
Lab 8 - Virtual Reality Lab	NA	NA	333	3
Lab 9 - Pneumatics Lab	NA	NA	82	3
Lab 10 - Welding Lab	NA	NA	229	3

Estimate number of students impacted overall:

- 2019-20 School Year: 1,477 students
- 2020-21 School Year: 614 students (from February-May)

Participating schools and school districts:

The 11 schools that were originally slated to participate in MNM are: Burwell, Centura, Cozad, Gibbon, Grand Island, Kearney, Lexington, Northwest, Pleasanton, Riverside, and Sumner-Eddyville-Miller. During Year 1 of MNM 10 of the 11 schools participated (Grand Island was slated to receive the MNM Lab in late March of 2020, but school district closed before the MNM Lab arrived). Year 2 (February 2021-May2021) of MNM included the following schools: Ravenna, Sandhills, Spalding Academy, Sargent, Pleasanton, Shelton, Gothenburg, Northwest, Riverside.)

### Student Survey Results

Students were administered a pre-survey and a post-survey to measure attitudes and thoughts regarding STEM, manufacturing, and related careers. 590 student responses were collected on the pre-survey while 559 student responses were collected on the post-survey. Students from 9 different school districts participated in the surveys. The

distribution of responses by school district is the following:

<b>School District</b>	<b># Pre (N=590)</b>	<b># Post (N=559)</b>
Cozad	1	0
Grand Island	21	10
Kearney	23	1
Lexington	190	265
Northwest	181	178
Pleasanton	14	0
Riverside	89	68
Sandhills	21	37
Sargent	50	0

The distribution by grade level is the following:

<b>Grade</b>	<b># Pre (N=590)</b>	<b># Post (N=559)</b>
7 <sup>th</sup> grade	195	211
8 <sup>th</sup> grade	174	191
9 <sup>th</sup> grade	25	5
10 <sup>th</sup> grade	12	8
11 <sup>th</sup> grade	16	3
12 <sup>th</sup> grade	22	8
Other	146	133

The distribution by gender of the student completing the surveys were as follows:

<b>Gender</b>	<b># Pre (N=590)</b>	<b># Post (N=559)</b>
Female	277	277
Male	311	282
No Answer	2	0

### Survey Prompts

The mean responses to the student prompts (1=Strongly Disagree to 4=Strongly Agree), as well as the change from the pre-survey to the post-survey, are displayed in the following table.

<b>Student Prompts</b>	<b>Pre-Survey (N=590)</b>	<b>Post-Survey (N=559)</b>	<b>Difference (Pre-Post)</b>
I like to imagine making new products.	3.04	3.02	-0.02
If I learn about STEM (Science, Technology, Engineering, Math) and manufacturing, then I can improve things that people use every day.	3.03	2.98	-0.05
I am good at building or fixing things.	2.91	2.83	-0.08
I am interested in what makes machines work.	2.86	2.82	-0.04
Designing products or structures will be important in my future jobs.	2.74	2.74	0.00
I am curious about STEM and manufacturing careers.	2.76	2.65	-0.11
I want to be creative in my future jobs.	3.34	3.31	-0.03
Knowing how to use math and science together will help me to invent useful things.	3.10	3.07	-0.03
I believe I can be successful in a STEM or manufacturing related career. (5 point scale)	3.37	3.49	0.12
My parents would be supportive if I chose to pursue a career in a STEM or manufacturing related career. (post-survey only)		3.26	
My parents' thoughts about STEM or manufacturing related careers have changed based on my experiences with the activities in this class. (post-survey only)		2.51	

## **Assessment Analysis**

Analysis of the survey results highlight at least two distinct conditions:

1. There was a slight increase from the pre/post survey in students' confidence in STEM or manufacturing related careers. This may help to bolster students' interest in these college/career fields.
2. We identified a modest decline in other questions from the pre to post assessments. Based on our observations and discussions with teachers, these declines are a result of students encountering projects that challenged students' confidence, skills, and knowledge of STEM and the manufacturing sciences. For some students, failing at completing a project caused them to lose confidence; whereas we stressed that failing is part of the manufacturing and engineering process so that we can continue to make improvements in products and processes.

## **Project Challenges**

The major challenge to MNM has been the COVID-19 Pandemic. MNM is structured to encourage collaboration and teams of students working together to complete projects and activities. Schools' health policies (such as social distancing) and concerns with sterilizing work surfaces created barriers to the success of the MNM Labs. Prior to the Pandemic, MNM was meeting and surpassing our expectations for students' and business engagement and learning in the manufacturing sciences. However, the Pandemic caused schools to prohibit visitors to enter schools, carefully controlling small group activities, and no field trips or out-of-school activities. As such, we were not able to bring in mentors to coach students, encourage collaboration and critical thinking among groups of students, and to hold the capstone event at Central Community College in Kearney, Nebraska.

## **Project Successes**

We received input from teachers whose students were engaged in MNM's labs. We expect the MNM Lab trailers will be in full use throughout the 21-22 school year. Below are testimonials from teachers whose students were impacted by the MNM Labs program:

At Shelton, there was a student who told me that he struggles with day-to-day academic tasks and that he would spend his whole day in the STEM lab if he could. He said he loves taking apart things and building things. His favorite workstation was the 3D printer. We had students interested in all of the MNM Labs.

At Northwest, a student wanted to print a 3D image on the DOBOT using the pen feature. She showed me that it wouldn't allow her to use the format she downloaded. I spent time troubleshooting with her without success. Undeterred, the student spent her



own time to overcome this challenge and, after researching and some failures, she was able to come up with a solution by converting the image to a different format, downloading it to the DOBOT and it was able to print the image.

# **NEBRASKA DEVELOPING YOUTH TALENT INITIATIVE** **VISTABEAM FINAL REPORT**

*Prepared by Frank Shimerdla for Vistabeam Internet and Gering Middle School*

## **EXECUTIVE SUMMARY**

The Nebraska Developing Youth Talent Initiative Grant being implemented by Vistabeam sought to enhance STEM education within Gering Junior High School. The project's genesis was the result of several intersecting initiatives and needs. Primary amongst these are: (1) Vistabeam's ongoing need for a skilled STEM workforce, (2) the emergence of the academy model at Gering Senior High School, and (3) ongoing reforms at Gering Junior High School to increase emphasis on STEM and align its efforts to the High School's STEM. As shown within this report, the NDYTI grant helped to support and expand these efforts, as part of a coordinated approach to strengthen the STEM workforce pipeline in Gering.

Vistabeam's NDYTI Project included two primary areas of emphasis. The first focus of the project was to create an IT/STEM lab, complete with new technology and furnishings, in order to provide the students with resources that allow for hands-on learning and exploration. In addition, the project also included a focus on increasing student exposure to IT and STEM careers through such industry engagement experiences as career fairs, guest speakers and field trips through Vistabeam. In this effort, Vistabeam and Gering Junior High School sought to expose students to various careers in STEM.

The Vistabeam NDYTI Project faced numerous challenges over the course of the two-year project, including turnover with the critical STEM teacher position at the Junior High School and a pandemic which resulted in school closure, remote learning, and limited access to students (given safety protocols enacted by Gering Public Schools).

Despite the unprecedented challenges, Vistabeam's Nebraska Developing Youth Talent Initiative Grant has entailed or supported reforms that have led to a more rich STEM learning environment; alignment of curriculum between the junior high and the high school's STEM programs; and increased involvement among industry (particularly through Vistabeam's contributions to the project. While the data collected through the grant to-date are insufficient to confirm the impacts of the project (due to limitations created by COVID 19), quantitative and qualitative data collected suggest that the project is having a positive impact relative to students' interest and awareness of STEM careers. Additional data collection is scheduled to occur over the Fall of 2021 and an updated report will be submitted to the Department of Economic Development by December 31, 2021. The enclosed report includes partial survey data and qualitative data collected through end-of-project interviews with key stakeholders.

## **Evaluation Strategy**

To evaluate the project and its impact, Vistabeam and Gering Junior High School worked closely with Frank Shimerdla to develop a pre- and post-survey. The survey included various questions to measure students' interest and awareness of careers in STEM, as well as other pertinent areas of investigation, to provide a comprehensive array of student perception data. The survey was administered in the winter of 2019-20 prior to the outbreak of the Covid-19 pandemic. The initial administration of the survey was designed to provide baseline data which would later be used to measure growth in students' awareness and interest of STEM careers. While the survey was not administered during the recently completed 2020-21 school year due to challenges created by Covid-19, the survey will be administered using a pre-

and post-approach during the fall of 2021. The data is expected to provide a complete “picture” of the project’s impact.

In addition to the survey, the evaluation included regular interviews with project staff and a more comprehensive end-of-project interview with Gering Junior High School’s STEM teacher, Mr. Pete Culhane, and Principal, Mr. Shawn Seiler.

The evaluation findings, while in process, provide some insights into the project’s progress toward the stated goals and its impact, as described throughout the following report. As mentioned, an updated report will be submitted by December 31, 2021 to include data from the pre- and post-surveys.

## Evaluation Findings

The enclosed findings document performance relative to each of Vistabeam’s five stated goals for the NDYTI grant. These goals are restated below along with a description of progress toward each of the goals.

### Goal 1: Create a new IT/STEM work environment for 7<sup>th</sup> and 8<sup>th</sup> graders.

Vistabeam’s NDYTI project had an explicit strategy of creating a high-touch, highly interactive environment that fosters a variety of STEM learning experiences. With funding made available through its 2019 Nebraska Developing Youth Talent Initiative Grant, Gering Junior High School was able to completely retrofit a current classroom into a STEM learning lab which served as setting for a total of seven (7) courses that included three (3) semester-long courses in grade 8 and two (2) quarter-long courses in grade 7. The enhancements made to the classroom environment included the purchase of



laptop computers, Lego kits, furniture, robotics kits, promethean displays (including ACTIV panels and chromeboxes), a television, a 3D printer with supplies, and soil experiment and plant cloning kits. (See enclosed photos which show the various supplies and equipment purchased through the NDYTI grant).

Post-grant interviews with Gering Junior High School Principal, Mr. Shawn Seiler, and STEM Teacher, Mr. Pete Culhane, provide insight into the extent to which these additions created a rich environment for STEM learning. It should be noted that these equipment and supplies helped form a comprehensive reform

around IT/STEM at the Junior High School. Primary amongst these reforms was the hiring of Mr. Pete Culhane as a full-time STEM teacher, beginning with the start of the 2020-2021 school year. Mr. Culhane was previously employed in Denver Public Schools where he served in a similar position and was recognized for teaching excellence, having won the Mile High Teacher of the Year award. Mr. Culhane’s approach to STEM takes a very hands-on instructional approach, with his classes featuring project-based learning. In addition, as former math teacher (prior



to teaching STEM), Mr. Culhane incorporates a strong math focus into his teaching, using warm-up and wrap-up exercises that present math in practical terms. “Students have been told over and over again how difficult math is,” said Culhane. “I try to show them how easy math is by using practical examples.” It appears that the classroom (complete with NDYTI-supported supplies and equipment) plays a key role in this effort to promote the development of math competency. Culhane utilizes the setting to engage students and then purposefully relates the activity to practical math application. (Math is widely considered a gateway subject into a variety of high-demand career fields, including the targeted areas of STEM and IT as well as many others, such as health care. Efforts that support increase competency in math are critical to ensuring potential workers in these areas have the requisite knowledge and skills required for advanced education and job entry within these career pathways.)

Upon completion of interviews and analysis of pre-survey data, the information collected suggest that the equipment and supplies provided through the NDYTI grant appear to be a substantial source of support to instructional efforts taking place in Gering Junior High’s STEM classroom, or as stated by Principal Seiler, “we could not have done it without the grant.” It is clear and was explicitly stated by both Seiler and Culhane that the grant helped to create a more “robust” STEM classroom and helped push the STEM learning to the “next level.”

#### **Goal 2: Increase the awareness of IT/STEM career fields to the students.**

To measure changes in students’ excitement for IT and STEM careers, the project developed a pre- and post-test to be administered at the beginning of each course section and again at the completion of the course.

It should be noted that several challenges occurred first at the outset of the project (due to unanticipated turnover at the junior high school with the STEM teacher) and then during the past year due to COVID-19, which disrupted the scheduled administration of the survey. Instead, the survey was administered twice during the 2019-2020 school year. It should further be noted that when these surveys were administered, the classroom had yet to be fully equipped with the supplies/equipment and technology made available through the grant.

While these disruptions and subsequent lack of administration of a “post-survey” limits analysis of growth in this area, the data which are available will serve as a strong set of baseline data for future analysis to be presented in an updated report in the fall of 2021. These data will include the baseline data included herein, as well as pre- and post-survey data for each section of STEM within the fully outfitted classroom.

Relative to Goal 2, the survey included two separate statements which sought to measure knowledge of jobs or careers in the IT and STEM fields, respectively. The survey then asked students to state their agreement with the statement using a five-point Likert-scale with five potential responses ranging from “Strongly Agree” to “Strongly Disagree.” The enclosed tables detail student responses within STEM and IT.

**Table 1: IT and STEM Awareness**

<b>Statement: I have a strong knowledge of jobs or careers in the &lt;IT&gt; or &lt;STEM&gt; Fields</b>						
<i>Course</i>	<i>Strongly Agree</i>	<i>Agree</i>	<i>Not sure</i>	<i>Disagree</i>	<i>Strongly Disagree</i>	<i>Weighted Average</i>
IT	17.24%	36.21%	34.48%	5.17%	6.90%	3.52
STEM	22.41%	41.38%	18.97%	10.34%	6.90%	3.62

As shown within the table, roughly 53% of the 58 students surveyed either “strongly agree” or “agree” with having a strong knowledge of careers in IT, while 63% report having a strong knowledge of careers in STEM. Interestingly, almost twice as many students were “not sure” whether they had a strong knowledge of careers in IT (34.48%) as opposed to the 18.97% in STEM. This data will be tracked closely in the fall as new data become available to see what impact the program has on the relatively large percentage of students (one in every three) who was “not sure” about their knowledge of IT careers. In addition to the classroom setting, the project also includes activities to expose students to careers in IT and STEM, which are described in greater detail later within this report under Goal 4 (Increase IT/STEM literacy for all students, including those who do not pursue IT/STEM-related careers).

**Goal 3: Increase the number of students who ultimately pursue careers in IT/STEM fields, as well as broaden the participation of women and minorities in these fields.**

Similar to “awareness,” the survey also includes specific questions which ask students to state their agreement with a pair of statements focused on interest in IT and STEM careers, respectively (i.e., I am interested in an <IT> and <STEM> career.

**Table 2: Student interest in IT and STEM careers**

<b>Statement: I am interested in an &lt;IT&gt; or &lt;STEM&gt; career.</b>						
<i>Course</i>	<i>Strongly Agree</i>	<i>Agree</i>	<i>Not sure</i>	<i>Disagree</i>	<i>Strongly Disagree</i>	<i>Weighted Average</i>
IT	20.69%	27.59%	13.79%	18.97%	18.97%	3.12
STEM	18.97%	22.41%	31.03%	17.24%	10.34%	3.22

Perhaps most notable in the student responses included herein is the gap in the percentage of students who report have a strong awareness of careers in IT and STEM (53% and 63%, respectively), and those with an interest in these career fields (48% and 41%, respectively). The two sets of data suggest that while students may be aware of different fields in these high-demand fields, these fields have not provided students with an appealing presentation of potential careers. This must be understood in the context of technology’s role in the students’ lives and also the pervasiveness of STEM. Youth are perhaps the most avid consumers of technology. Gering Junior High School students were born after the release of the first iPhone and are very technologically adept when compared to previous generations. Today’s youth utilize technology for communication, entertainment and learning. Likewise, STEM is a field that is integrated throughout society and one which offers students a wide array of exciting careers paths. Despite their relative familiarity with IT and STEM, a large number of students view IT and STEM careers as

challenging.

These results are reflected in open-ended responses collected in the survey. When asked “what is your biggest challenge as you picture yourself in an IT or STEM career,” several students (46% of responses) made particular note of a lack of confidence or ability to perform IT or STEM-related tasks, such as building a robot. Another 25% addressed concerns with general work-related skills (i.e., working with others or focusing).

**Table 3: Biggest Challenge in an IT or STEM Career - Open-Ended Student Responses**

	<b>ALL</b> <i>(n=57)</i>	<b>Female</b> <i>(n=24)</i>	<b>Male</b> <i>(n=33)</i>
IT/ STEM Skills-Related Tasks/Skills	26	12	14
Other Work Skills	14	8	6
Work Setting/Equipment-Related	7	2	5
Not Sure/None	5	0	5
Academic	3	2	1
Expression of Confidence	2	0	2
<b>Total</b>	<b>57</b>	<b>24</b>	<b>33</b>

Of particular interest this fall will be the potential changes in attitudes toward these careers, as well as associated challenges, for students embedded within a more rich IT and STEM learning environment. As mentioned previously within this report, the end-of-grant interview with STEM teacher, Pete Culhane, revealed targeted efforts to expose students to a variety of STEM learning activities within the NDYTI grant-enhanced classroom. In describing his approach, Culhane said he often walks students through projects by showing them using a step-by-step demonstration. Using a computer, he will complete the steps as they are shown on the promethean board. He then walks around and provides technical assistance to students as they complete the task individually. It is clear from open-ended responses that confidence in performing in an IT or STEM environment is a real concern to students. Activities, such as these, appear to provide students the experiences they need to be comfortable in completing IT and STEM-related tasks, according to Culhane. Further, equipment, such as the 3D printer, provides a “hook” according to Culhane. “Once students build something on the printer, it is palpable..... real,” he said.

**Goal4: Increase IT/STEM literacy for all students, including those who do not pursue IT/STEM-related careers**

The reforms resulting from Vistabeam’s NDYTI grant appear to be providing students, regardless of career plans, an immersive learning experience within IT and STEM. The equipment and supplies, as well as the curricular strategies provide students with extensive opportunities to engage in these two fields. Further, a total of 7 STEM courses are offered at the Junior High School, including three semester-long classes for students in 8<sup>th</sup> grade, and two quarter-long courses for students in grades 7<sup>th</sup> and 6<sup>th</sup>. Students seeking additional study in IT and STEM can pursue focused studies and additional work-based learning experiences in these areas through the Gering Senior High School’s Academy. There is significant alignment between the junior high school and high school’s STEM programming, and common planning is provided to Culhane and his counterpart in the high school, Mr. Justin Reinmuth, who meet every other Wednesday to align curriculum and share best practices.



In addition to these, a series of other IT and STEM career-oriented activities have taken place including: a site visit to Vistabeam’s Mitchell office in the fall of 2019 where the students had the opportunity to tour the facility and meet with Vistabeam staff who were available to answer questions and provide insight into the work setting (see enclosed photos from the site visit).

The high school also provides a career fair which is attended by junior high students and provides opportunity for the students to interact with professionals from 46 participating businesses. In his interview, Culhane also shared that he regularly “connects” various classroom projects to specific jobs in IT and STEM and likes to include salary information for those careers. According to Culhane “kids seem to be motivated by money.”

Due to COVID-19, the summer externship for a teacher did not occur. However, Vistabeam intends to extend this opportunity in the near future.

**Goal5: Expand our workforce at Vistabeam Internet**

While this goal will not be adequately measured for several years, there are a number of indicators available which might suggest an increase in the number of students who pursue IT or STEM careers in the local workforce. Primary amongst these is in enrolment data in STEM coursework. As shown in the enclosed table, enrollments in STEM courses at the junior high level has increased from 220 enrollments in 2019-20 to 245 for the upcoming 2021-22 school year. These positive trends in enrollment are also being experienced at the secondary level where enrollment in the High School’s 9<sup>th</sup> and 10<sup>th</sup> Grade Engineering courses have increased from 62 enrollments in 2019-20 to 81 enrollments for the upcoming 2021-22 school year. These increases in enrollment show a strengthening in the STEM educational



pipeline. As enrollments in the junior high continue to increase and attract growing numbers of students into STEM, it is anticipated that course enrollments will be able to sustain this growth.

The impact of increasing enrollment goes beyond simply the number of students receiving credit. This is an intentional effort to utilize the reforms at the junior high and senior high school to engage students in enhanced STEM learning. Likewise, as more students take these interactive, engaging courses, it is expected that enrollments will continue to benefit via word-of-mouth and reputation.

**Table 4: STEM Enrollment – Grades 7-10 for the 2019-2022 school years**

Grade	Enrollment		
	2019-20	2020-21	2021-22
7 <sup>th</sup> Grade (STEM – quarter)	115	107	124
8 <sup>th</sup> Grade (STEM – semester)	105	103	121
9 <sup>th</sup> Grade (Engineering Design Course)	43	45	62
10 <sup>th</sup> Grade (Engineering Problem Solving Course)	19	20	19

### Summary and Recommendations

While final analysis of Vistabeam’s progress toward the goals outlined in its 2019 NDYTI grant application will not occur until December of 2021 when post-survey data are available, the data collected to-date indicate that Gering Junior High School has effectively utilized its NDYTI grant to implement a series of reforms in the areas of IT and STEM education. This has included the purchase, installation and use of equipment and supplies similar to that used in IT and STEM workplaces. This has allowed Gering Junior High School, through STEM teacher Culhane, to create for students experiences and projects that engage students while imparting IT and STEM occupational skills. Vistabeam and Gering Junior High have also done a remarkable job of incorporating the grant into existing IT and STEM initiatives at the Junior High School and Senior High School, which maximizes impact and supports the sustainability of the grant’s reforms.

Final recommendations will be included in the December 2021 report.

## CLAAS Omaha Inc. Developing Youth Talent Initiative Mid-Project Report

**Assessed changes in student interest in and knowledge of related occupations**

### **A. Student Survey Results**

Students were administered a pre-survey and a post-survey to measure attitudes and thoughts regarding STEM, manufacturing, and related careers. 111 student responses were collected on the pre-survey while 17 student responses were collected on the post-survey. Students from 5 different school buildings participated in the surveys. The distribution of responses by school is the following:

<b>School</b>	<b># Pre (N=111)</b>	<b># Post (N=17)</b>
Lewis & Clark	22	1
McMillan	28	6
Monroe	18	9
Norris	18	0
RM Marrs	25	1

The distribution by grade level is the following:

<b>Grade</b>	<b># Pre (N=111)</b>	<b># Post (N=17)</b>
7 <sup>th</sup> grade	43	2
8 <sup>th</sup> grade	68	14
Other	0	1

The distribution by gender of the student completing the surveys were as follows:

<b>Gender</b>	<b># Pre (N=111)</b>	<b># Post (N=17)</b>
Female	70	12
Male	41	5

### **Survey Prompts**

The mean responses to the student prompts (1=Strongly Disagree to 4=Strongly Agree), as well as the change from the pre-survey to the post-survey, are displayed in the following table.

<b>Student Prompts</b>	<b>Pre-Survey (N=111)</b>	<b>Post-Survey (N=17)</b>	<b>Difference (Pre-Post)</b>
I like to imagine making new products.	3.01	3.12	0.11
If I learn about STEM (Science, Technology, Engineering and Math) then I can improve things that people use every day.	3.16	3.24	0.08
I am good at building or fixing things.	2.90	2.82	-0.08
I am interested in what makes machines work.	2.91	2.59	-0.32
In the future, I want a job that allows me to be creative.	3.29	3.24	-0.05

I believe I can be successful in a STEM or manufacturing related career.	2.88	2.88	0.00
--	------	------	------

Responses to the student prompts were disaggregated by gender to see if there were differences in response rates between females and males. The following chart displays the disaggregated responses:

<b>Student Prompts</b>	Pre-Survey (F N=70/ M N=41)	Post-Survey (F N=12/ M N=5)	Difference (Pre-Post- F/M)
I like to imagine making new products.	2.99/3.00	3.17/3.00	0.18/0.00
If I learn about STEM (Science, Technology, Engineering and Math) then I can improve things that people use every day.	3.17/3.15	3.25/3.20	-0.08/0.05
I am good at building or fixing things.	2.71/3.12	2.83/2.80	0.12/-0.32
I am interested in what makes machines work.	2.64/3.20	2.58/2.60	-0.06/-0.60
In the future, I want a job that allows me to be creative.	3.27/3.29	3.25/3.20	-0.02/-0.09
I believe I can be successful in a STEM or manufacturing related career.	2.76/3.05	2.92/2.80	0.16/-0.25

**B. Student Pre/Post-Survey Prompt**

Do you know an adult who works in a STEM or manufacturing career?

	All %	Female %	Male %
Response	Pre/Post	Pre/Post	Pre/Post
Yes	19.8/47.1	15.7/41.7	26.8/60.0
No	36.0/29.4	34.3/33.3	39.0/20.0
Unsure	44.1/23.5	50.0/25.0	34.1/20.0

**Student Pre/Post Survey Prompt**

I would like to know more about STEM or manufacturing careers.

	All %	Female %	Male %
Response	Pre/Post	Pre/Post	Pre/Post
Yes	80.2/88.2	78.6/91.7	82.9/80.0
No	19.8/11.8	21.4/8.3	17.1/20.0

**Student Pre/Post Survey Prompt**

I plan to pursue a career in STEM or manufacturing.

	All %	Female %	Male %
Response	Pre/Post	Pre/Post	Pre/Post
Yes	36.9/52.9	31.4/58.3	46.3/40.0
No	63.1/47.1	68.6/41.7	53.7/60.0

**Student Pre/Post Survey Prompt**

I plan to take STEM or manufacturing courses in high school.

Response	All %	Female %	Male %
----------	-------	----------	--------

	Pre/Post	Pre/Post	Pre/Post
Yes	25.2/23.5	18.6/25.0	36.6/20.0
No	12.6/5.9	14.3/8.3	9.8/0.0
Not Sure	61.3/70.6	67.1/66.7	51.2/80.0

**Student Pre/Post Survey Prompt**

I am knowledgeable about STEM and Manufacturing.

	All %	Female %	Male %
Response	Pre/Post	Pre/Post	Pre/Post
Strongly Agree	2.7/0.0	2.9/0.0	2.4/0.0
Agree	24.3/29.4	21.4/33.3	29.3/20.0
Neutral	62.2/64.7	58.6/66.7	68.3/60.0
Disagree	9.9/5.9	15.7/0.0	0.0/20.0
Strongly Disagree	0.9/0.0	1.4/0.0	0.0/0.0

**Student Pre/Post Survey Prompt**

I am familiar with one manufacturing business in the state of Nebraska.

	All %	Female %	Male %
Response	Pre/Post	Pre/Post	Pre/Post
True	29.1/64.7	22.9/75.0	39.0/40.0
False	70.9/35.3	75.7/25.0	61.0/60.0

**Student Pre/Post Survey Prompt**

I can follow instructions and ask for help when I need it.

	All %	Female %	Male %
Response	Pre/Post	Pre/Post	Pre/Post
True	98.2/100.0	97.1/100.0	97.6/100.0
False	2.7/0.0	2.9/0.0	2.4/0.0

**Student Pre/Post Survey Prompt**

I can think of an improvement for a product I use every day.

	All %	Female %	Male %
Response	Pre/Post	Pre/Post	Pre/Post
True	83.6/58.8	82.9/50.0	82.9/80.0
False	17.3/41.2	17.1/50.0	17.1/20.0

**4. Narrative Analysis**

A. The goals of the project are designed to increase the number of Nebraska youth interested in pursuing a career in engineering and/or manufacturing technology in an effort to ultimately address the state’s need for more skilled workers to fill positions in this growing industry. Project goals will also address the issue of inequitable access to quality, out-of-school career exploration and training opportunities for the state’s low-income and minority youth populations.

Project goals are as follows:

1. Goal 1: Expose 315 of Nebraska’s low income and minority middle school youth to professional pathways in the engineering and manufacturing industry within their state that will provide

earnings that enable financial stability. Industry exposure will take place during the fall and summer months between September 2020, and June, 2022.

- a. Youth participants report an increase in knowledge about engineering and/or manufacturing. (85% of participants by end of project year 1 and 90% by end of project year 2.)

*Youth post-survey responses at this mid-project juncture indicate their level of interest in engineering and manufacturing has increased since the pre-test but may not feel fully confident in saying they are “knowledgeable” about STEM and manufacturing at this juncture of the project. This assumption is based the data that indicates the largest percentage of post-survey respondents selecting “neutral” in response to the survey prompt, “I am knowledgeable about STEM and manufacturing.” We project that as students continue to engage with project activities the percentage of respondents who “agree/strongly agree” with this statement will consistently increase.*

- b. Youth participants report they know at least one adult who works in a manufacturing career. (85% of participants by end of project year 1 and 90% by end of project year 2.)

*Although the percentage of survey respondents who report they know an adult working in a manufacturing career significantly increased from pre-to post survey, it is below the anticipated benchmark for this project juncture. This can be attributed to much of the project activities having to be completed remotely. Because students weren’t able to have in-person interaction with the industry professionals who provided project guidance, the youth may not feel like the remote learning interaction qualified as “knowing” an individual working in the field. As students go back to more in-person learning this next year, we project survey response rate of students who “know an adult who works in manufacturing” will increase as they build in-person connections.*

- c. Youth participants report they are familiar with a manufacturing business within the state of Nebraska. (85% by end of project year 1 and 90% by end of project year 2.)

*Again, while post-survey response rate of participants reporting they are “familiar with a manufacturing business within the state of Nebraska” significantly increased from pre-survey results, it did not reach the anticipated 85% mid-project benchmark. We believe this could be related to remote-learning challenges and students not engaging in virtual tours and content as fully as they would if it were in-person. We project that we will see a significant increase in survey respondent familiarity with Nebraska manufacturing businesses as they engage in more in-person project content.*

2. Goal 2: Educate 315 of Nebraska’s low-income and minority middle school youth about engineering principles and manufacturing technology through hands-on experiences which will take place between September 2020, and June 2022.

- a. Youth participants agree or strongly agree that if they learn about manufacturing then they can improve things that people use every day or improve their lives. (80% of participants by end of project year 1 and 85% by end of project year 2.)

*Post-survey responses agreeing/strongly agreeing that they can think of a way to improve a product they use every day increased slightly from pre-test results. We*

*project this number will continue to increase as students continue to engage in project activities.*

- b. Seventh grade participants will report that they understand how to follow instructions and ask for help when they need it. (85% of participants by end of project year 1 and 90% by end of project year 2).

*We are pleased to report that 100% of survey respondents are confident in their ability to follow instructions and ask for help when needed at the post-survey mid-project juncture.*

- c. Eighth grade participants will be able to articulate a minimum of three product modifications they made in an attempt to improve their product (85% of participants by end of project year 1 and 90% by end of project year 2).

*We are also pleased to report that according to project instructors, 100% of participants were successful in the exercise prompting them to improve upon their initial design.*

- 3. Goal 3: Initiate and cultivate a pipeline of youth interested in engineering and manufacturing technology by June, 2022. Indicators of success include:

- a. Youth participants agree or strongly agree that they could think of an improvement for something they use on a daily basis. (70% of participants by end of project year 1 and 75% by end of year 2.)

*Post-survey response rates indicated fewer participants could think of an improvement to a product they use every day than in pre-survey responses, despite 100% success among youth who participated in the exercise prompting them to improve their own design. We project that student responses to this survey question could be due to students realizing that the intricacies of STEM and manufacturing fundamentals are more complex than they initially anticipated. As such, their confidence-level in improving real-world products has dissipated. We predict future survey results will increase in the number of participants who are able to think of product improvements as they continue to engage in project activities and build their confidence in their abilities.*

- b. 20% more participants will report that engineering/manufacturing or product design is an industry of interest on yearly post-project surveys after the 2020-21 program year and summer programming.

*Post-project survey responses indicate an incremental increase in student interest compared to pre-survey results. Although the projected benchmark increase in interest was not met, we believe student interest is there and predict positive response rates will continue to increase the longer students engage in the project.*

- c. 30% more participants will report that engineering/manufacturing or product design is an industry of interest on yearly post-project surveys after the 2021-22 program year and summer programming. N/A

*Overall, we anticipate that these percentages will continue to incrementally increase as the project is sustained beyond the grant period.*

## B. Narrative Analysis of Assessment and Metrics

While the number of post-surveys completed are low (N=17), preliminary results for girls (pre N = 70 and post N = 12) show a significant increase in positive attitudes towards STEM and STEM careers. On the prompt “I would like to know more about STEM or manufacturing careers” 91.7% of girls responded “yes” on the post-survey which was an increase of 13 percentage points from the pre-survey. Also, on the prompt “I plan to pursue a career in STEM or manufacturing”, 58.3% of girls responded “yes” on the post-survey which was an increase of 28 percentage points from the pre-survey. The results from several other prompts showed similar results for girls. While preliminary and low in responses, changes in attitudes and perceptions among girls appear to be promising. Since only 5 boys responded to the post-survey, it is difficult to make any overall judgement related to their responses.

Comments from students about what they learned through the grant are indicative of increased knowledge of STEM and the importance of soft skills. Comments from students on the post-survey include the following:

“You’re not gonna get everything right the first time and also you need a plan.”

“Conserving energy and what we use every day can help with problems we face, as a nation to be able to pursue in ideas we have for the future.”

“No matter how hard it gets, you got to keep trying.”

“Appearance matters. How something looks is key to selling or simply catching someone’s interest.”

## C. Challenges of the Project thus far

The majority of project challenges thus far have been associated with complications caused by the pandemic. Reported challenges are as follows:

*Remote Project Facilitation*--Project staff have reported that there were some initial growing pains with learning how to effectively facilitate project activities through a remote-learning model. Staff have also reported that they have consistently gained confidence and skill in their remote facilitation capabilities over the past 10 months and well-prepared to facilitate project activities via remote and/or in-person this fall.

*Supply Expense and Availability*—Unanticipated increases in project supply costs and availability became a challenge project staff were faced with navigating. We predict these unforeseen price increase and product scarcity issues were due to pandemic-related supply chain complications. Project staff navigated these obstacles by shifting project activities around and securing comparable supplies that were priced within the project budget.

*Low Summer Project Attendance*—This challenge is due to scheduling conflicts outside of project staff control including 1) families not ready for their student to participate in in-person activities yet for fear of an increased risk of contracting COVID-19, 2) students having conflicting commitments (caring for younger siblings, out-of-town vacations, etc.)

*Measuring Remote-Learning Student Participation*—During remote project-facilitation, many project participants refused or were unable turn-on/keep their cameras on during project activities. This made it difficult to assess if they were truly understanding and completing of project activities. Although staff continually reminded students to turn on their cameras, due to many students having difficult home life situations, they did not want to show their home environment on camera.



#### D. Successes of the Project

Despite pandemic and remote-learning complications, we are proud to report we have seen many successes since project implementation began.

*Positive Student Feedback*—Project staff have consistently reported that during case management and other one-to-one student sessions, they have voiced they are really enjoying participation in project activities. They have also voiced that they feel they are learning a lot about STEM-related principles and career fields and their interest in those fields is also growing.

*Summer Project Proficiency*—Project staff have also reported that although student participant numbers are lower than anticipated, 100% of those who are participating have been successful in the project exercises such as building and launching a water rockets and water-powered cars and making modifications/improvements to their finished products.