

NEBRASKA



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DEPT. OF ECONOMIC DEVELOPMENT

2017-2018 FINAL EVALUATION: NEBRASKA DEVELOPING YOUTH TALENT INITIATIVE

SEPTEMBER 2018

Dave Rippe, Director

INTRODUCTION

Implemented in 2015, LB 657: the Nebraska Developing Youth Talent Initiative (DYTI) was created to support an industry-defined approach to expose seventh and eighth grade students to occupations within the manufacturing and information technology (IT) industries. By piquing interest in these industries and occupations at an early age, the 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, particularly within the manufacturing and IT sectors, two of the largest non-farm economic drivers in Nebraska. Manufacturing alone contributes directly and indirectly over \$24.032 billion¹ to Nebraska’s economy annually. Looming retirements, public misconceptions about careers in manufacturing, and advanced skill-sets require collaborative efforts on many fronts. By the year 2024, the IT industry and other industries with high IT occupational densities will see an increased demand for employees from 15% to 31%.²

Eligible applicants are for-profit businesses, or a consortium of businesses, working in partnership with a public school system. Applicant businesses must outline their goals and strategy to develop the future workforce by providing exposure to and generating interest in the skills, technologies, and career opportunities relevant to manufacturing and/or IT occupations to 7th and 8th grade students.

Applications are independently scored by a committee of leaders from the Nebraska Department(s) of Economic Development (DED), Education (NDE), and Labor (DOL). Scoring criteria includes 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

The DED awards and administers \$250,000 annually to a minimum of two business applicants, one of which must be based in a county with a population under 100,000. Since 2015, six companies and three consortiums have been awarded the DYTI Grant.

2015-2016 Awards

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

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

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

<u>2016-2017 Awards</u>	
*Distefano (Omaha)	\$120,500
MetalQuest (Hebron)	<u>\$121,343</u>
TOTAL:	\$241,843

<u>2017-2018 Awards</u>	
Aulick (Scottsbluff)	\$107,962
*BD (Broken Bow)	\$ 67,113
Cyclonaire (York)	<u>\$ 74,835</u>
TOTAL:	\$249,910

<u>2018-2019 Awards</u>	
Nucor Detailing Center (Norfolk)	\$124,977
Reinke (Deshler)	<u>\$125,000</u>
TOTAL:	\$249,977

(*) indicates consortium

Data is collected by the applicants and by external, third-party evaluators. Schools collect both quantitative data on enrollments and qualitative data on impacted areas difficult to examine numerically. External evaluators conduct pre- and post- surveys to assess the impact DYTl programs had on participating student’s perceptions, knowledge, and interest in pursuing careers in manufacturing and/or IT.

2017-2018 PROGRAM EVALUATIONS

Following are overviews of the DYTl program outcomes for Aulick, BD* and Cyclonaire. Detailed focus group responses are included in the appendix.

AULICK (SCOTTSBLUFF)

The Nebraska Developing Youth Talent Initiative grant being implemented by Aulick Industries in partnership with Scottsbluff Public Schools sought to address the growing need locally for an increased number of skilled workers in the fields of manufacturing, IT and health care. The project featured the adoption of [Project Lead the Way’s](#) highly-respected, evidenced-based curriculum, which is specifically designed to engage students in the learning process through hands-on activities and, subsequently, increase their interest in manufacturing, IT and health careers.

The project commenced in the summer of 2017 with three Bluffs Middle School (BMS) teachers participating in training through *Project Lead the Way (PLTW)*. This included three teachers who attended a week-long training in Denver. Specific *Project Lead the Way* courses adopted through the grant include Design and Modeling, Automation and Robotics, Computer Science for Innovation and Makers, and Medical Detectives.

The project was guided by one overarching goal of *exposing an increasing number of students to career opportunities in the region's manufacturing and information technology industries*. Supporting this goal were a series of measurable outcomes that include:

- (1) An increase in students' awareness and interest in IT and Manufacturing careers and/or study, as measured through a pre- and post-survey of students.
- (2) Increased enrollment from fall 2017 to fall 2018 in the BMS Career Explorations course as well as the four PLTW courses.
- (3) Increased enrollment from fall 2017 to fall 2018 in Scottsbluff High School freshman level IT and Manufacturing courses.
- (4) An increase in the number of students who participate in industry engagement experiences such as guest speakers, industry tours, industry-led projects and job shadowing opportunities.

INCREASED AWARENESS

To measure changes in students' excitement for manufacturing, IT and health careers, the project utilized a pre- and post-test administered at the beginning of each course section and again at the completion of the course.

Relative to raising "awareness," in manufacturing, the project had a largely positive affect. The percentage of students who "strongly agreed" with having a "*strong knowledge of jobs or careers in the manufacturing field*" increased from 3.91% to 10.71%. Likewise, the percentage of students who "agreed" with having a "*strong knowledge of jobs or careers in the manufacturing field*" increased from 39.84% to 42.86%. The percentage of students who responded affirmatively to the statement (i.e., either "Strongly Agreed" or "Agreed") collectively increased from 43.75% to 53.57%. These increases would suggest that the project is certainly having the intended impact with regard to increasing awareness of manufacturing careers among students.

In the field of Information Technology, the percentage of responses that "strongly agreed" with having a "*strong knowledge of jobs or careers in the information technology field*" increased from 3.31% to 14.71% and the percentage of responses that "agreed" with the statement rose from 35.76% in the pre-test to 45.59% in the post-test. Looking specifically at positive responses relative to career awareness of IT, the overall percentage of students who "strongly agreed" or "agreed" with the statement increased from 39.07% to 60.30%, a remarkable increase.

Of the three career focus areas (manufacturing, IT and healthcare), only Information Technology experienced an increased percentage of students indicating an interest in the field as a career. These results suggest that the program may not be attracting increasing percentages of students to the career areas of manufacturing and health despite an increased awareness of jobs in these fields. Monitoring of "interest" data, even in select sections of each course, for the 2018-19 year and beyond might yield results that show positive trends in these career areas.

INCREASED ENROLLMENT

Using the data available, there are currently 408 students registered in the PLTW courses for the 2018-19 year, which represents an increase of 6.8% from 2017-18. This is encouraging data that confirms the project's sustainability and growth.

Likewise, looking at data for the fall 2017-18 and fall 2018-19 quarters, the Middle School experienced an increase in its Career Explorations Course, from 160 students in 2017-18 to a registered 185 for the upcoming fall 2018-19 quarter. The Career Explorations Course is a precursor to the PLTW courses and has the potential to play a key role in attracting more students into the PLTW courses.

INDUSTRY ENGAGEMENT

A complementary objective of Scottsbluff's DYTl grant was to increasingly involve industry within these classes to expand student knowledge and exposure to Health, IT and Manufacturing careers. For the most recent year, there were a minimum of 14 engagements (guest speakers, industry tours, industry-led projects and job shadowing opportunities) between the three PLTW courses and an additional eight engagements within the Career Explorations course.

BD (BROKEN BOW)

BD, with the help of its regional partners, purchased and outfitted a mobile trailer with interactive STEM technologies and curriculum. The STEM trailer traveled across the participating school districts and remained on school sites for several weeks, exposing students to advanced technology that would otherwise be inaccessible.

The Goals for BD and their local partners were to:

- 1) Expose at least 390 seventh and eighth grade students in Custer, Sherman, Loup, Blaine, Thomas, Hooker, and Logan counties to manufacturing technologies, careers, and educational opportunities in the manufacturing sciences.
- 2) Establish business to school connections to improve students' awareness of careers and education requirements in the manufacturing sciences.

The program evaluation process examined the following questions:

- 1) To what extent does the project increase student awareness and interest in manufacturing careers and related training?
- 2) To what extent does the project increase teacher or community awareness of and interest in manufacturing science careers and training?
- 3) To what extent does the project result in industry engagement in outreach and education?
- 4) To what extent does the project prompt manufacturing related education in participating schools?

Students were asked to respond to the following prompt with an open-ended answer:

"What was the most important idea you learned from your experiences with the STEM trailer?"

All 173 students responded to this prompt and their responses were overwhelmingly positive about what they had learned. Only 4.6% of the students either did not like the activities or indicated that they did not learn anything from the experience.

Comments from students about what they learned:

- *"I learned how important it is to use common problem solving skills."*
- *"I learned that I may be a good engineer someday."*
- *"I learned that science is a lot more fun when it is used in a fun environment."*
- *"Researching and finding solutions to problems independently."*

Students in the focus group were asked to share one thing they learned from their experiences with the STEM trailer activities. These comments were also overwhelmingly positive.

Comments from Student Focus Group:

- *"There's not just one correct way to do things. You can always find another way."*
- *"Really made us think of all the technology hiding in agriculture and making them combined to work together."*
- *"More specific directions, explained everything about everything they will be doing."*
- *"It made me think about more what I want to go to college for."*

Teacher Survey Highlights:

Teachers received a pre and post survey about their knowledge of STEM careers and confidence in finding resources for their students. There was a positive difference in the teachers' confidence level in the four prompted areas:

- *Increased awareness about STEM careers.*
- *Increased awareness on where to find information on teaching students about STEM careers.*
- *The STEM trailer activities had positive impact on student awareness for manufacturing careers.*
- *The STEM trailer activities had an impact on students' awareness of the educational requirements for manufacturing careers.*

Teacher Focus Group Summary:

Teachers in the focus group were asked to share how students' attitudes towards careers in manufacturing or technology, or possibly parents' attitudes towards their children's choices for a career, may have been impacted by the STEM trailer activities. The teacher responses were positive and focused on the creation of awareness amongst students related to careers they did not know existed. Teachers also focused on the relationship of science and math to the STEM trailer activities.

Teachers in the focus group were asked to share how their teaching practice may have been impacted by their experiences with the STEM trailer activities. While responses varied, some of the teachers indicated that the activities inspired them to consider how they teach in other classes and the types of activities used to engage students in the learning.

Business Partner Focus Group Summary:

Business partners in the focus group were asked about their role in the STEM trailer project. The business partners were very positive about the STEM trailer and what they were able to provide for students in the area.

The benefits mentioned by the business partners included the following: increased collaboration with schools, developing a relationship between businesses and the schools, creating an awareness of their business with students, creating an awareness of technical jobs in the area that are available to students, and the development of soft skills, especially problem solving and critical thinking, with students.

Conclusion:

It is clear that the goals of the grant were met through this project. Students and teachers from a wide variety of rural schools participated in the STEM trailer activities. All of the evaluation measures, except for the student pre- and post- surveys, showed a positive effect of the STEM trailer on students' thoughts regarding manufacturing and technical careers. The student survey results may have been impacted by the large difference in respondents between the pre- and post- surveys. In addition, some schools did not respond at all to the post- survey or had a significantly lower participation rate on the post- survey compared to the pre survey.

However, an interesting result on the surveys was the change in thinking by female students. On all survey items with one exception, *I like to imagine making new products*, changes in female responses were more positive than male students. This would suggest that the impact of the STEM trailer activities on female students is as great or greater as compared to male students.

Qualitative data collected on the student surveys, teacher surveys, student focus group, teacher focus group, and business partner focus group were overwhelming positive about the impact of the STEM trailer activities. There was also evidence that teachers may have thought differently about how to use instructional strategies to increase student engagement, problem solving, and critical thinking in other classes. There were few negative comments or feedback related to the project. It was also clear through the qualitative data that the project helped to create a positive view of the business partners in schools, had a positive impact on the relationships between business partners and schools, and increased the collaboration between the business partners and schools. The positive feedback from community members to business partners was also positive and encouraging.

CYCLONAIRE (YORK)

The goal of Cyclonaire and its' partners was to *encourage interest in design, manufacturing and engineering areas through positive experiences*. The York Middle School converted an entire classroom into a permanent makerspace for equipment purchased using DYTl funds with input from industry experts at Cyclonaire.

The project had four goals:

- 1) Introduce students to the manufacturing process, from design to product creation.
- 2) Encourage interest in design, manufacturing, and engineering areas through positive experience.
- 3) Raise awareness of career opportunities in these fields.
- 4) Raise awareness of local company activities requiring these skillsets.

The program evaluation process explored the extent to which the project goals had been accomplished. The evaluator also explored how the grant activities may be modified to increase the impact on the intended outcomes.

To evaluate the program goals, the evaluator created a pre-survey and post-survey for students and teachers. Data collected demonstrated that students increased awareness and knowledge of STEM driven careers in manufacturing and IT through responses to the following survey prompts:

- I like to imagine making new products.
- If I learn about manufacturing, then I can improve things that people use every day.
- I am curious about how electronics work.
- Knowing how to use math and science together will help me to invent useful things.
- I believe I can be successful in a manufacturing career.

Comments from Students About What They Learned:

Students were asked to respond to the following prompt with an open-ended answer: *“What was the most important idea you learned from your experiences?”* The student responses were positive about what they had learned. The most common themes from the student responses were: collaboration, persistence, value of hard work, designing new products, making things, and marketing. Approximately half of the student responses addressed soft skills.

Comments from Teachers About What Students Gained from the Experience:

Responses from teachers about what students gained from the experience may best be summed up with the following quote from one of the teacher respondents:

- *“The students learned the importance of problem solving skills, organization, and time management skills required to complete projects. I believe most of them hear talk about these skills but now had to actually put them to use. It was a tough experience for them at first but have improved immensely.”*

Conclusion:

It is clear that the goals of the grant were met through this project. Students participated in a semester-long class to introduce them to entrepreneurship, creation of products, and marketing of the products. All of the evaluation measures, except for three prompts on student pre- and post- surveys, showed a positive effect of the class experience on students' thoughts regarding manufacturing and technical careers. An interesting result on the surveys was the perception by female students of their parents' views on careers in manufacturing/IT. Responses from females was considerably higher than that of male students. In general, responses to the survey items were positive and significant changes were seen from the pre- to post-survey results.

Qualitative data collected from the student surveys and teacher surveys as well as from the evaluator's visit to the program, indicated positive results from the experience. The impacted areas primarily focused on soft skills such as problem solving, cooperation, collaboration, and critical thinking as well as an increased awareness of entrepreneurship. There were few negative comments or feedback related to the project. It was also clear through the qualitative data that the project helped to create a positive view of the business partner in the schools.

**The following reports were submitted
by each grant recipient.**

Project Evaluation

Nebraska Developing Youth Talent Initiative Grant
Entrepreneurship Academy

Dr. Richard Meyer, Ed.D.
7-8-2018

Project Goals:

The project had four goals:

- 1) Introduce students to the manufacturing process, from design to product creation.
- 2) Encourage interest in design, manufacturing, and engineering areas through positive experience.
- 3) Raise awareness of career opportunities in these fields.
- 4) Raise awareness of local company activities requiring these skillsets.

The program evaluation process explored the extent to which the project goals had been accomplished. The evaluator also explored how the grant activities may be modified to increase the impact on the intended outcomes.

Method

To evaluate the program goals, the evaluator created a pre-survey and post-survey for students and teacher. The surveys were adapted from surveys developed by the Friday Institute for Educational Innovation (2012). The Friday Institute and the survey authors granted the evaluator permission to use, adapt, and modify the surveys to meet the needs of this evaluation. The surveys were constructed in Qualtrics, a secure, online survey software available to the evaluator. Links for the surveys were distributed by e-mail to the York Public Schools. Responses were monitored for completion and reminders sent so surveys were completed in a timely manner.

The student survey included the following demographic information: grade level, gender, and school. The pre and post surveys included 9 stems that were the same. The stem responses were gathered using a 5 point Likert scale (1=Strongly Disagree, 2=Disagree, 3=Neither Agree or Disagree, 4=Agree, and 5=Strongly Agree). One yes-no-not sure question was included on both surveys that asked if the student knew adults working in manufacturing. The post survey also included two open-ended questions that asked what students had learned through the experience and how the experience might be improved. Two questions related to parents' perceptions of manufacturing careers were added to the survey during the school year. The questions were added after student responses had been collected for the pre survey, so responses to these prompts are only available for the post survey. 23 students completed the pre survey while 25 students completed the post survey. The surveys were not matched by student since all students in the class were surveyed.

The teacher survey included the following demographic information: gender. The pre and post-surveys included 4 stems that were the same. The stem responses were gathered using a 5 point Likert scale (1=Strongly Disagree, 2=Disagree, 3=Neither Agree or Disagree, 4=Agree, and 5=Strongly Agree). On the pre-survey, the teacher was asked about the benefits she thought students would gain from the experience and what concerns she had about the class. On the post survey, the teachers were also asked two yes-no-not sure questions about the impact of the activities on students. In addition, the teachers were asked to respond to two open-ended questions where they were asked to explain what students gained from the experience and how the experience might be improved. One teacher completed the pre-survey while 3 teachers completed the post-survey.

The evaluator visited the classroom located in the York Middle School on April 12, 2018 to observe the class. The evaluator was able to visit with each of the students and the teacher during the visit.

Student Survey Results

23 student responses were collected on the pre-survey. 25 student responses were collected on the post-survey. All students completing the surveys were enrolled in grade 8 at the York Middle School. The distribution by gender of the students completing the surveys were as follows:

Gender	# Pre (N=23)	# Post (N=25)
Female	10	12
Male	13	13

Survey Prompts

The mean responses to the student prompts (1=Strongly Disagree to 5=Strongly Agree) are displayed in the following table.

<i>Student Prompts</i>	Pre-Survey (N=23)	Post-Survey (N=25)	Difference (Pre-Post)
I like to imagine making new products.	3.87	4.00	0.13
If I learn about manufacturing, then I can improve things that people use every day.	3.83	4.08	0.25
I am good at building or fixing things.	3.70	3.88	0.18
I am interested in what makes machines work.	3.52	3.40	-0.08
Designing products or structures will be important in my future jobs.	3.48	3.44	-0.04
I am curious about how electronics work.	3.48	3.52	0.04
I want to be creative in my future jobs.	4.30	4.20	-0.10
Knowing how to use math and science together will help me to invent useful things.	3.96	4.04	0.08
I believe I can be successful in a manufacturing career.	3.26	3.56	0.30
My parents have a positive view of manufacturing/IT careers.		3.64	
My parents thoughts about manufacturing/IT careers have changed based on my experiences with the lab activities.		3.4	

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:

<i>Student Prompts</i>	Pre-Survey (F N=10/ M N=13)	Post-Survey (F N=12/ M N=13)	Difference (Pre-Post- F/M)
I like to imagine making new products.	3.80/3.92	4.00/4.00	0.20/0.08
If I learn about manufacturing, then I can improve things that people use every day.	3.80/3.85	4.08/4.08	0.28/0.23
I am good at building or fixing things.	3.50/3.85	3.67/4.08	0.17/0.18
I am interested in what makes machines work.	2.90/4.00	3.00/3.77	0.10/-0.23
Designing products or structures will be important in my future jobs.	3.30/3.62	3.08/3.77	-0.22/0.15
I am curious about how electronics work.	3.20/3.69	3.08/3.92	-0.12/0.23
I want to be creative in my future jobs.	4.40/4.23	4.00/4.38	-0.40/0.15
Knowing how to use math and science together will help me to invent useful things.	3.80/4.08	4.08/4.00	0.28/-0.08
I believe I can be successful in a manufacturing career.	3.10/3.38	3.50/3.62	0.40/0.24
My parents have a positive view of manufacturing/IT careers.		4.00/3.31	
My parents thoughts about manufacturing/IT careers have changed based on my experiences with the lab activities.		3.75/3.08	

Student Pre-Survey Question

Do you know adults who work in manufacturing?

Response	All %	Female %	Male %
Yes	34.8	20.0	46.2
No	26.1	20.0	30.8
Not Sure	39.1	60.0	23.1

Student Post-Survey Question

Do you know adults who work in manufacturing?

Response	All %	Female %	Male %
Yes	48.0	50.0	46.2
No	20.0	33.3	7.7
Not Sure	32.0	16.7	46.2

Comments from students about what they learned

Students were asked to respond to the following prompt with an open-ended answer: *“What was the most important idea you learned from your experiences?”* The student responses were positive about what they had learned. The most common themes from the student responses were: collaboration, persistence, value of hard work, designing new products, making things, and marketing. Approximately half of the student responses addressed soft skills.

Students were also asked to respond to the following prompt: *What could be changed to make the experience better for students?* Student answers to this question varied widely. Common themes included more time for the class, more money or resources for products, more feedback on products from other successful entrepreneurs, access to more students, and everyone collaborating on projects.

Teacher Survey Results

One teacher response was collected on the pre-survey, while 3 responses were collected on the post-survey. The responses to the teacher prompts (1=Strongly Disagree to 5=Strongly Agree) are displayed in the following table.

<i>Teacher Prompts</i>	Pre-Survey (N=1)	Post-Survey (N=3)	Difference (Pre-Post)
I know about current STEM careers.	4.00	4.00	0.00
I know where to learn more about STEM careers.	3.00	4.00	1.00
I know where to find resources for teaching students about STEM careers.	2.00	4.00	2.00
I know where to direct students or parents to find information about STEM careers.	2.00	3.33	1.33

Comments from teachers about what students gained from the experience.

Responses from teachers about what students gained from the experience may best be summed up with the following quote from one of the teacher respondents.

The students learned the importance of problem solving skills, organization, and time management skills required to complete projects. I believe most of them hear talk about these skills but now had to actually put them to use. It was a tough experience for them at first but have improved immensely.

The teacher response primarily focuses on soft skills and not specific knowledge of any program or product.

Teachers were also asked about how to improve the experiences for students. In the evaluator’s opinion, all of the teacher comments are appropriate and would be helpful in improving the experiences for students. Teachers made the following comments.

Continue to find donors to increase raw materials.

I think we need to do a better job of exposing them to more career possibilities and outside experiences.

Stream line the curriculum, better-adapt curriculum; certain points/goals to attain along the way; rubrics for grading those requirements/steps.

Conclusions

It is clear that the goals of the grant were met through this project. Students participated in a semester-long class to introduce them to entrepreneurship, creation of products, and marketing of the products. All of the evaluation measures, except for three prompts on student pre-post surveys, showed a positive effect of the class experience on students' thoughts regarding manufacturing and technical careers. An interesting result on the surveys was the perception by female students of their parents' views on careers in manufacturing/IT. Responses from females was considerably higher than that of male students. In general, responses to the survey items were positive and significant changes were seen from the pre to post-survey results. However, positive changes were not observed in all survey areas.

Qualitative data collected on the student surveys and teacher surveys as well as from the evaluator's visit to the program, indicated positive results from the experience. The impacted areas primarily focused on soft skills such as problem solving, cooperation, collaboration, and critical thinking as well as an increased awareness of entrepreneurship. There were few negative comments or feedback related to the project. It was also clear through the qualitative data that the project helped to create a positive view of the business partner in the schools.

Recommendations

While the entrepreneurship class was successful in meeting the program goals, I believe the following suggestions may help to increase the impact of this class on student' views towards manufacturing and technical careers as well as continued skill development.

- 1) Have students keep journals to record their thinking on classroom experiences. I would also suggest that students set either weekly or daily goals to accomplish. Students could then reflect and write about their progress or lack of progress in their journals. Group discussions on a regular basis about each group's goals would also be helpful in creating more collaboration between teams of students.
- 2) Have clear goals for the class that are shared with students. The teacher and student could have periodic discussions (weekly or every other week) to discuss progress towards accomplishing the class goals.
- 3) Involve business partners in sharing about their career choices and how they are related to what students are learning in class.
- 4) Provide professional development for teachers on classroom management in this type of classroom environment. For many teachers, this type of environment is far different from their normal classroom and requires different classroom management strategies.

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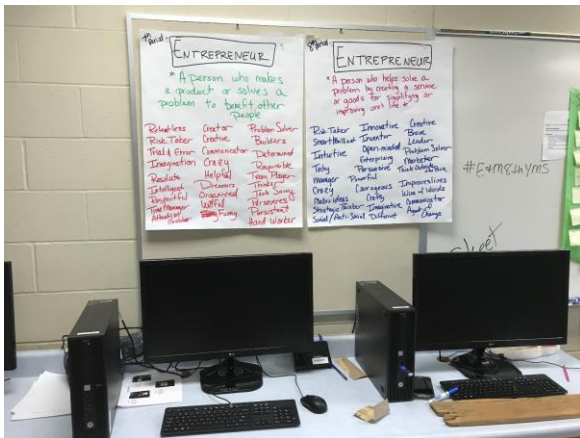
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Project Evaluation

Nebraska Developing Youth Talent Initiative Grant
STEM Trailer Project

Dr. Richard Meyer, Ed.D.
7-7-2018

Project Goals:

The project had two goals:

- 1) Expose at least 390 7th and 8th grade students in Custer, Sherman, Loup, Blaine, Thomas, Hooker, and Logan counties to manufacturing technologies, careers, and educational opportunities in the manufacturing sciences.
- 2) Establish business/school connections to improve students' awareness of careers and education requirements in the manufacturing sciences.

The program evaluation process examined the following questions:

- 1) To what extent does the project increase student awareness of and interest in manufacturing careers and related training?
- 2) To what extent does the project increase teacher or community awareness of and interest in manufacturing science careers and training?
- 3) To what extent does the project result in industry engagement in outreach and education?
- 4) To what extent does the project prompt manufacturing related education in participating schools?

The evaluator also explored how the grant activities may be modified to increase the impact on the intended outcomes.

Method

To evaluate the program goals, the evaluator created a pre-survey and post-survey for students and teachers. The surveys were adapted from surveys developed by the Friday Institute for Educational Innovation (2012). The Friday Institute and the survey authors granted the evaluator permission to use, adapt, and modify the surveys to meet the needs of this evaluation. The surveys were constructed in Qualtrics, a secure, online survey software available to the evaluator. Links for all surveys were distributed by e-mail to each school contact. Responses were monitored for completion and reminders sent to schools that had not completed surveys in a timely manner.

The student survey included the following demographic information: grade level, gender, and school. The pre and post-surveys included 9 stems that were the same. The stem responses were gathered using a 5 point Likert scale (1=Strongly Disagree, 2=Disagree, 3=Neither Agree or Disagree, 4=Agree, and 5=Strongly Agree). One yes-no-not sure question was included on both surveys that asked if the student knew adults working in manufacturing. The post-survey also included two open-ended questions that asked what students had learned through the experience and how the experience might be improved. Two questions related to parents' perceptions of manufacturing careers were added to the survey during the school year. The questions were

added after student responses had been collected, so responses to these prompts are not included in the results. 268 students completed the pre-survey while 173 students completed the post-survey. The surveys were not matched, so there is no way to know if students who completed the pre-survey also completed the post-survey. However, given the number of surveys collected, it is probable that the results were not significantly impacted by the difference in responses to the two surveys.

The teacher survey included the following demographic information: gender and school. The pre and post-surveys included 4 stems that were the same. The stem responses were gathered using a 5 point Likert scale (1=Strongly Disagree, 2=Disagree, 3=Neither Agree or Disagree, 4=Agree, and 5=Strongly Agree). On the pre-test, teachers were asked about what benefits they thought students would gain from the experience and what concerns they had about using the STEM trailer. On the post-survey, teachers were also asked two yes-no-not sure questions about the impact of the activities on students. In addition, teachers were asked to respond to two open-ended questions where they were asked to explain what students gained from the experience and how the experiences might be improved. 40 teachers completed the pre-survey while 12 teachers completed the post-survey. The surveys were not matched, so there is no way to know if teachers who completed the pre-survey also completed the post-survey. While there is no way to determine if the pre-survey results may be different if only the 12 teachers had completed the pre-survey, it's unlikely that the results would be significantly different.

Focus group discussions were also conducted at the STEM Capstone event in Broken Bow on April 16, 2018. Focus group discussions were held with students, teachers, and community/industry representatives. Each focus group lasted approximately 30 minutes and were digitally recorded. It should be noted that students in the focus group were selected by teachers to attend the event, and did not include every student impacted by the grant. In addition, the evaluator conducted a site visit to the STEM trailer implementation at Litchfield Public Schools on November 29, 2017. The evaluator was able to observe the different activities with and without students. The evaluator also had the opportunity to visit with students and the instructor during the visit.

Student Survey Results

268 student responses from 11 different schools were collected on the pre-survey. 173 student responses were collected from 12 different school on the post-survey. Students in one school did not respond to either survey. Responses by school are the following:

School	# Pre (N=268)	# Post (N=173)
Anselmo-Merna	44	0
Ansley	21	10
Arnold	10	20
Broken Bow	58	54
Callaway	48	17
Litchfield	9	5
Loup County	8	1

McPherson County	2	2
Mullen	22	23
Sandhills	21	16
Sargent	25	24
Stapleton	0	0
Thedford	0	1

Students completing the surveys were enrolled in grades 5, 6, 7, and 8. The distribution by grade level is the following:

Grade	# Pre (N=268)	# Post (N=173)
5 th grade	0	10
6 th grade	14	0
7 th grade	92	52
8 th grade	162	111

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

Gender	# Pre (N=268)	# Post (N=173)
Female	139	91
Male	129	82



Survey Prompts

<i>Student Prompts</i>	Pre-Survey (N=268)	Post-Survey (N=173)	Difference (Pre-Post)
I like to imagine making new products.	3.87	3.86	-0.02
If I learn about manufacturing, then I can improve things that people use every day.	3.80	3.85	0.05
I am good at building or fixing things.	3.73	3.67	-0.06
I am interested in what makes machines work.	3.65	3.65	0.00

Designing products or structures will be important in my future jobs.	3.38	3.37	-0.01
I am curious about how electronics work.	3.66	3.60	-0.06
I want to be creative in my future jobs.	4.22	4.13	-0.09
Knowing how to use math and science together will help me to invent useful things.	3.97	3.90	-0.08
I believe I can be successful in a manufacturing career.	3.41	3.31	-0.10

The mean responses to the student prompts (1=Strongly Disagree to 5=Strongly Agree) are displayed in the following table.

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:

<i>Student Prompts</i>	Pre-Survey (F N=139/ M N=129)	Post-Survey (F N=91/ M N=82)	Difference (Pre-Post- F/M)
I like to imagine making new products.	3.83/3.91	3.74/3.99	-0.09/0.08
If I learn about manufacturing, then I can improve things that people use every day.	3.67/3.95	3.76/3.95	0.09/0.00
I am good at building or fixing things.	3.50/3.98	3.47/3.89	-0.03/-0.09
I am interested in what makes machines work.	3.30/4.02	3.35/3.98	0.05/-0.04
Designing products or structures will be important in my future jobs.	3.12/3.66	3.24/3.51	0.12/-0.15
I am curious about how electronics work.	3.44/3.89	3.41/3.82	-0.03/-0.07
I want to be creative in my future jobs.	4.32/4.12	4.27/3.98	-0.05/-0.14
Knowing how to use math and science together will help me to invent useful things.	3.94/4.01	4.01/3.77	0.07/-0.24
I believe I can be successful in a manufacturing career.	3.22/3.62	3.22/3.40	0.00/-0.18

Student Pre-Survey Question

Do you know adults who work in manufacturing?

Response	All %	Female %	Male %
Agree	60.8	55.4	66.7
Disagree	10.4	7.9	13.2
Not Sure	28.7	36.7	20.2

Student Post-Survey Question

Do you know adults who work in manufacturing?

Response	All %	Female %	Male %
Agree	64.2	58.2	70.7
Disagree	8.7	7.7	9.8
Not Sure	27.2	34.1	19.5

Comments from students about what they learned

Students were asked to respond to the following prompt with an open-ended answer:

“What was the most important idea you learned from your experiences with the STEM trailer?”

The student responses were overwhelming positive about what they had learned. All 173 students responded to this prompt. 8 (4.6%) of the students either didn't like the activities or indicated that they didn't learn anything from the experience. The following comments are typical comments made by students on the post-survey.

I learned that I have a lot more creativity than I think I did.

I learned that I may be a good engineer someday.

How to be creative and try new things.

Better teamwork and critical thinking.

The most important idea I learned is that sometimes you need to think differently to accomplish something.

I learned that science is a lot more fun when it is used in a fun environment.

If you work in a group you have to work together.

The most important idea I learned is that there are many career paths that I can take.

Anything is possible!

That there is a lot of things that people use every day and they can in the near future. I can help more people know how stuff works and how they are made.

How to figure things out without our teacher and get more hands on with things.

Researching and finding solutions to problems independently.

I learned that it can be fun if you are willing to work to make something better or useful.

How to use the small STEM labs in real life.

How to be creative, but still productive.

I learned how important it is to use common problem solving skills.

The most important idea I learned is that there are many career paths that I can take.

Student Focus Group Summary

Students in the focus group were asked to share one thing they learned from their experiences with the STEM trailer activities. The comments were overwhelmingly positive. The following are a sampling of the comments and typical of the overall reaction by students.

When other people write stuff down in the notebooks, it can really help you.

There's not just one correct way to do things. You can always find another way.

To figure out how to do things by yourself.

When you make mistakes you can always go back, fix them and make it better.

Don't quit when you fail once, you are still trying.

Pay attention to the little things because sometimes you're working on something and even the slightest bit of difference made the world of help to us. We just instantly figured out after we messed up on one simple thought.

Students were then asked to respond to the following prompt: *Has your experiences with the STEM trailer activities changed your view about what you might want to do for a career?*

Student answers to this question varied widely depending upon their situation. The following are a sampling of the comments and typical of the overall reaction by students.

I realized there's a lot of different careers in technology. I'm not as interested in that as I could be, but I know that if I ever do become interested in the future, there's a lot of possibilities to see.

I found it I interesting, but I do not see as a career or something, like a hobby.

It helped me realize that there's more out there than just cows.

It made me like totally reconsider what I want to be when I grow up ...

It really made think of all the technology hiding in agriculture and making them combined to work together.

It just opened up my eyes to, there's more things out there than just like the occupations you usually think of, like you can be an entrepreneur making things with the 3d printers and stuff, but it really helps me open my eyes.

It made me think about more what I want to go to college for.

Students were then asked to respond to the following prompt: *How do you think your parents views of careers in technology or STEM related careers might have changed because of your participation in the STEM trailer activities?* Student answers to this question varied widely depending upon their situation. The following are a sampling of the comments and typical of the overall reaction by students.

They were pretty supportive before. So I don't think they will change any.

My parents are very supportive, and they are understanding as much as I do, but they know it (technology) is growing in the world. So, they really want me to do what I like.

My parents encourage me to do whatever I want when I am growing up.

They were supportive once I explained then exactly what I was doing.

My parents always support me with whatever I do but it has change their views.

They started supporting, like once I started bringing home wood carvings and stuff though I think it really opened their eyes to what exactly we are doing and learning.

They started supporting me once they saw how happy it made me. They like to help me find more opportunities to continue learning things.

Students were then asked to respond to the following prompt: *What would you change in the activities or in the whole process to make it better?* Student answers to this question varied, but the following are a sampling of the comments and typical of the overall reaction by students.

More organized, more people in the first day, kind of explaining everything about everything.

At first it was kind of hard to understand, so maybe more directions to know what you are doing.

More specific directions, more variety in the stations. Like maybe add more stations

I agree with what we were talking over there about how it'd be nice to have like another week or just a few days to get some final products made and find more stuff.

Like the first day, probably have somebody there to give you a head start and show you some things about it, but not tell you how to do everything. Just get you going in the right direction so you know what to do.

I would like NOT to have the notebooks the first week. Give us the notebooks the second week. That way we really get to try out our own things and then just see how it differentiates seeing what other people did, what we did.

I would find more stuff you can make out of everything, just a wider variety of options.

Definitely more direction.

Teacher Survey Results

28 teacher responses from 12 different schools were collected on the pre-survey. 12 teacher responses were collected from 8 different school on the post-survey. Teachers in one school did not respond to either survey. Responses by school are the following:

School	# Pre (N=28)	# Post (N=12)
Anselmo-Merna	2	0
Ansley	2	0
Arnold	1	2
Broken Bow	2	1
Callaway	4	1
Litchfield	5	2
Loup County	1	0
McPherson County	3	3
Mullen	2	1
Sandhills	3	1
Sargent	2	1
Stapleton	0	0
Thedford	1	0

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

Gender	# Pre (N=28)	# Post (N=12)
Female	20	7
Male	8	5

The mean responses to the student prompts (1=Strongly Disagree to 5=Strongly Agree) are displayed in the following table.

Survey Prompts

The mean responses to the teacher prompts (1=Strongly Disagree to 5=Strongly Agree) are displayed in the following table.

<i>Teacher Prompts</i>	Pre-Survey (N=28)	Post-Survey (N=12)	Difference (Pre-Post)
I know about current STEM careers.	4.00	4.17	0.17
I know where to learn more about STEM careers.	3.75	4.08	0.33
I know where to find resources for teaching students about STEM careers.	3.39	3.83	0.44
I know where to direct students or parents to find information about STEM careers.	3.32	3.42	0.10

Teacher Post Survey Questions

The STEM Trailer activities had an impact on students' awareness of manufacturing careers.

Agree	11
Disagree	0
Not Sure	1

The STEM Trailer activities had an impact on students' awareness of the educational requirements for manufacturing careers.

Agree	8
Disagree	0
Not Sure	4

Comments from teachers about what students gained from the STEM trailer experience.

They were able to make a connection between how STEM relates to the real world.

Making them aware of the problem solving skills industry needs from their employees needed to develop and go their businesses.

My fifth grade students used the Makey-Makey to control code they wrote themselves using M.I.T.'s scratch coding. They also used the CNC and Easel software to design and carve projects. They learned problem solving as well as the ability to write code and control their content.

Several of my students got to try things they normally would have never experienced.

My students were exposed to sciences and technology that they would have not been exposed to otherwise

They loved the hands-on learning and being able to use all of the labs. It was great seeing the moment that they understood or figured out a solution to a problem they were having at a station.

They gained a better understanding of careers in STEM.

It opened their minds to careers that they would not have considered before.

Learned more about the technological aspects of STEM.

The students gained a stronger awareness of STEM related activities and careers.

My students gained an understanding about their ability to try new things and learn about something all on their own. They also learned that there are countless more areas in science and math areas that they had no idea even existed. They also learned that sometimes reading directions and perseverance actually do pay off in the long run. Most of all they learned that it is ok to experiment and make mistakes, just as long as you learn something from it.

Comments from teachers about what could be changed to make the STEM trailer experience more beneficial for students.

More time to explore and learn.

We need to get more of our teachers involved in this project especially our math, science and technology instructors.

Unsure.

More resources such as extra batteries, or network passwords.

I just wish that my class had more consecutive time in the lab. Not just 50 minutes.

Time for our students to use all of the stations, some of the stations were easy to use in our 50 min. class periods, but some didn't get used because we didn't have the time to really get into it. One example would be the electronics lab.

Provide more lessons or ideas for using the lab.

Training for staff before arrival, better guides to go with several of the units.

It would have been nice to have it longer so that more students had a chance to use the 3D printer and other stations that required more time to set up and run.

Sandhills was one of the last schools to get the STEM lab, and I feel that several things were not working. We were not able to actually get two of the labs due to not working.

The only recommendation I would have to ensure that any technology based station is working at each and every school so that one school (or a few) does not miss out on that station simply because the technology was not functioning.

Having simple goals/tasks/products for them to work towards would have helped their focus.

Teacher Focus Group Summary

Teachers in the focus group were asked to share what they believe their students learned from the STEM trailer activities. The comments were centered on non-academic soft skills that students need to be successful in school and life. Teachers commented about the following skills: perseverance, problem solving, collaboration, attention to detail, dealing with frustration, dealing

with feelings of being overwhelmed, dealing with a fear of failure, being prepared, and the use of inquiry. The following are a sampling of comments and typical of the comments made by teachers.

I think they learned a lot about trying things around, and not being afraid of failure.

They would see someone try it and mess up and then try to figure it out. Collaborate. So I think not that fixed mindset I guess. Just trying to figure things out.

They learned that I'm not going to tell them how to do it. And then they said "OK", find out who knows something and pull your ideas together.

Actually I think, made students try to figure it out

But I think that there's a lack of direction really need students kind of get out of their comfort zone, and try to figure it out.

I just noticed some students went ahead, used, and looked over the notes previous students had taken when they had the lab. You know, they figured out how helpful that was, so they are some good note takers from other schools obviously.

It was overwhelming for us to like it wasn't just the kids that were overwhelmed. After two weeks you realize that it's okay.

Yeah, I kind of like that they could see me as a learner. I was trying to figure it out versus you know everything and how to do it.

Teachers in the focus group were asked to share how students' attitudes towards careers in manufacturing or technology, or possibly parents' attitudes towards their children's choices for a career, may have been impacted by the STEM trailer activities. The teacher responses were positive and focused on the creating more awareness amongst students related to careers they had no idea existed. Teachers also focused on the relationship of science and math to the STEM trailer activities.

I thought it brought a lot of careers back into the realm of possibility.

I think it made kids more aware of the fact that like you weren't just in the science field that it's not just like microscopes. There's so much more involved with that that they didn't know before. Yes, there's a math component to almost everything. So, maybe that's why you have to take so many math classes, I think it made them more aware of the fact that there's just more to it than what they thought before. It's not just white black and white. There's more gray.

...it was a good way for them to realize, you know maybe I am really good at something that I had no idea that I was good at...

Their vision of a career is only open to what they've been exposed to. It's hard to calculate or have any imaginable idea how that's going to impact students going forward. I don't think we can really quantify that. But as a kid, I mean as you were in your own life, you really only knew about jobs that your parents did or if you went to visit what one of your friends' parents did. Or if you went on a field trip someplace. You didn't even consider jobs that you didn't know were in existence. So, I think that it is valuable, but that it's hard to quantify.

Teachers in the focus group were asked to share how their teaching practice may have been impacted by their experiences with the STEM trailer activities. While responses varied, some of the teachers indicated that the activities inspired them to consider how they teach in other classes and the types of activities used to engage students in the learning. The following are a sampling of comments made by the teachers.

I'm just letting go and letting them do it on their own. I think sometimes I'm guilty of running right by their side. Let me show you how to do this and get it right.

I think for me being in the library, I wanted to make my own Stem Lab and make this area. It inspired me to start doing and working with tech and having more tech activities available for teachers to check out to bring into the classrooms.

I guess it's changed me because I'm going to be changing from counseling to be our IT tech guy. I've got classes that I'm putting in next year that are based on some of what is in the STEM trailer.

The nice thing about this whole thing was the advantage for different styles of learners.

Well, the new science standards being inquiry based, like they're really project based learning inquiry. I think this really just kind of helped me be more comfortable and jumping into the new standards.

Teachers in the focus group were asked to share their thoughts on how the STEM trailer experience might be improved. Again, responses varied, but in general, the teachers voiced concerns about the amount of time (2 weeks) that the activities were available, the technology working correctly, and a lack of directions or lesson plans for the activities. In addition, the teachers mentioned the need for classroom management skills different from the traditional classroom and suggested that community members not only set up the activities, but also be available to talk to students about their careers and how the STEM activities matched with their work.

Business Partner Focus Group Summary

Business partners in the focus group were asked about their role in the STEM Trailer project. Focus group members included people who had the following roles in the project: STEM trailer and activities designer, authors of the grant, fiscal agent, project manager, setting up activities, and repairing activities. The business partners were very positive about the STEM trailer and what they were able to provide for students in the area. The benefits mentioned by the business

partners included the following: increased collaboration with schools, developing a relationship between businesses and the schools, creating an awareness of their business with students, creating an awareness of technical jobs in the area that are available to students, and the development of soft skills, especially problem solving and critical thinking, with students. A sample of comments made by business partners include the following:

Our technicians and our engineers connecting with the kids is a good thing. Listening to some of the conversation this morning with the students that was one of the notes that I did make for myself. Are we really focusing on making that connection?

Our biggest thing is really connecting schools and businesses. When we bring the Stem Lab to schools and they see all the workforce skills that businesses need and the opportunities. We are trying to encourage kids no matter what they do to come back here. You can do it locally. They're seeing that opportunity here.

Letting students know that we exist that there are good solid technical career paths in the region. You don't have to go away and never come back. I think that kind of benefits both of us.

One of the other things that I've seen at the schools, a lot of the rural schools, is there are kids that are wanting to stay with their ranch jobs. They're thinking outside the box of how they can supplement that income... The path that we gave kids the opportunity to be able to think outside the box some ways to supplement, stay, and help the ranch and stay in their community. You know that's a win for us.

Business partners also mentioned the feedback they had received in their communities regarding the STEM trailer activities.

Conclusions

It is clear that the goals of the grant were met through this project. Students and teachers from a wide variety of rural schools participated in the STEM trailer activities. All of the evaluation measures, except for the student pre-post surveys, showed a positive effect of the STEM trailer on students' thoughts regarding manufacturing and technical careers. The student survey results may have been impacted by the large difference in respondents between the pre and post surveys. In addition, some schools did not respond at all to the post survey or had a significantly lower participation rate on the post survey compared to the pre survey. However, an interesting result on the surveys was the change in thinking by female students. On all survey items with one exception, *I like to imagine making new products*, changes in female responses were more positive than male students. This would suggest that the impact of the STEM trailer activities on female students is as great or greater as compared to male students.

Qualitative data collected on the student surveys, teacher surveys, student focus group, teacher focus group, and business partner focus group were overwhelming positive about the impact of the STEM trailer activities. The impacted areas included soft skills such as problem solving and critical thinking as well as an increased awareness of manufacturing and technology related careers. There was also evidence that teachers may have thought differently about how to use

instructional strategies to increase student engagement, problem solving, and critical thinking in other classes. There were few negative comments or feedback related to the project. It was also clear through the qualitative data that the project helped to create a positive view of the business partners in schools, had a positive impact on the relationships between business partners and schools, and increased the collaboration between the business partners and schools. Also, the positive feedback from community members to business partners was positive and encouraging.

Recommendations

While the STEM trailer project was successful in meeting the program goals, I believe the following suggestions may help to increase the impact of the STEM trailer on student' views towards manufacturing and technical careers.

- 1) Business partners were extremely helpful and valuable in setting up the STEM trailer activities. In addition to this assistance, I would suggest that business partners also provide employees to visit with students and teachers about their jobs/careers and how the STEM trailer activities relate to what the employee does on the job.
- 2) Increase the amount of time that students have access to the activities. Each school was scheduled for two weeks, but in some cases, schools actually had the activities available for less than the full two weeks.
- 3) While the goal of the trailer activities was for student exploration, it would be helpful if teachers conducted activities to help students reflect on what they had discovered or learned from their exploration. I would suggest students keep a journal to write a short reflection on their experiences each day. Teachers could also lead group discussions on what students were learning in the activities.
- 4) Provide professional development for teachers on how to teach in an environment where students are being asked to explore. For many teachers, this is far different from what occurs on regular basis in their classrooms.
- 5) Provide professional development for teachers on classroom management in this type of classroom environment. Again, for many teachers, this type of environment is far different from their normal classrooms and requires different classroom management strategies.
- 6) Since there is some evidence of the impact on teachers' classroom teaching, including more teachers in the process may have an impact across the school.

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NEBRASKA DEVELOPING YOUTH TALENT INITIATIVE

FINAL REPORT

Prepared by Frank Shimerdla for Aulick Industries and Scottsbluff Middle School

Executive Summary

The Nebraska Developing Youth Talent Initiative grant being implemented by Aulick Industries in partnership with Scottsbluff Public Schools sought to address the growing need locally for an increased number of skilled workers in the fields of manufacturing, IT and health care. The project featured the adoption of Project Lead the Way's highly-respected, evidenced-based curriculum, which is specifically designed to engage students in the learning process through hands-on activities and, subsequently, increase their interest in manufacturing, IT and health careers.

The project commenced in the summer of 2017 with three Bluffs Middle School teachers participating in training through Project lead the Way. This included three teachers who attended a week-long training in Denver. Specific PLTW courses adopted through the grant include Design and Modeling, Automation and Robotics, Computer Science for Innovation and Makers, and Medical Detectives.

The project was guided by one overarching goal of *exposing an increasing number of students to career opportunities in the region's manufacturing and information technology industries*. Supporting this goal were a series of measurable outcomes that include:

- (1) An increase in students' interest in IT and Manufacturing careers and/or study, as measured through a pre- and post-survey of students.
- (2) Increased enrollment from fall 2017 to fall 2018 in the BMS Career Explorations course as well as the four PLTW courses.
- (3) Increased enrollment from fall 2017 to fall 2018 in SHS freshman level IT and Manufacturing courses.
- (4) An increase in the number of students who participate in industry engagement experiences such as guest speakers, industry tours, industry-led projects and job shadowing opportunities.

The project evaluation was conducted by Mr. Frank Shimerdla. The evaluation included a variety of strategies to collect quantitative and qualitative data to determine the extent to which the project met these outcomes. Instruments used in the evaluation include pre- and post-surveys administered at the beginning and completion of each course section, interviews with teachers, enrollment data from the middle and high school, regular meetings with staff to understand the processes being used, and other strategies as well.

The enclosed report outlines Aulick Industries' progress toward the attainment of these goals. The Report is structured according to each of the four objectives and includes within each section the data and findings relating to that objective.

Results/Findings

Objective 1: An increase in students' interest in IT and Manufacturing careers and/or study, as measured through a pre- and post-survey of students.

To measure changes in students’ excitement for manufacturing, IT and health careers, the project utilized a pre- and post-test administered at the beginning of each course section and again at the completion of the course. Relative to Goal 1, the test included two statements which sought to measure (a) knowledge of jobs or careers in the IT, Manufacturing and health fields and (b) students’ interest in these industries as a potential destination for careers. The survey that was used included a five-point Likert-scale with five potential responses ranging from “Strongly Agree” to “Strongly Disagree” for each of the statements.

The enclosed tables detail student responses within the three industry areas addressed through the coursework. It should be noted that Bluffs Middle School’s academic year is comprised of four academic quarters. Quarter one began in August and ran through October; Quarter Two ran from October to December; Quarter Three from January through March and Quarter Four from March to May.

Relative to raising “awareness,” the project had a largely positive affect. As shown in the enclosed table, weighted averages increased across all three industry areas. The following section described the results relative to each of the three industry areas.

Table 1: Manufacturing, IT and Health Career Awareness

STATEMENT: I HAVE A STRONG KNOWLEDGE OF JOBS OR CAREERS IN THE <MANUFACTURING>, <IT> OR <HEALTH> FIELDS												
Course	STRONGLY AGREE		AGREE		DON’T KNOW		DISAGREE		STRONGLY DISAGREE		WEIGHTED AVERAGE	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Manufacturing	3.91%	10.71%	39.84%	42.86%	42.19%	33.33%	9.38%	8.33%	4.69%	4.76%	3.29	3.46
Information Tech.	3.31%	14.71%	35.76%	45.59%	34.44%	22.06%	17.88%	13.24%	8.61%	4.41%	3.07	3.53
Medical Detectives	7.56%	8.51%	44.54%	41.49%	27.73%	35.11%	17.65%	10.64%	2.52%	4.26%	3.37	3.39

In manufacturing this included an increase from a weighted average of 3.29 to 3.46. Looking more closely at the data, the percentage of students who “strongly agreed” with having a “*strong knowledge of knowledge of jobs or careers in the manufacturing field*” increased from 3.91% to 10.71%. Likewise, the percentage of students who “agreed” with having a “*strong knowledge of knowledge of jobs or careers in the manufacturing field*” increased from 39.84% to 42.86%. The percentage of students who responded affirmatively to the statement (i.e., either “Strongly Agreed” or “Agreed”) collectively increased from 43.75% to 53.57%.

These increases would suggest that project is certainly having the intended impact with regard to increasing awareness of manufacturing careers among students. In terms of negative impacts, the percentage of students who either “disagreed” or “strongly disagreed” with the statement decreased only slightly from 14.07% to 13.09%. It should be noted then that the greatest shifts occurred in the percentage of students who moved from not knowing (i.e., responding “don’t know”) to agreeing or strongly agreeing with having a greater awareness of manufacturing careers as a result of the project. In fact, the percentage of student who responded “don’t know” decreased from 42.19% to 33.33%.

In the field of **Information Technology** (as also shown in the enclosed table), the weighted average of the responses increased dramatically from 3.07 to 3.53. This average was especially boosted by the

percentage of students whose awareness of IT careers increased per their responses on the pre- and post-survey. The percentage of responses that “strongly agreed” with having a “*strong knowledge of knowledge of jobs or careers in the information technology field*” increased from 3.31% to 14.71% and the percentage of responses that “agreed” with the statement rose from 35.76% in the pre-test to 45.59% in the post-test. Looking specifically at positive responses relative to career awareness of IT, the overall percentage of students who “strongly agreed” or “agreed” with the statement increased from 39.07% to 60.30%, a remarkable increase. Given the large percentage of students who reported having a strong awareness of careers in IT, it is not surprising that there were reductions across the three remaining categories of responses.

In the field of health, student awareness of health careers generated mixed results. The weighted average of responses increased slightly between the pre- and post-survey, from 3.37 to 3.39. While there was an increase in the percentage of students who responded “strongly agree” to the statement of increased awareness (from 7.56% to 8.51%) the percentage of students who responded positively collectively when using both “Strongly Agreed” and “Agreed” responses declined from 52.10% to 50.00% while the percentage of students who didn’t know if they had a strong knowledge of careers in the health field increased from 27.73% to 35.11%. It should be noted, however, that the percentage of students who either “disagreed” or “strongly disagreed” with having a strong knowledge decreased from 20.17% to 14.9%.

One of the more prevalent themes during post-program interviews with teachers was the challenges related to the implementation of the new curricula. While they all were extremely positive toward the curriculum and the initial training, the teachers did acknowledge challenges during the school year – particularly early in the school year – in the new curriculum. These challenges are not unique to Project Lead the Way or Scottsbluff but is common with the adoption of any instructional approach. This is an area that might be monitored in future sections of the course to determine whether the trends are maintained and, if this is the case, to inform program modifications.

Table 2: Manufacturing, IT and Health Career Interest

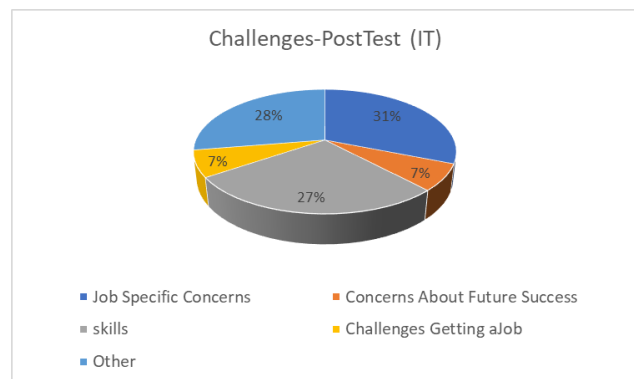
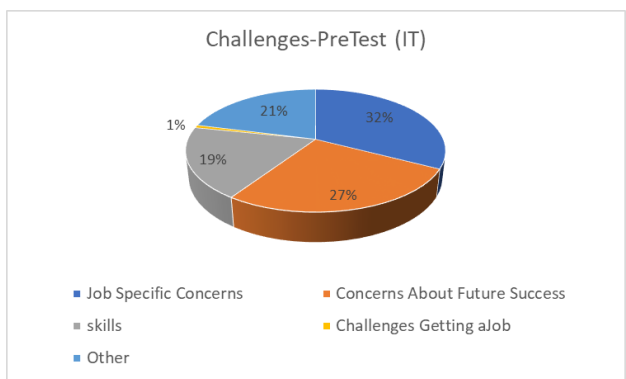
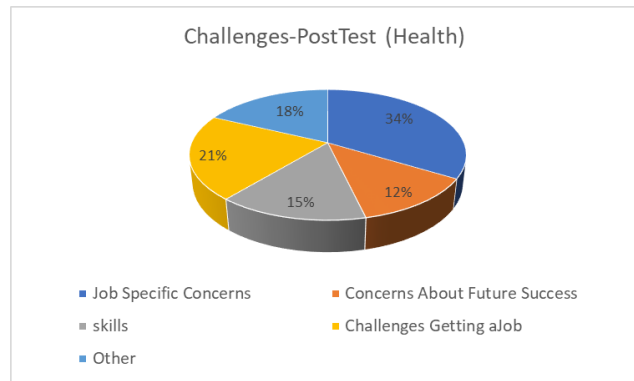
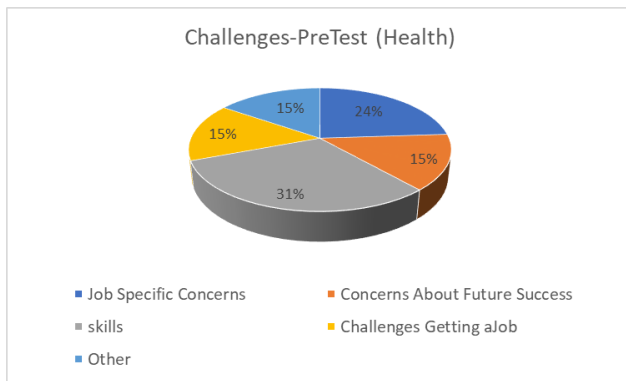
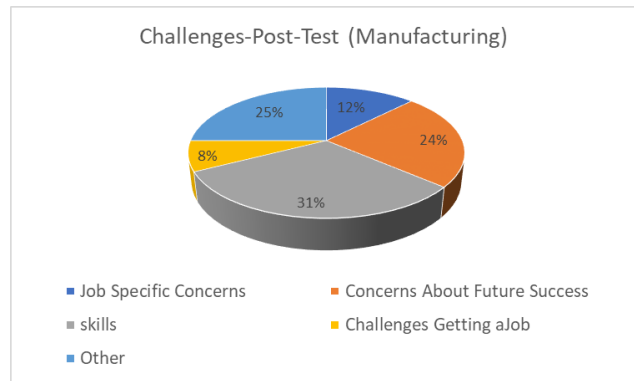
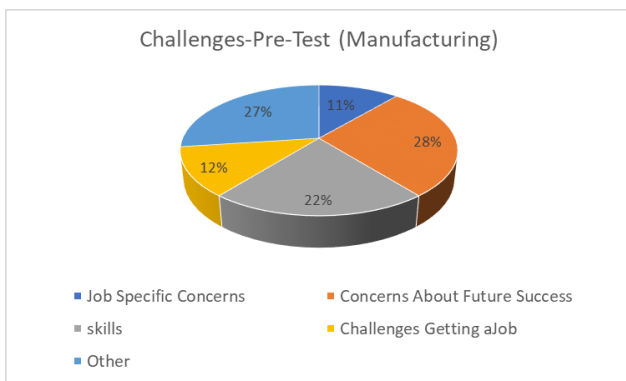
STATEMENT: I AM INTERESTED IN A <MANUFACTURING>, <IT> OR <HEALTH> JOB WHEN I AM OLDER.												
Course	STRONGLY AGREE		AGREE		DON'T KNOW		DISAGREE		STRONGLY DISAGREE		WEIGHTED AVERAGE	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Manufacturing	6.45%	7.06%	29.03%	21.18%	34.68%	37.65%	18.55%	17.65%	11.29%	16.47%	3.01	2.85
Information Tech.	5.96%	8.82%	11.92%	10.29%	37.09%	44.12%	27.15%	17.65%	17.88%	19.12%	2.61	2.72
Medical Detectives	15.97%	11.70%	22.69%	15.96%	36.97%	35.11%	15.97%	21.28%	8.40%	15.96%	3.22	2.86

As shown in the enclosed table, of the three career focus areas, only Information Technology experienced an increased percentage of students indicating an interest in the field as a career, where the weighted average of responses increased from 2.61 to 2.72, from the pre-survey to the post-survey. In the areas of manufacturing and health, the weighted averages decreased from 3.01 to 2.85 and from 3.22 to 2.86 respectively. These results suggest that the program may not be attracting increasing percentages of students to the career areas of manufacturing and health despite an increased awareness of jobs in these fields (as documented in the previous section of this report).

However, as the report has also noted, there were challenges in “launching” the curriculum during Year 1. These challenges are, again, to be anticipated. Monitoring of “interest” data, even in select sections of each course, for the 2018-19 year and beyond might yield results that show positive trends in these career

areas. It should be further mentioned that Scottsbluff Public Schools – like most educational agencies – seeks to prepare students for careers and college that align *to their specific interests and talents*. SBPS’ commitment is perhaps most evidenced by its restructuring of the high school to accommodate a wall-to-wall career academy model. Thus, while students may not indicate a particular interest in manufacturing, IT or health careers through the project, an unintended positive impact may be that the program is directing students to career academy areas during their secondary studies that are more suited to their interests and talents.

Further insight into students’ interest in health, IT or manufacturing careers, or lack thereof, can potentially be found in the students’ responses to an open-ended question regarding their biggest perceived challenge in entering these fields. As part of the evaluation, the responses were categorized into one of five theme areas, which included (1) **Job-Specific Concerns** (e.g., don’t like blood, working with sick people, have a hard time with computers, wiring, etc.); (2) **Concerns About Future Success** (e.g., misdiagnoses, passing coursework, acquiring the necessary knowledge, etc.); (3) **Skills** (e.g., working with others, math, problem solving); (4) **Challenge of Getting a Job** (e.g., schooling required, cost of education/training, making enough money) and (5) **Other** (e.g., don’t know, no answer, nonsensical answer, etc.).



In assessing the results from the open-ended survey, it is important to keep in mind that the project addresses three very unique career fields and this fact is represented by the specific challenges cited by students within their responses to this open-ended survey question. In looking at the responses within each field, some noteworthy trends emerge. For instance, in the area of manufacturing there was a marked increase in the percentage of students who noted that specific skills are a challenge, from 22% in the pre-survey to 31% in the post-survey. Looking more closely at the “skills” data, a large percentage of the responses, in both the pre-and post-survey, included working with others. In looking at data from students in the “Medical Detectives” course, concerns regarding skills reduced dramatically from the pre- to the post-survey, from 31% to 15%. However, the percentage of responses that involved job-specific skills increased from 24% to 34% and included such concerns as giving shots, the sight of blood, surgery, and having someone’s life in the students’ hands. In the area of Information technology, most prominent in the results between the pre-survey and the post-survey was the significant decrease in the percentage of students who included “Concerns about Future Success” as a challenge. From the pre-survey, it is apparent that there were a significant percentage of students who were concerned about learning the content and passing the course, suggesting that Information Technology may be an imposing field for a student. This only confirms the need for IT courses such as this, especially at the middle school level where students are beginning to explore and make choices regarding careers.

At the completion of the project, PLTW teachers were interviewed one-on-one to obtain additional insights into the project. All of the teachers shared positive feedback on the project. Among the most prominent of this feedback was the project’s embrace of hands-on learning. All three of the teachers interviewed stated that the project did a good job of engaging students in the learning. However, they also noted that the curriculum was more challenging for students than the previous curricula. The rigor seemingly did a good job of engaging those students who were more interested in the subject matter and was more challenging to those students were less engaged. One teacher felt the PLTW curriculum could do more around differentiation, i.e., better meeting students where they are at.

It is recommended that BMS continue to monitor all of the PLTW courses piloted through the NDYTI project during future school years to determine if awareness and interest, in particular, increase as teachers become more comfortable with the curriculum.

Objective 2: Increased enrollment from fall 2017 to fall 2018 in the BMS Career Explorations course as well as the four PLTW courses.

Course enrollments from the 2017-18 and 2018-19 school year are detailed in the enclosed table. It should be noted that the timing of course offerings vary from year-to-year. As shown in the enclosed tables, there were a total of 382 students served through the four PLTW courses piloted through the NDYTI grant.

Table 3: Course Enrollments (2017-18)

2017-2018	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Total
Medical Detectives	25	24	22	30	101
Computer Science	39	41	39	41	160
Automation & Robotics (mfg)	-	24	-	56	80
Design & Modeling (mfg)	-	17	24	-	41
Total	64	106	85	127	382

Table 4: Course Enrollments (2018-19)

2018-2019	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Total
Medical Detectives	-	-	49	75	124
Computer Science	38	19	13	14	84
Automation & Robotics (mfg)	-	73	-	69	142
Design & Modeling (mfg)	-	28	-	30	58
Total	38	120	62	188	408

It should be mentioned that student registration for the 2018-19 year is ongoing and will not be finalized until August. Hence, it is likely that enrollment in the courses will increase. Using the data that are available, there are currently 408 students registered for the 2018-19 year, which represents an increase of 6.8% from 2017-18. These are encouraging data that confirm the project’s sustainability and growth. Of course, overall impact will continue to hinge on whether the courses are increasing student awareness and interest in these career fields. As enrollments increase, awareness and interest should continue to be monitored.

Likewise, looking at data for the Fall 2017-18 and Fall 2018-19 quarters, the Middle School experienced an increase in its Career Explorations Course, from 160 students in 2017-18 to a registered 185 for the upcoming Fall 2018-19 quarter. The Career Explorations Course is a precursor to the PLTW courses and has the potential to play a key role in attracting more students into these courses. Increases in enrollment suggest a potential increase in PLTW courses in future years and should continue to be monitored with PLTW courses enrollments. Also, as discussed later in this report, the Career Explorations Course entails a strong industry involvement component (i.e., guest speakers, field trips, etc.). Continuing to invite and coordinate speakers within the IT, Health and Manufacturing fields is an excellent strategy to heighten student awareness of the fields and potentially incite interest in the newly adopted PLTW courses.

Objective 3: Increased enrollment from fall 2017 to fall 2018 in SHS freshman level IT and Manufacturing courses.

One of the key outcomes of the Scottsbluff NDYTI grant project is increasing the number of students who matriculate into IT and manufacturing courses in grade 9, which demonstrates both interests and continued engagement in these targeted career pathways. The enclosed table shows fall enrollment in freshman level IT and

manufacturing courses from 2017-18 to 2018-19. It should be noted that enrollment for the Fall 2018 semester is still in process and the numbers here will very likely increase prior to the start of the school year.

Table 4: SHS Freshman Level IT & Manufacturing Enrollment

Course	2017-18	2018-19
Intro to Built Environment	69	61
Intro to Engineering Design	43	16
Principles of Engineering	22	16
Computer Aided Drafting	77	41
Information Technology Applications	26	22

While the enclosed table shows decreases in enrollment, only official enrollment data should be used to determine whether the project is having an impact on increasing enrollment in freshman-level, and beyond, IT and manufacturing coursework. Scottsbluff Senior High School (SHS) recently made the dramatic shift to a wall-to-wall academy model in its educational structure. Each student who attends

SHS enrolls in an academy which entails a continuum of curricula and experiences to strengthen preparation for careers in their stated career academy area. The Wall-to-Wall Career Academy Model includes six career academies as identified by the Nebraska Career Education Model, and each Academy includes multiple career pathways. This includes Agriculture, Food and Natural Resources; Business, Marketing and Management; Communications, Arts, and Technology; Health Sciences; Human Sciences and Education; and Skilled and Technical Sciences. Further, it should also be noted that SHS also has adopted Project Lead the Way Coursework in STEM, which provides additional alignment with the middle school in terms of forging a powerful career pathway in IT and Manufacturing. As the project encourages more students into these areas, there is great potential for attracting and preparing students for careers in these high-growth, high-demand fields.

It is recommended that enrollment in these courses continue to be monitored each fall once enrollments are finalized to determine to what extent the project is increasing enrollments (or not). Further, this should include monitoring over several years as it would be expected that enrollments would increase incrementally as the project gains a stronger foothold in the middle school.

Objective 4: (4) An increase in the number of students who participate in industry engagement experiences such as guest speakers, industry tours, industry-led projects and job shadowing opportunities.

A complementary objective of Scottsbluff's NDYTI grant was to increasingly involve industry within these classes to expand student knowledge and exposure to Health, IT and Manufacturing careers. As new courses, the data collected during 2017-18 will serve as a baseline in measuring industry involvement in future years.

For the most recent year, there were a minimum of 14 engagements between the three PLTW courses and an additional eight engagements within the Career Explorations course. In the Medical Detectives course there were a total of five "engagements," which entailed guest speaking by Wendy Wells, BS, BSN, MSN, and RN, who walked the students through a process of testing the cranial nerves and the importance of this process. Ms. Wells is very accomplished within the nursing field, serving as an instructor at the UNMC and as an advisor for the Student Nurses Association Sigma Theta Tau, among others. Ms. Wells "credibility" were well received by the students who "loved having a different teacher as a guest speaker," according to the Medical Detectives teacher. In the Computer Science course, there were a total of eight guest speakers over the course of the year and the focus of these talks were around IT careers. The manufacturing class included a one guest speaker, a local engineer, and the Career Explorations course, which serves as a precursor for the PLTW courses, included eight guest speakers.

Summary and Recommendations

Scottsbluff Public Schools District has initiated several dramatic reforms in recent years to strengthen students' readiness for college and for careers, especially in the region's high-growth, high-demand career fields. As part of this district- and community-wide approach, SBPS has engaged several businesses throughout the community to expand school-business partnerships and the NDYTI Project is a result, and an extension, of this effort. Scottsbluff Public Schools, Aulick Industries, and all community and industry partners who are supporting these reforms should be commended.

The NDYTI Project as described throughout this report has embraced the District's and community's focus around education, economic development and workforce development. The impact of this initiative will not be apparent for many years – when the students currently within the program complete high school and make decision regarding their postsecondary and/or career plans. Therefore, the results included herein are interim results that do not necessarily reflect the full impact of the project. Further, given the dramatic shifts occurring within the classroom, additional time is needed for teachers to increase their comfort given the new content and curricula.

With particular pertinence to the NDYTI Project, the following recommendations are provided as potential considerations as grant funding expires:

- 1) Continued monitoring of enrollment data is necessary to determine to what extent the project is increasing enrollment in these career pathways. This should include annual analysis looking at enrollments within the specific career fields and may include the participation of females, low-income students and other populations of students given the underrepresentation of populations within STEM occupations.
- 2) Student engagement in the NDYTI courses might also be monitored. This would not need to include a survey, such as that used in the NDYTI external evaluation, but may be as informal as one-on-one interactions between teachers and students. These conversations could drive minor reforms in the classroom to promote programmatic improvements.
- 3) Consistent with the project's goals, as the project ensues and teachers gain additional confidence, the further expansion of industry engagements (speakers, field trips, etc.) would serve to increase exposure and provide additional context to the learning.
- 4) In post-program interviews with teachers, a common theme was the challenge of teaching a new curriculum (and in two cases, new content) and all of the teachers cited a desire for additional assistance/training in PLTW. While Districts face increasing budget constraints, additional support for teachers should be considered, and these challenges should be accounted for in the adoption of new PLTW courses.