

## **Introduction and Need**

Minnesota is waking up to the reality that a World’s Best Workforce is going to need a diverse workforce in multiple types of technically high skilled careers. In Northwest MN alone over 9,000 new such jobs are expected to open between 2010 and 2020. *See Appendix A.*

For the past decade Minnesota has focused exclusively on academic skills with the Minnesota Academic Standards, and has seriously underinvested in secondary technical-vocational awareness and training. As a result, students do not have sufficient awareness of clean manufacturing and in-demand high-tech careers to make informed career and college plans, despite Minnesota’s workforce needs.

It is the intent of this Rural STEM Pilot to test the effectiveness of experiential learning with the tools of the 21<sup>st</sup> century imbedded in career-oriented units to increase students’ awareness of these new careers, assess their interest and aptitude through experiential hands-on learning, and provide pathways for students to pursue their interests in these careers and ultimately to well-paying middle-class jobs in these careers.

Due to the smallness in scale and geographic dispersion of the typical Minnesota rural high school, schools need to come together in cooperatives to advance an initiative such as this and need state investment for most of the significant front end costs of such a pilot.

Two groups of rural schools have had sufficient conversation regarding this model to organize this pilot. Two superintendents, Warren Schmidt of Rothsay in West Central MN and Ron Bratlie of Cromwell-Wright in NE MN, have been spearheading this effort.

This pilot is based on the experiences received by students in North Dakota in similar cooperatives with state funding by the State of North Dakota. One Minnesota school district, Campbell-Tintah, has been participating in the SE North Dakota consortium with great success. Campbell-Tintah has presented this program at the MSBA Annual Conference.

The pilot proposal is conceptual at this time, and no final decisions have been made by the respective consortiums or school districts.

## **Program Definition**

This pilot will provide hands-on, experiential learning for high school students with eight foundational tools of clean manufacturing and other high in-demand jobs of the 21<sup>st</sup> century economy. This pilot will include curriculum development, articulation with post-secondary degree and certification programs, outreach to local industries for job shadowing and other career exploration experiences in the uses of these tools, and a robust evaluation of this pilot.

## **Participation**

High school students from up to 16 rural high schools from the North Dakota to Wisconsin borders are expected to participate in this program. Thirteen schools (*see list on page 9*) have already expressed a strong interest and will be among the 16 schools. Each school will offer curriculum units centered on these high tech tools on a rotating basis over a two-year period. Students can experience all eight tools throughout their junior and senior high years or can be selective in their participation.

## **Expected Student and Workforce Outcomes**

- Between 320 and 1280 high school students will experience between 2 and 8 of these high tech tools over a four-year period from 2015-2020 in this pilot.
- 67% or more (850 or more) of these students will pursue post-secondary or industry training in a career field related to the tools.
- 33% or more (420 or more) of these students will be employed in a high demand field related to these tools within 4 years from the beginning of the program.

These outcomes will be duplicated in each subsequent two-year cycle. SLEDS will be used to measure these outcomes. Each school will write site-specific objectives.

See page 4 for a list of the modules, the high-demand STEM fields directly affected by student participation in this pilot project, and median annual salaries.

## **Program Implementation**

Each school will receive one unit each quarter. All the tools will be rotated among eight schools over a two-year period. The students in each school in that year will be able to participate in up to four units per year, eight in two years.

Two schools, Rothsay and Cromwell-Wright, have offered to be responsible for the housing and transportation of these tools across their respective consortia. Final decisions regarding this will be a made by each consortia following legislative action. Lakes Country Service Cooperative will serve as the fiscal host for this pilot.

As part of this pilot, each consortium of eight school districts will collaboratively develop, schedule and share units learning these 8 sets of tools. Much of this work may already exist within these consortia, but the consortia will take a much more cohesive and region-wide approach to career awareness, experiential learning, and industry experiences as a result of this pilot.

**Budget**

The pilot project budget is based on the up to 16 school districts taking responsibility for all on-going and replacement costs over the five years of the pilot and keeping those responsibilities for the life of the project including equipment replacement costs and adding new units such as drone technology. The consortia will determine the exact allocation of these costs. The state’s investment is the one-time start up for equipment purchase, evaluation, and initial training.

<b>MREA STEM Pilot Project for up to 16 Rural Schools Coordinated by Lakes Service Cooperative</b>		
<b>Expenditures</b>	<b>One-Time/First Year</b>	<b>Annual</b>
Equipment	\$550,000	
Evaluation	\$15,000	
Curriculum Development/Training	\$30,000	
Maintenance of Equipment		\$4,000
Scheduled equipment replacement 8 year cycle		\$72,000
On-going training, new teacher orientation		\$4,000
Staff Support X2 (Driver, mileage, admin assist, professional coordination)	\$18,000	\$18,000
Indirect Cost 6%	\$36,780	\$5,880
<b>Totals</b>	<b>\$649,780</b>	<b>\$103,880</b>
subtotal without 6% indirect costs	\$613,000	\$98,000
<b>Revenue</b>	<b>One-Time/First Year</b>	<b>Annual</b>
State	\$570,000	
16 School Districts @ estimated \$5,000 each	\$80,000	
16 School Districts @ estimated \$6,500 each		\$104,000
<b>Totals over the five years of the Pilot Project</b>	<b>\$650,000</b>	<b>\$416,000</b>
<b>Grand Total Pilot Investment</b>		<b>\$1,066,000</b>
<b>State One-time Investment</b>	<b>\$570,000</b>	<b>53%</b>
<b>16 School Districts</b>	<b>\$496,000</b>	<b>47%</b>
<b>Total</b>	<b>\$1,066,000</b>	<b>100%</b>

Each participating school district is expected to contribute \$5,000 in the first year of the project and \$6,500 each year thereafter. Lakes Country Service Coop will be the fiscal host.

## Program Start

The pilot program will begin in the 2015-2016 school year.

## Example of High Tech Modules, Descriptions and Related High Tech In-Demand Occupations (Final Decisions will be made by each Consortium of 8 Districts)

- **Bio/Tech/DNA    Medical Secretaries, Licensed Practical & Licensed Vocational Nurses, Dental Assistants, Medical & Health Services Managers, Physical Therapists, Dental Hygienists**

**Median Salary: \$65,393**

### Description

This unit addresses micro pipetting, transformation of cells with DNA, DNA fingerprinting, electrophoresis and plasmid mapping.

### Areas of Impact/primary use:

Science, Biology, Ag and Health

- **GPS            Heavy & Tractor-Trailer Truck Drivers, Industrial Truck & Tractor Operators, Drafters, Engineering Technicians, & Mapping Technicians, Construction Managers, First-Line Supervisors of Transportation**

**Median Salary \$39,826**

### Description

Provides understanding in Global Positioning System, data points, and building Geographic Information System

### Areas of Impact/primary use:

Ag, Math, Geometry, Geography

- **Laser            Machinists, Computer-Controlled Machine Tool Operators**

**Median Salary \$39,826**

### Description

Includes accessories for demonstrating the principles of optics in a basic course of physics or physical science.

Areas of impact/primary use

Physics, Physical Science, Math

- **Plastic Molding** **Machinists, Computer-Controlled Machine Tool Operators**

**Median Salary \$39,826**

Description

Imagine capturing an idea with your CAD program, then holding a functional model of it in a few hours later.

Areas of impact/Primary use

Pre-Engineering, Math, Tech Ed

- **Robotics** **Welders, Cutters, Solderers & Brazers, Computer-Controlled Machine Tool Operators, Mobile Heavy Equipment Mechanics, Electrical, Industrial, Civil & Mechanical Engineers**

**Median Salary \$44,678**

Description

Training in the programming and operation of industrial robots. Students learn to create automated work cells.

Areas of Impact/Primary use

Physical Science, Math, Tech. Ed.

- **Vertical Mill** **Machinists, Welders, Cutters, Solderers & Brazers, Computer-Controlled Machine Tool Operators, Mobile Heavy Equipment Mechanics, Electrical, Industrial, Civil & Mechanical Engineers**

**Median Salary \$44,678**

Description

Provides training in computer-aided design (CAS), computer-aided manufacturing (CAM), and computer numerically controlled (CN) milling.

Areas of Impact/Primary use

Tech Ed, Math, Ag

- Vinyl Cutter      **Computer-Controlled Machine Tool Operators**

**Median Salary \$39,826**

Description

Everything you need to create professional-grade graphics and signs right on your desktop.

Areas of Impact/Primary use

Tech Ed, Math, Business/Computer

- **Welding Simulator      Welders, Cutters, Solderers & Brazers, Mobile Heavy Equipment Mechanics, Team Assemblers, Plumbers, Pipefitters & Steamfitters, Industrial Machinery Mechanics, Automotive Body & Related Repairers**

**Median Salary \$39,826**

Description

The student practices welding in a virtual environment, including a simulated welding booth and field welding applications.

Area of impact/Primary use

Ag, Math, Tech Ed.

**Example of Equipment**

*(Final Decisions will be made by each consortium)*

**Two Classrooms of Each Type of Equipment—One set per Consortia**

**Bio/Tech**

2	Balance
2	Water Bath
2	Hot Plate
2	Centrifuge
48	100 ml Beakers
48	60 ml Beakers
4	Electrophoresis Apparatus
40	Mortar Pastels
48	50 ml Graduates
12	1000 ml Stock Bottles
8	Transformers
48	Thermometers
48	Gel Packs
8	Light Tables

**Total Cost**

**\$18,000**



Voice For Greater Minnesota Education

- 2 Instructor Manuals
- 4 Books on Exploring with fast plants
- 2 Instructor manuals
- 36 Student Manuals

**GPS**

- 2 Garmin DVD
- 40 GPS Units
- 80 Rechargeable Batteries
- 8 Battery Chargers

**Total Cost \$12,000**

- 40 GPS Training manuals
- 40 GPS Unit Manuals w. C.D.
- 40 USB Cables

**Laser**

- 4 Lasers (Full Spec – 60W)

**Total Cost \$38,000**

- 40 Student Manuals
- 2 Teacher Manuals

**Plastic Molding**

- 6 3-D printers (DAVinci)

**Total Cost \$12,000**

- 40 Student Manuals
- 2 Teacher Manuals

**Robotics**

- 10 Lab Volts (Texan Genesis 150)

**Total Cost \$32,500**

- 40 Student Manuals
- 2 Teacher Manuals

**Vertical Mill**

- 4 mills (Bolton Tools 10" by 48")
- 4 mill bags
- 2 Techno Router
- 2 Router tool kit
- 6 Interface cords
- 20 computers
- 20 monitors
- 20 keyboards
- 20 mice



Voice For Greater Minnesota Education

Rural STEM Experiential Learning Pilot Project
"Put 21st Century Tools in Kids' Hands!"
SF 471, Chief Author Saxhaug | HF 555, Chief Author Backer

Table with 2 columns: Item description and Total Cost. Items include router dust collector, Master CAM Software Keys, Power Cords, Mouse pads, Student Manuals, Intr. To Art Manuals, and Intro to CNC Manuals. Total Cost: \$85,000.

Vinyl Cutter

Table with 2 columns: Item description and Total Cost. Items include Vinyl Cutter machines, computers, keyboards, mice, power cords, mice pads, USB cords, and T-Shirt Press. Total Cost: \$35,000.

Table with 2 columns: Item description and Total Cost. Items include 10BN - Manuals, Graphic Production Manuals, Applying Vinyl DVD, Pen jig, and Rotary Fixture.

Welding Simulator

Table with 2 columns: Item description and Total Cost. Items include Welding Simulators, student manuals, and teacher manuals. Total Cost: \$188,000.

Additional Costs

Table with 2 columns: Item description and Total Cost. Items include Trucks to move equipment, Books and Curriculum materials, Storage containers, and Miscellaneous. Total Cost: \$550,000.





Voice For Greater Minnesota Education

**School Districts Expressing a Strong Interest in Participating as of Feb 9, 2015:**

ISD #	District Name	K-12 ADM
West Central MN Consortium members as of Feb. 9, 2015		
261	Ashby	252
864	Breckenridge	701
2164	Dilworth-Glyndon-Felton	1,473
150	Hawley	922
2889	Lake Park-Audubon	629
850	Rothsay	258
Northeast/East Central Consortium members as of Feb 9, 2015		
91	Barnum	796
93	Carlton	456
95	Cromwell-Wright	323
99	Esko	1,239
381	Lake Superior	1,374
97	Moose Lake	646
100	Wrenshall	324

## STEM Employment Outlook – Northwest Minnesota

December 2014

Table 1. STEM Occupations requiring a High School diploma, Northwest Minnesota

Title	2010 Employment	Percent Change 2010-2020	Total New Hires 2010-2020	Median Salary 2014
Heavy and Tractor-Trailer Truck Drivers	4,296	27.1%	2,020	\$35,893
Carpenters	2,596	25%	1,200	\$35,417
Team Assemblers	1,772	20.6%	710	\$32,010
Welders, Cutters, Solderers, and Brazers	1,119	28.5%	620	\$34,731
Electricians	975	36.6	620	\$45,703
Machinists	967	26.7%	440	\$38,024
Plumbers, Pipefitters, and Steamfitters	572	39.5%	390	\$36,904
Computer-Controlled Machine Tool Operators, Metal	464	41.8%	280	\$32,104
Cement Masons and Concrete Finishers	472	40.3%	270	\$36,323
Bus and Truck Mechanics and Diesel Engine Specialists	644	19.6%	270	\$45,489
Electrical Power-Line Installers and Repairers	518	15.8	260	\$71,506
Industrial Machinery Mechanics	487	34.3	260	\$45,909
Industrial Truck and Tractor Operators	618	10.2%	240	\$34,283
Medical Secretaries	410	28%	180	\$32,830
Telecommunications Line Installers and Repairers	280	33.9%	150	\$35,149
Mobile Heavy Equipment Mechanics, Except Engines	261	24.1%	130	\$45,243
Production, Planning, and Expediting Clerks	299	16.4%	130	\$36,925
Automotive Body and Related Repairers	299	15.7%	120	\$38,499
<b>Total</b>	<b>12,753</b>	<b>26.4%</b>	<b>6,270</b>	<b>\$39,826</b>

**APPENDIX A:**

**Table 2. STEM Occupations requiring Post-Secondary Education, Northwest Minnesota**

<b>Title</b>	<b>2010 Employment</b>	<b>Percent Change 2010-2020</b>	<b>Total New Hires 2010-2020</b>	<b>Median Salary 2014</b>
Licensed Practical and Licensed Vocational Nurses	3,019	22.2%	1,470	\$36,776
Electrical, Industrial, Civil and Mechanical Engineers	1,245	15.2%	490	\$69,056
Drafters, Engineering Technicians, and Mapping Tec	1,466	12.2%	460	\$44,678
Dental Assistants	538	18.2%	210	\$37,476
Medical and Health Services Managers	481	18.9%	210	\$83,624
Physical Therapists	360	41.9%	190	\$77,536
Computer User Support Specialists	458	8.1%	160	\$47,864
Construction Managers	503	24.1%	150	\$78,684
Dental Hygienists	345	24.3%	150	\$66,138
Industrial Production Managers	288	26.4%	150	\$77,247
Network and Computer Systems Administrators	399	21.1%	150	\$53,352
First-Line Supervisors of Transportation and Mater	404	14.4%	140	\$45,910
Industrial Engineering Technicians	292	15.8%	110	\$51,061
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	388	5.9%	110	\$84,801
Computer Systems Analysts	221	14.5%	70	\$80,482
Software Developers, Applications	267	13.9%	70	\$91,813
Computer Programmers	151	6.0%	50	\$56,565
<b>Total</b>	<b>7,806</b>	<b>16.8%</b>	<b>2,870</b>	<b>\$65,393</b>
<i>Source: DEED Employment Outlook (Projections), Northwest Minnesota 2010-2020</i>				

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