Designing Technology Education Curriculum Based Upon Manufacturing/Industries Requirements

by

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ABSTRACT

The purpose of this study is to collect and analyze data from industry in Manitowoc County, primarily the city of Manitowoc, to identify the skills, knowledge, attitudes and attributes that are needed for an employee to be successful in a career in manufacturing technology. A survey was developed and distributed to the employees of selected companies in the fall of 2008. The information was then collected to assist in determining the types of content change needed in the MPSD manufacturing curriculum.

The objectives of the study are to identify the skills, attitudes and knowledge that are determined to be important in manufacturing career fields. This survey contains a description of the basic employability and technical skills and rates the importance of each skill of an entry level employee. The data collected and analyzed will determine the employability and technical skills necessary to modify and improve the Manitowoc Public School Districts Career and Technical Education curriculum.

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Chapter I: Introduction

Preparing students for a career after a secondary school education has long been the task of a public school districts education mission statement. In each state, county, town and school district, manufacturing industry employability skills vary. The city of Manitowoc in Manitowoc County is located in northeastern Wisconsin. The Manitowoc Public School District (MPSD) includes the entire City of Manitowoc and some of the bordering rural area, a total of 93 square miles. The district has the 25th largest enrollment among the 426 public school districts in the state. The 2007 third-Friday-in-September enrollment count was 5,629. The MPSD has a 21% minority enrollment, of which 11.2% are Asian (primarily Hmong) and 6.5% are Hispanic. Manitowoc County has industries in agriculture, industrial manufacturing, and tourism. By asking manufacturing employers and employees how best to educate a student population, is essential for providing the best, most relevant, applicable education possible while maximizing the potential of both industry and public education (Garmire, 2006).

Technology education is important for every person in a civilized nation such as the United States. Technology Education (TE) is a study of technology, which provides an opportunity for students to learn about the processes and knowledge related to technology. As a study, technology education covers the human ability to shape and change the physical world we live in, by manipulating materials with tools and techniques. One of the goals of education is to develop the knowledge and techniques required to develop technological literacy which is accomplished by bringing real world laboratory activities to students (Moye, 2007).

Innovative technology education is not a substitute for the core academic curriculum but rather an enhancement of education. A student that receives an education in technology

education also receives an education in math, science, social sciences, history and critical thinking. The term "technology education" is frequently shortened to "tech ed".

Technology Education (TE) is a key component to change the industrial/manufacturing base of a country. No country can bring about an economic revolution unless its citizens rise to meet technology literacy (Burk, 1995). Technology education makes the citizens of a country realize that his/her goals and aspirations are attainable (Today and Tomorrow, 1991). Students want to succeed and obtain a goal in some form whether it is in sports, academia, or a career. Technology education can help the student earn and achieve that dream/goal.

Throughout the decades derogatory names have been associated with technology education, some of them light-hearted, such as a grease-monkey or a Bob the Builder (Ireland, 2006). For years these programs were known as vocational education, but through at college education and the forward thinking of universities, the technical education career field has become viewed with more respect. Technical schools which focus on the trades such as HVAC (heating, ventilation and air-conditioning), electrical wiring (residential and commercial), automotive repair, automotive servicing, and construction were seen as having less value then the core academic subjects causing the placement of low achieving students in these programs. "I think that the perception did exist, and it may exist still in some parts of the country," as quoted by Alisha Hyslop assistant director of public policy at the Association for Career and Technical Education (Hyslop, 2007). Parents and school guidance counselors still push for all students to get a degree from a four year college. Manitowoc Public School District has daily announcements at the high school level on four-year college applications, yet very little is said about a technical school.

Attracting and retaining skilled and qualified workers is one of the largest problems facing industrial manufacturing. The lack of a skilled labor force can be credited to many factors, including the absence of educational training to enter a skilled trade (Technology Literacy, 2006). According to the United States Bureau of Labor Statistics, 18 of the 20 fastest growing occupations within the next decade will require a technical education (Bureau of Labor Statistics, 2006).

The Department of Labor has estimated a shortage of 104,000 total job's in the area of HVAC alone (Department of Labor Statistics, 2006). This shortage may be directly related to the lack of education related training programs, and reinforcement training once an employee is hired.

Technology has changed dramatically over the last decade requiring manufacturing employee's to have exemplary attendance, and operate sophisticated machinery including robotics and computer logistics programs (Technology and Attendance, 2006). The health care field has highly technical diagnostic machines and construction workers use digital tools for measuring, landscaping, erosion control, residential and commercial construction. In other words the American worker must adapt with technology to stay current and be a valuable asset to the manufacturing employer (Georgia Manufacturers Survey, 1996).

Manufacturing skill development often requires both a broad-base of knowledge of various industries, in addition to in-depth knowledge of a particular industry. This combination of learning, is extremely time consuming and hard to master for the student. The goal of manufacturing technology education is to help train and expand a student's marketable job skills and obtain employment in a specific career field.

Professional manufacturing employees expand their career horizons by diversifying their skills through manufacturing technology education programs (Profiling in Manufacturing, 2006). Industry and education need to determine appealing skills for a student in a manufacturing career and take steps needed to succeed in this type of career.

People in manufacturing careers may have ideas that generate many of the solutions to a country's problems. Manufacturing uses new technologies, processes, transferable skills, and builds upon what the consumer needs and wants. When technology education programs collaborate with manufacturing industries, both sides contribute to a holistic endeavor, and together, education and industry are able to reach an educational solution. Manufacturing employers may need to connect to trade technical knowledge, manage educational philosophies, and best practices to make new business contacts and strengthen existing ones. It is crucial that these industries have an educational connection to school districts such as Manitowoc Public School District.

Manitowoc County-specifically the city of Manitowoc is a community of 34,053 with a female population of 17,564 and male population of 16,489 (United States Census, 2006). Adjacent to Manitowoc is the community of Two Rivers with a combined population of 12,658 (United States Census, 2006). Manitowoc alone has 4,294 students/adults between the ages of 15 and 24 who are eligible for a career in manufacturing technology.

There are positions in manufacturing that are continually available due to the lack of trained employees. Positions are available in welding, machining, set-up, painting, electrical and administrative (Bureau of Labor Statistics, 2006). All manufacturing companies are finding it increasingly difficult to find qualified employees. In 2006, Wisconsin had approximately 270

jobs available as a Press Machine Setter (Bureau of Labor Statistics, 2006). This job entails setting up the correct press dies with mathematical precision.

The benefits of a partnership between manufacturing and education, rests not only with teachers and students but also with manufacturing companies. The first benefit to manufacturing is the assurance of knowledgeable well skilled employees (Wink, 1997). Inclusive benefits would be manufacturing community service, demonstrating the benefits of mutual cooperation, increased state and federal grant monies, and future political advantages.

Manitowoc County currently has manufacturing positions available with over 350 students available for employment. Manitowoc has students who are interested in a career such as welding, machining, tool and die, plasma cutting and stamping, as well as material and product scheduling.

Currently, the Manitowoc Public School District has a total enrollment of 1,200 students at the senior high and two junior high schools. All three schools offer a variety of classes including woods processing, plastics, metals, communications technology, manufacturing and design, transportation, construction, and multi media. Curriculum revision at all three schools has been an ongoing endeavor with each instructor leading the way in their individual content area.

As a student develops the necessary knowledge and skills in manufacturing they are creating career opportunities. When training is completed the student would be more than ready to begin a career with one of the manufacturing companies in Manitowoc County.

The Manitowoc School District has not seen a substantial change in technical education curriculum prior to 2000. Changes have occurred by ongoing revision of classes felt appropriate by the instructor. This in itself has been beneficial to both the school district and student's but there has been no input from industry or the employees of industry.

Purpose of the Study

The City of Manitowoc, in the county of Manitowoc, has a large short fall of highly skilled workers to draw from for its industrial base. Currently there are 411 job postings in Manitowoc County with 325 of these manufacturing positions being skilled and semi-skilled. The Manitowoc Public School District has a manufacturing technology program, but the program needs to be enhanced to meet the needs of modern industrial manufacturing. This manufacturing program change would allow students to be fully prepared to obtain the knowledge and skills to be a successful employee in a manufacturing career.

Importance of the Study

This research study was chosen for the following three objectives:

1. Completion of this research will be advantageous to the students of Manitowoc Public School District. Culmination of this study will give a new direction to the manufacturing course content to better mirror the requirements of the manufacturing industry. This will provide manufacturers valuable employees who have all of the attributes of a well rounded employee before training in a company.
2. Culmination of this research will provide the manufacturing industry employees who already have the standards of knowledge and content valued by industry. This gives the manufacturing industry a human resource from which to pick qualified applicants.
3. Culmination of this research will give the manufacturing technology program new insight as to what is needed by industry and allow the teachers to develop content that mirrors industry needs creating instruction of value to industry.

Assumptions of the Study

This researcher makes the following assumptions:

1. Being a native of the manufacturing community there is the risk of over identifying due to association via tours and ongoing technical programs such as the Mini-Chopper. This will be difficult to overcome but as a prudent researcher, the intention is to be very careful from the onset of the project.
2. That a large percentage of the questionnaires will be returned within a prudent time period. When mailing questionnaires to any industry they may be lost in the mail or simply laid aside for other more important company business. By advance contact with the human resource manager and owners this will be alleviated.
3. That the questionnaire will be completed thoroughly and to the best of the ability of the respondent. During a certain time period such as a fifteen minute break period or one half hour lunch period workers may feel rushed and misread or all together skip a question.. This should be eliminated by allowing the survey to be completed at the employee's leisure with a time period in place.

Research Objectives

The following research objectives will guide this study:

- Identify the attitudes, skills, attributes, and knowledge required by industry employers in the Manitowoc demographic area.
- Identify any difference in manufacturing competencies based on the type of manufacturing industry.
- Identify any changes or modifications that would be made to the technology education program to meet the needs of manufacturing in the Manitowoc County.

Limitations of the Study

This research will be limited by:

1. The present study will not control the possibility of contamination of the control group of manufacturing employees due to the employees talking to one another.
2. The ability to isolate the employees is beyond the capabilities of not only the researcher but also the study itself. This diffusion of information between employees may impact the questionnaire scores of the group.
3. This questionnaire will be distributed to local manufacturers in the Manitowoc area, manufacturers in other locations may not desire the same set of attributes as desired by local manufacturers.
4. This questionnaire will utilize open-ended questions; all information provided could be limited in specifics or contain meticulous answers. The researcher cannot control the amount or quality of the responses provided by the individual who completes the survey.

Definitions of Terms

The following definitions of terms are provided for clarity of understanding by the lay person regarding this research paper. Definitions are taken from Merriam-Webster's collegiate dictionary (11th ed.)(2004)

Articulation. The process of comparing content of courses that is transferable between secondary and post-secondary institution.

HVAC. Heating, ventilation and air conditioning.

Holistic Endeavor in Education. Identifies many levels of cognitive functions.

Mission Statement. A brief statement of the purpose of a company or other organization.

Employability: a person's capability of gaining initial employment.

Manufacturing. The use of tools and labor to make products for use or sale.

Skill. The learned capacity or talent to carry out pre-determined results often with the minimum outlay of time, energy, or both.

Technology Education. A study of technology, which provides an opportunity for students to learn about processes and knowledge related to technology.

Chapter II: Review of Related Literature

Introduction

In order to determine the knowledge, skills, and attitudes that should be included in the survey a review of literature is necessary. This review accomplished the following criteria. It provided a rational for this research project by showing that there is a lack of necessary knowledge and skills for entry level employees for manufacturing jobs in the Manitowoc County. A list of essential skills was formulated to include on the survey that was sent to manufacturing employers. The review of literature is divided into three parts:

1. What entry level technical skills do manufacturing employers seek in new employees?

2. What entry level employability skills do manufacturing employers seek in new employees?

3. What skills do high school students possess and need, especially those students not attending a technical college or a four-year university?

The Skills Employers Want: Technical Skills

Research has shown that employers in all areas of industry from manufacturing, to communications, to management—seek knowledge, skills, and attitudes on two different levels. On the first level, employers seek technical skills required to be competent in a specific occupation in an industry sector such as welding or a machinist. On another level, they seek employability skills such as math, technical reading, print reading and writing, which are basic to most jobs and will be discussed later in this chapter (Career Field Technical Content Standards, 2006). Research in the area of technical skills is divided into three sections: skills that manufacturing employer's desire, skills that apprenticeships and training programs teach and skills listed in the Secretary's Commission on Achieving Necessary Skills (SCANS) report.

Due to the limitations of this study, knowledge, skills, and attitudes desired was anecdotal from the training programs examined at the manufacturing job site. These findings are relevant because training and apprenticeship programs are designed based on the participation of local manufacturing employers. The importance of training has increased steadily since the 1960's as a result of the economic challenges presented to this country as a once dominate manufacturing society. The apprenticeship and training programs revealed that the technical skills for manufacturing training are categorized into similar skill sets. According to the Career Field Technical Content Standards (2006), educational state standards for manufacturing careers are broken down into three areas: What are the academic standards? Academic standards specify what students should know and be able to do, what they might be asked to do to give evidence of standards, and how well the student must perform. They include content, performance, and proficiency standards.

Content standards refer to *what* students should know and be able to do. Performance standards tell *how* students will show that they are meeting a standard. Proficiency standards indicate *how well* students must perform.

1. Core Standards are those skills essential for all learners regardless of career goals. These include local and state academic standards as well as national career and workplace standards.
2. Cluster Standards refer to those competencies common to related occupations in an industry sector. They provide the broad foundation for entry level, technical and professional careers.

3. Occupational Specific Standards consist of the technical skills and knowledge particular to a given occupation. Many of these are available at the state and national public education level.

Core standards are similar to the above employability skills. The occupation specific standards and benchmarks found necessary for the manufacturing industry, according to, (SCANS) 2006 are listed below:

Standard 10: Demonstrate knowledge of the manufacturing industry, related careers, and social/economic issues that affect the industry.

Benchmarks:

1. Identify the role and major functions of manufacturing businesses.
2. Identify and describe types of manufacturing systems.
3. Describe how manufacturing businesses manage performance.
4. Describe how changes outside the manufacturing business impact the manufacturing business.
5. Explain the role of risk management in reducing risks and improving performance in manufacturing businesses.
6. Reports on the history of the manufacturing industry [in a specific state].
7. Identify the roles and functions of government in regulating and supporting manufacturing businesses.
8. Describe how manufacturing businesses manage customer relationships.
9. Describe how planning and budgeting are used to accomplish organizational goals and objectives.

10. Explain how planning is used to improve overall business performance in manufacturing.

Standard 11: Applies technical skills and knowledge used in the manufacturing industry.

Benchmarks:

1. Demonstrate the planning and layout processes (e.g., designing, print reading, and measuring) that are used in manufacturing.
2. Summarize how materials can be processed using tools and machines in manufacturing.
3. Describe various types of assembling processes (e.g., mechanical fastening, mechanical force, joining, fusion welding) used in manufacturing.
4. Explain finishing processes (e.g., types of finishing materials, surface preparation, methods of application) used in manufacturing.
5. Explain the processes of inspection and quality control (QA) are used in manufacturing.
6. Recognize and correct production processes to assure that products meet production quality standards.
7. Suggest or perform corrective actions to correct quality problems.
8. Perform preventative maintenance and routine repair by contacting appropriate people and securing needed supplies.
9. Maintain production schedules by completing daily housekeeping activities.
10. Document training of maintenance activities according to company maintenance regulations.

Standard 12: Understand and apply workplace safety measures.

Benchmarks:

1. Demonstrates knowledge and application of basic first aid.

2. Summarize and employ safety protocols to maintain a safe and productive production workplace.
3. Perform environmental and safety inspections following local, federal and company regulations (OSHA). Occupational Safety Health Administration
4. Perform emergency drills as part of an emergency response team.
5. Identify unsafe conditions according to safety standards.
6. Implement corrective actions to follow safety protocols.
7. Understand employee rights and responsibilities and employer obligations concerning occupational safety and health.
8. Demonstrate methods to correct common hazards following appropriate safety procedures.
9. Inspect and use protective equipment (PPE).
10. Identify specific health and safety laws and regulations that impact manufacturing and the major topics they address.

The technical skills listed in Manufacturing, Careers Technical Field Content Standards (CTFCS) are similar to those listed above; however, CTFCS has additional skill requirements, called competencies rather than standards. The competencies listed in CTFCS are more specific than those listed above. The additional competencies include being able to perform basic cutting, shaping, and operations; assist in the preparation of materials; construct fixtures and jigs, participate in the installation, repair and maintenance of machinery and equipment. They would conduct and support safety training and quality assurance to include developing manufacturing and process procedures.

Competency 1.2: Explore professional development and career advancement opportunities for a manufacturing technology professional. Descriptors:

- 1.2.1 Identify advancement opportunities in manufacturing technology (e.g., internal and external).
- 1.2.2 Research continuing education courses or programs available to enhance skills, to remain current in the profession, and for career advancement (e.g., governing organizations and requirements).
- 1.2.3 Describe the importance of professional organizations, associations, trades shows, seminars and professional relationships with manufacturing technology professionals.
- 1.2.4 Remain current on changes in the manufacturing technology profession.
- 1.2.5 Demonstrate quality work as measured by performance evaluations in a manufacturing setting.
- 1.2.6 Maintain a résumé, a list of references, and a portfolio with all updated information.
- 1.2.7 Prepare for job interviews.

Competency 1.4: Demonstrate positive work behaviors and personal qualities. Descriptors:

- 1.4.1 Conform to company and departmental policies (e.g., attendance, punctuality, time management, educational in services).
- 1.4.2 Demonstrate professionalism, self-discipline, self-worth, positive attitude and integrity in a work situation.

- 1.4.3 Demonstrate flexibility and willingness to learn, be able to fill in when necessary.
- 1.4.4 Exhibit a commitment to the organization.
- 1.4.5 Explain how individuals impact manufacturing performance.
- 1.4.6 Describe the expectations for individuals in terms of manufacturing performance.
- 1.4.7 Identify impact areas of individual performance (e.g., quality, profit, customer relations).

The Skills Employers Want: Employability Skills

Empowering prospective employees with the technical skills to succeed in a trade is only half the battle. Study after study has revealed that employers are more concerned with employability skills than they are with technical skills (United States Department of Labor, 2000; Career Field Technical Content standards, (Ohio), (2006) stated,

> Although technical skills prepare participants [in manufacturing training programs] for entry-level employment and are instrumental in getting them 'in the door,' they are not enough. Industry experts articulate that employees are more likely to keep the job and progress in a career if training is integrated with employability skills. (p. 7-8)

She stated that there are nearly as many definitions of employability skills as there are pieces of literature describing them. She does, however, go on to provide her own definition:

> Employability skills are a holistic constellation of transferable core skill groups that represent essential functional and enabling knowledge, skills, and attitudes required in the 21st century workplace. They are necessary for entry-level employment, further education, upward mobility of incumbent workers, and for lifelong career success. (p. 5)

1. Career Field Technical Content standards, (Ohio, 2006), also describes employability skills with qualifiers such as motivation, initiative, judgment, ability to work with others, and communication skills.
2. The Secretary's Commission on Achieving Necessary Skills (SCANS) was a committee organized by President George P. Bush to examine the skills deemed necessary to succeed in the workplace of the 21st century. The initial findings of the committee were published in 1991, and in it five basic competencies were identified that agree with the three foundations of skills and personal qualities that lie at the center of job performance fundamentals.
3. The three-part foundation consists of "basic skills," which consist of reading, writing, arithmetic, listening, and speaking; "thinking skills," which include creative thinking, decision making, problem solving, seeing things in the mind's eye, knowing how to learn, and reasoning; and "personal qualities," which include responsibility, self-esteem, sociability, self-management, and integrity/honesty.
4. The five competencies identified by SCANS address issues of resources, interpersonal skills, information skills, knowledge of systems, and an understanding of technology. Effective use of resources includes identifying, organizing, planning and allocating resources, such as time, money, materials, facilities, and human resources. Interpersonal skills are defined as the ability to work well with others in the subsequent ways: participating as a team member, teaching other employees new skills, serving clients and customers with appropriate attentiveness, exercising leadership qualities, negotiating agreements and contracts, and working with a diverse demographic or geographic population. The information skills consist of the acquisition and use of information and

the ability to evaluate, organize and maintain, interpret, communicate both verbally and written, and use computers to process the information. Knowledge of systems is defined as being able to understand complex manufacturing inter-relationships. Workers should be able to understand manufacturing systems, monitor and correct performance within a manufacturing system, and improve or design systems to improve its quality. Finally, workers should be technologically competent. This includes selecting appropriate manufacturing technology for a given situation, applying technology to a task, while maintaining and troubleshooting equipment for the shortest possible downtime.

5. While the SCANS report provides an overview of the general skills that all employers need, it does not address needs specific to the manufacturing industry. Career Field Technical Content Standards (2006) included two categories of employability skills that are desired specifically by manufacturing employers. They are communication skills and mathematics skills. Communication skills are further sub-categorized into the following areas: reading; writing; listening/visual literacy; and oral communication. Mathematics skills are also sub-categorizes of the Scans report. They include all those listed in Career Field Technical Content Standards (2006, p. 22), the previous paragraph, plus the following additions: basic computations; uses basic numerical concepts such as whole numbers and percentages in practical situations; makes reasonable estimates of arithmetic results without a calculator; and uses tables, graphs, diagrams, and charts to obtain or convey quantitative information.
6. Academic Standards benchmark measures that define what students should know and be able to do at specified grade levels.

7. Students should understand and apply the fundamental concepts, principles of manufacturing, and processes of science in manufacturing industry.
8. Demonstrate creative thinking, problem solving, decision making and visualization.
9. Apply computer literacy skills and knowledge.

Generic Workplace Readiness

1. Demonstrate knowledge and skills to make practical career choices and obtain sustainable employment in the manufacturing industry.
2. Demonstrate personal qualities of self-esteem, self-management, and personal responsibility.
3. Demonstrate acceptable behavior governed by the rules of society and the workplace.
4. Demonstrate an understanding and ability to work with other regardless of ethnic or religious diversity.

Having discovered the skills that manufacturing employers seek in entry-level employees, it is now fitting to examine the skills that high school students comprise to serve as a source of comparison.

The Skills High School Students Possess

According to the SCANS report (2006) the outlook for the average American high school student is unpromising. Individuals from all sectors of industry were interviewed, including manufacturing business owners, public employees, union and non-union workers, supervisors and lead personnel in shops, plants and industries. This is what has been reported:

1. The message to teachers is universal: good jobs will increasingly depend on people who can put knowledge to work. What is disturbing is that more than half of young people will leave public schools without the knowledge or skill foundations required

to find and maintain a good job. The manufacturing industries and country will pay a very high price for this oversight. The unskilled and unknowledgeable student will face bleak prospects of dead-end positions interrupted by periods of unemployment.

2. The previous section of this chapter detailed the basic skills that employers seek. Included in those skills were reading, writing, and arithmetic. SCANS (2006) estimates that less than half of high school students achieve the reading and writing minimums, and even fewer reach the math minimums. Furthermore, many schools today do not directly teach listening and speaking skills which has become an employability epidemic.
3. Research has proven there is limited documented information about what trade-specific skills students learn in area high schools. A reason for this may be the fact that a small percentage of students take coursework relating to a specific trade because those classes are typically elective classes, such as construction, metals, transportation and manufacturing. A more accurate reason for the deficiency in data on the topic of trade specific skills is that high school technology education classes tend to run independently of each other, providing little evidence of the skills that would be acquired from technology education classes.
4. Despite the variation among technology education programs, technology education instructors in Wisconsin have a guide for teaching manufacturing technology- Standards for Technological Literacy: Career and Technical Education in the United States (2005), which is a document published by the International Technology Education Association. It proposes standards and benchmarks for teachers of technology education. Standard 20 reads: "Students will develop an understanding of

and be able to select and use manufacturing technologies" (p. 191). While standards are broken down for grades kindergarten through 12, only the standards for grades six through 12 follow; standards F-I are for grades 6-8, and standards J-N are for grades 9-12.

5. These include math, science, reading, writing, communications, IT, analysis, problem-solving, teamwork, organization, planning, and basic technical skills all in a manufacturing context.
6. Increases productivity and innovation through reinforcement of these core knowledge and skill sets.
7. Decreases recruitment costs by providing job candidates with industry-recognized credentials.
8. Recognizes that "learning is becoming an increasingly important function for companies to develop skills needed to sustain competitive advantage, increase efficiencies, and improve business results" (ASTD/IBM Study, Oct. 05).
9. Provides a diagnostic tool to enable employers to benchmark their workers against high-performance national standards and identify skill gaps skills.
10. Increases (ROI) return on investment for training by targeting skill enhancement to those skill gaps.
11. Serves to attract, motivate, and retain qualified employees.

Workers Education

1. Improves career advancement opportunities and earnings by obtaining high-performance skills through training.
2. Improves job security through certification of proven skill sets.

3. Provides nationally portable credentials offering flexibility to work successfully in all manufacturing sectors and all production occupations.

Technology Education in the school setting

1. Increases industry client base and internationally recognized certification-based training. ISO 9001.
2. Increases student enrollment through on-demand learning solutions.
3. Provides fully developed courses for immediate implementation in the manufacturing setting.
4. Offers high-quality courses with proven results, i.e. certification.
5. Enables schools to offer certifications i.e. automotive, welding, machine tool

State Government

1. Attracts advanced manufacturing company investment through the attraction of a large pool of certified manufacturing employees.
2. Broadens the variety of manufacturing industries that a state can attract through the availability of certified workers with the core knowledge and skills applicable to all manufacturing sectors and all manufacturing occupations.
3. Enables dislocated workers from one industry sector to acquire the credentials to shift readily to other industry sectors that need qualified workers.
4. Manufacturing skills require maintenance, alteration, or retraining periodically to improve them or to alter their intended use.
5. Manufacturing can include prefabricated materials such as steel or aluminum stud walls.
6. A review of the national standards for manufacturing reveals that they are more general than the technical skills that manufacturing employers seek as stated above.

7. A study done by Ireland (2006) examined the appropriateness of technology education curricular content as perceived by secondary trade and industrial educators. One finding was that technology education's focus on humanistic concerns and societal needs "has neglected the knowledge, skills, and attitudes related to the tools, equipment, materials, and processes of industry" (n. p.).
8. Welders, machinists, drafters, and workers with other skills in the manufacturing trades are in short supply and will be for many years.
9. Schools are working hard to prepare students for college; they are not preparing most students for important and rewarding manufacturing careers for students' futures.

These reports indicate that the emphasis in high school curricula may be in the wrong areas. Griffith and Wade (2001) indicate that more than 65% of all jobs in the year 2008 required specialized education (more than high school but less than a four-year degree), nearly tripling since the 1950s, while the percentage of jobs requiring at least a four-year degree has hovered around 20%, as it has for the past 50 years Essay and Holmes (2008). As early as (2005) 90% of public high school students took at least one technical education course, with one in five post secondary students taking at least three courses in a CTE program area.

Chapter III: Project Methodology

Introduction

This chapter will describe the companies/employees chosen for this study and relate how the companies/employees were selected. It will also provide important details about the instrument used to collect the data for the study, the amount of time expected to complete the survey, the procedures used to collect the data, and the data analysis. As indicated earlier, the purpose of this study is to determine the knowledge, skills, and attitudes that manufacturing employers/employees in the Manitowoc County area judge valuable entry-level employees. The objectives of this study are as follows:

1. Identify the knowledge, skills, and attitudes that are viewed as important by manufacturing employers in the Manitowoc County area.
2. Identify the knowledge, skills, and attitudes that are currently being taught in Manitowoc Public School District technology education program.
3. Identify modifications that could be made to the technology education curriculum to meet the needs of manufacturing employers in Manitowoc County.

Selection and Description of Sample

The subjects used for this study are approximately 100 manufacturing employees from the Manitowoc County area. The sample will be selected from known companies that are highly visible employers in the, Manitowoc County. A survey will be hand delivered by this surveyor explaining the survey procedure at every company under the following headings, welding, stamping, cutting, torching, drilling, engineering, sheet steel, metallurgists, metal work, plating, polyurethane products, and product development.

These manufacturing subcategories were derived from Manufacturing Career Guide (2008). Since many manufacturers were listed under multiple headings, repeat entries were skipped. The sample represented both union and nonunion manufacturers.

Instrumentation

The instrument used in this study is designed to ascertain the degree of importance that Manitowoc County Manufacturers employers/employees place on predefined employability and technical skills possessed by entry-level employees. In order to determine whether or not employees' preferences differed relating to trade, size of manufacturing company, etc., they were also asked to identify the following.

The skills and personal attributes of employees that employers seek when hiring are important when determining who will be successful in their career. Departments of education, employment agencies and school to workplace programs site a range of employability skills important not only to secure a job, but to progress within an organization.

Employers consider that employability skills are as important as job-specific or technical skills. Employers will seek the employability skills that are most important to their business and will choose workers who are strong in these areas, with job matches, better job satisfaction and increased manufacturing productivity. The data collection instrument is in the form of a three-page pamphlet (See Appendix A).

The following is a five part description that provides an explanation of the expectation of both employers and employees at the entry level in manufacturing. The first part of the instrument consists of both gender and age specific groups. These two groups give a demographic picture of the changing scope of who is employed, male vs. female, and their respective ages. With the aging workforce and the increase of the female population in a

previously male dominated industry, schools must incorporate a curriculum to meet the needs of a more diverse population.

The second part of the instrument deals with the generic skills and personal attributes of the employee (i.e. loyalty, enthusiasm, motivation). The key generic skills identified and how they contribute to the industry are:

- Communication – speaking and listening skills to communicate effectively with fellow workers, supervisors, and/or clients/customers
- Team work – sociable, friendly and polite person who is able to work cooperatively with others
- Mathematic skills – able to solve ordinary to complex math equations
- Computer skills – information and technology skills
- Responsibility – dependability and independence with reliability to complete tasks
- Integrity traits – shows how trustworthy and honest with good established rule concepts at work and in society
- Personal Health traits – show a concern not only for their own well being but other workers and society in general

The third part of the instrument deals with the job specific skill sets that are required to function in a manufacturing setting. Manufacturing includes technical skills that are needed to succeed in industry ranging from an artistic ability to creative thinking. This includes prints and schematic interpretation, mechanical and computerized drafting, industry cleanliness and organizational skills and planning of work procedures. The manufacturing employee must read a standard ruler and metric to a high degree of accuracy, in addition to following safety and health standards.

The fourth part of the instrument is job specific. This instrument consists of technical skills of various positions in manufacturing with an accurate account of most skills in this demographic area. It includes floor welders, machinists, tool & die assemblers, office employees, materials management, purchasing and engineers. Information obtained through this instrument shows what positions are the most employee heavy.

The fifth part of the instrument dealt with union versus non-union membership. Although this component had no major impact in the instrument it showed the high quality of skill sets that are needed for designated employability positions and the education needed for entry level positions. The Instrument is shown below.

The skills that are included in this survey were selected from a variety of sources. The Employability Skills were adopted from a similar study done by Naces (2007). The Technical Skills were chosen from numerous sources referred to earlier in this study. Among those influential resources are National Institute for Metal Working Skills, Inc. (NIMS) (2005) A full copy of the instrument can be found in Appendix B.

Procedure

The instrument was hand delivered and explained to each of the selected businesses during prescribed break periods. Information was provided that indicated the purpose of the study and instructions for the completion of the questionnaire. The contact Human Resource personnel were present during the survey with the completed surveys being put into a sealed envelope. The employee was informed that participation was completely voluntary and that all information collected would be kept strictly confidential. Lastly, employees were assured that they could not be identified and that they would not be contacted in any form by the researcher or any other individual associated with the survey.

Data Analysis

A number of statistical analyses were used in this study. When the data was received from industry, it was summed and analyzed by recording the degree of importance placed on each of the "employability skills" and "technical skills" used in manufacturing. The scores from each individual surveyor were then summed and averaged by calculating the mean.

There were three specific research objectives of importance to this study. The first objective of importance was to ascertain the degree of importance that manufacturing employers in the Manitowoc County area place on ten given employability skills and eight technical skills. When this data was received, it was tallied and analyzed by recording the degree of importance placed on each of the skills listed under the headings of "employability skills" and "technical skills."

The second research objective was to identify the knowledge, skills, and attitudes that are currently being taught in Manitowoc High School's technology education program. The data for this objective was gathered through a review of syllabi for courses offered during the past seven years of this instructor's employment at MPSD. Although the district possesses no standardized inter-department curriculum, a review of the syllabi indicated that some general conclusions can be made about the knowledge, skills, and attitudes commonly taught within the manufacturing technology education courses.

The third research objective was to identify modifications that could be made to the manufacturing technology education curriculum in the Manitowoc Public School District career and technical education program.

Chapter IV: Analysis of Findings

Introduction

The purpose of this study was to determine the level of importance manufacturing employee and employers placed on ten employability skills and eight technical skills in regard to entry-level employees. It also sought to identify the knowledge, skills, and attitudes that are currently being taught in the Career and Technology Education curriculum at Manitowoc Public High School. Finally, it sought to identify modifications that could be made to improve the technology education curriculum at Manitowoc Public High School.

A summary of the returned data is shown in Table 2. Note that this summary data is based on the returns.

Table 1

Demographics

Category	Respondents
Age Group	
18-25	8
26-30	15
31-35	15
36-40	10
41-45	9
46-50	12
51-55	9
56-60	4
61-65	3
66-70	0
Gender	
Male	54
Female	31
Union Workers	25
Non-Union Workers	57

Table 2

Summary Data

Employability Skills	5	4	3	2	1	Responses
Speaking	29	38	17	1	0	85
Listening	50	29	6	0	0	85
Reading/Writing	37	33	12	3	0	85
Mathematics	37	34	13	1	0	85
Computer	12	37	29	7	0	85
Technology	27	31	17	7	2	84
Teamwork	36	31	16	1	1	85
Responsibility Traits	50	29	4	1	0	84
Integrity Traits	36	32	13	3	0	84
Personal Health Traits	18	33	27	5	2	85
Reads and interprets blueprints	26	30	21	7	1	85
Demonstrates proficiency/skill	13	33	23	12	4	85
Cleans, maintains and organizes work areas	31	32	18	3	0	84
Plan progression of work procedures	15	32	31	4	2	84
Determines/calculates appropriate materials	23	29	22	7	3	84
Reads standard & metric ruler	43	20	17	3	2	85
Demonstrates knowledge of safety	47	26	11	0	0	84
Demonstrates knowledge of trade vocabulary	16	31	34	2	2	85

Table 3

Manufacturing Trades Represented

Trade	Number
Engineer	2
Welder	5
Machinist	20
Tool and Die	1
Set-up Specialist	5
Sheet Metal Fabricator	0
Purchasing	2
Maintenance	3
Logistics	0
Production Planning	2
Materials Manager.	1
Warehousing	0
Painter	0
Electrical	0
Finisher	0
Assembler	13
Injection Molder	18
Quality Assurance	3
Other	9

The survey provided employees with a list of 10 employability skills and eight technical skills. The employee was asked to circle the number (1-5) that corresponded to the importance that he/she placed on the individual skill (one being less important and five being more important).

Objective One. The survey (Appendix A) provided employees with a list of 10 employability skills and eight technical skills. The employee was asked to circle the number (1-5) that corresponded to the importance that he/she placed on the individual skill (one being less important and five being more important).

One hundred (100) surveys were hand delivered to Manitowoc area manufacturing employees; Eighty-five (85) were returned and tabulated. The results of the survey were measured by adding the score of each individual skill and divided by the number of surveys returned (85). As an example, had one particular skill received a score of "5" from every respondent, that skill's average would be "5." After compiling the average score for each skill listed on the survey, the following results were established. Manufacturers' employees in the Manitowoc area indicated that, overall, employability skills were more important in regard to entry-level employees.

The employability skills identified as most important by manufacturing employees of the Manitowoc area are "Responsibility Traits 4.6" and "Listening Skill 4.5," See Table 2. Responsibility traits include qualities such as consistently working hard and dependability in attendance and timeliness. Listening traits are defined as receiving, interpreting, responding correctly and appropriately to oral instructions, and general communications. Following closely behind with an average score of 4.3 was the skill identified as "Math Skills," which is defined as numbers and number relations; measurement; estimation, mental computation, data analysis and probability, algebra, geometry, patterns, relations, and functions.

The third most important skill (average score of 4.5) is "Teamwork Skills." These skills are represented by such qualities as being outgoing, friendly, and polite with the ability to work cooperatively with others of diverse ethnic backgrounds. Several employability skills received an average score of 4.2., those being "Speaking Skills 4.1," "Writing Skills 4.2," and "Personal Health Traits 3.7." Finally, the skill labeled "Computer Skills" received the lowest average score, of 3.6.

Table 4

Mean and Standard Deviation Scores for Employability Skills

Employability Skills	Total Score	Mean Score	Standard Deviation
Speaking Skills	145	4.1	1.72
Listening Skills	250	4.5	1.00
Reading & Writing Skills	185	4.2	1.63
Math Skills	185	4.3	1.72
Computer Skills	60	3.6	1.64
Technology Skills	135	3.9	1.50
Teamwork Skills	180	4.2	1.68
Responsibility Skills	250	4.6	1.72
Integrity Traits	180	4.2	1.62
Personal Health Traits	90	3.7	1.52

Average scores for Technical Skills ranged from a high of 4.4 to a low of 3.4. See Table 3. The technical skill deemed most valuable by Manitowoc area manufacturing trades employees, is Cleans and Maintains Safe Work Area with the score being 4.4. Following close behind with scores of 4.2, 4.0, and 3.8, respectively, were the ability to "Selects, Maintains and Uses Tools of the Industry", Plans Sequence of Work Operations", and Reads and Interprets Prints/Project Plans.

Two technical skills received an average score of 3.7. They are, "Estimates Time and Cost to Complete Projects", and "Determines appropriate Materials & Equipment needed for a

Job." Receiving a score of 3.4 as the skill identified as being the least important is, "Demonstrates Proficiency with Manual Drafting" rounds off all of the technical skills on the survey.

Table 5

Mean Scores & Standard Deviation for Technical Skills

Technical Skills	Total Score	Mean Score	Standard Deviation
Selects, maintains, and uses tools of the industry	215	4.1	1.61
Reads and interprets prints and project plans	130	3.8	1.30
Demonstrates proficiency with manual drafting	65	3.4	1.07
Cleans and maintains safe work area	235	4.4	1.74
Plans sequence of work operations	155	3.6	1.50
Estimates time and cost to complete projects	115	3.7	1.58
Determines appropriate materials and equipment needed for job	215	3.7	1.50
Reads a standard ruler accurately to the 16^{th} of an inch	215	4.1	1.71

The above findings support the ideas presented in the literature review (Chapter Two) of this study. Numerous researchers (Garmire, 2006; Ireland, 2006; Needleman, 1995; Sanders, 1996; Smith, 2002; and Holland, 2008) have found that employers in general seek not so much the technical skills that are required for a job but those described in this survey as "Employability Skills" or the soft skills associated with a new employee. These researchers found that skills such as cooperation, problem solving, critical thinking written/language skills, communication,

organization, teamwork, and dependability are highly regarded by employers and employees, while the more technical skills can be trained on-the-job, especially when considering entry-level employees.

Table 6

Knowledge, Skills, and Attitudes Currently Taught in Manitowoc Public High School Technical Education Program

Skills	
Speaking/Listening Skills	Required oral presentations (career research project) Presenting solutions of problems to the class Textbook readings to introduce units of study
Reading and Writing	Writing evaluations of completed projects Writing written reflections to summarize learning activities Reading magazine articles/plans for completing manufacturing projects Writing plans of procedure for completing manufacturing projects
Teamwork	Working together to complete problem solving projects Organizing and operating a manufacturing enterprise
Computer/Technology Skills	Learning the AutoCADD and AutoSketch programs Programming the CNC routers, mills, lathes and welders
Responsibility Traits	Students are held accountable for their attendance and punctuality and having projects completed on time
Reading a Ruler	Students are given weekly quizzes until they earn three perfect scores in a row
Knowledge and Application of Basic Job-Site Safety	Students pass a written safety test with 100% accuracy
Cleans and Maintains Work Area	Students demonstrate safe use of all applicable equipment Students are assigned cleanup jobs
Plans Sequence of Work Operations	Students are evaluated upon how well they perform their cleanup Students write plans of procedure for some of their woodworking projects responsibilities Students write plans of procedure for some of their woodworking projects

The above table represents the current curriculum that is being utilized by the instructors at Manitowoc Public High school. This curriculum has been obtained and revised by utilizing current syllabi and lesson plans. The instructors at MPSD have tried throughout their careers to maintain real world situations within the school framework and allow the students to grow and achieve as many of the skills sets needed to be successful in a manufacturing setting.

Table 7

Comparison Between What Employers Want and What is Being Taught in the MPSD Technical Education Programs

Top Five Employability Skills	Top Five Technical Skills
Responsibility Traits	Team Work
Listening Skills	Reading & Interpreting Standard/Metric Ruler
Math Skills	Safety
Reading and Writing Skills	Organizational, selects and maintains tools
Speaking	Demonstrates trade specific skills

As reflected in Table 7, many of the employability skills and technical skills that local employers and employees desire is currently taught. There are, however, many areas that need of improvement. Table 5 includes only the top five employability skills and technical skills because those are the skills most desired by manufacturing employers and employees.

Table 8

Excel Survey Tabulation

	Total Participants Scores					Part.	Mean	Std. Dev.
	5	4	3	2	1			
Speaking skills	29	38	17	1	0	85	4.12	1.72
Listening skills	50	29	6	0	0	85	4.52	1
Read/write skills	37	33	12	3	0	85	4.22	1.63
Math skills	37	34	13	1	0	84	4.26	1.72
Computer skills	12	37	29	7	0	85	3.64	1.64
Techs kills	27	31	17	7	2	84	3.88	1.5
Teamwork skills	36	31	16	1	1	85	4.18	1.68
Responsibility	50	29	4	1	0	84	4.52	1.72
Integrity	36	32	13	3	0	84	4.20	1.62
Health	18	33	27	5	2	85	3.71	1.52
Prints	26	30	21	7	1	85	3.86	1.30
Mech/drafting	13	33	23	12	4	85	3.46	1.07
Organization	31	32	18	3	0	84	4.08	1.5
Work procedures	15	32	31	4	2	84	3.64	1.58
Material/equip	23	29	22	7	3	84	3.74	1.50
Stand/metric	43	20	17	3	2	85	4.16	1.71
Safety	47	26	11	0	0	84	4.43	1.74
Vocabulary	16	31	34	2	2	85	3.67	1.61

Union Members: 25

Non-Union members: 58

Unknown: 2

Total: 85 (Males: 54 Females: 31)

Chapter V: Summary, Conclusions, and Recommendations

Introduction

This chapter will summarize the progress of the study thus far. As stated in the review of literature many if not most of all students who leave the MPSD technology education programs still lack the skill sets necessary for a successful career in manufacturing industries. Chapter five will provide conclusions about the data collected and provide recommendations based on those conclusions. Finally, recommendations for further research on this topic will be suggested.

Summary

The purpose of this study was to determine what knowledge, skills, and attitudes were deemed most valuable by manufacturing employees in the Manitowoc area as they relate to entry-level employees. This information was to be used to improve the manufacturing curriculum for Manitowoc Public High School that reflects the needs of local employers and employees.

A review of literature discovered that crucial knowledge, skills, and attitudes for entry-level employees can be divided into two categories—employability skills and technical skills. Through the review of literature, two lists were developed. The first list describes ten common employability skills, while the second list described eight common technical skills related to the manufacturing industry. These lists, in the form of a survey, were personally delivered to local manufacturing employers who were selected from previous contacts from student tours and visiting guest speakers. The employees were asked to participate in the study by rating the importance of each of the ten employability skills and eight technical skills on a scale from one to five. Employees were also asked to provide information about their company of what type of

product they manufactured, how many manufacturing people they employed, and whether they were a union or a nonunion shop.

The second and third objectives of this study were to identify the knowledge, skills, and attitudes that were being taught in Manitowoc Public High School's technology education program and to prepare them with the skill local employers deemed valuable. The second objective was developed through a thorough review of syllabi, lesson plans, and anecdotal evidence of classroom activities, completed projects, and grading rubrics.

Objective three was accomplished by comparing the findings of the first two research objectives. The results of the survey from objective one indicated that manufacturing employers and employees place a higher overall value on employability skills compared to technical skills. This reinforces what was indicated in the review of literature. The employability skills that ranked the highest were Responsibility Traits and Integrity Traits, followed closely by Listening skills. This survey indicated that employability skills were significantly less valuable such as Technology and Computer skills. The technical skills that received the highest rankings were the ability to Read a Standard Ruler, and Knowing and Applying Basic Manufacturing Safety Practices. Technical skills receiving lower scores included Estimating Time and Costs to Complete a Manufacturing Job, and Proficiency in *Manual Drafting*.

The conclusions of objectives two and three indicated that the current curriculum addresses some of the knowledge, skills, and attitudes valued by local employers and current employees in the manufacturing sector, but there are areas of that still need to be addressed. These ideas will be further developed in the next section of this chapter.

Conclusions

Research objective number one was to determine the level of importance that manufacturing employers in the Manitowoc area placed on ten employability skills and eight technical skills in regard to entry-level employees. Based on the data it is concluded that in general, Manitowoc county employers and employees place more emphasis on employability skills than they place on technical skills. The employability skills they ranked most valuable are responsibility traits and integrity traits, followed by listening skills. The technical skills ranked most valuable are the ability to read a standard ruler, and knowing and applying basic manufacturing safety practices. Based on the survey analysis it is recommended that the technology education curriculum be modified to include methods of evaluating students' responsibility and integrity skill sets. Suggestions include emphasizing the importance of being on time, ability to take responsibility for all work regardless of quality, and independence to address responsibility traits. It is also recommended that the curriculum continue to be enhanced to include more emphasis on ruler reading and basic safety rules.

Research objective number two was to identify the knowledge, skills, and attitudes that are currently being taught in the Technology Education curriculum at Manitowoc Public High School. Based on the data it is concluded that the curriculum currently addresses the following employability skills: speaking and listening skills, reading and writing skills, teamwork skills, computer and technology skills, and responsibility traits. The curriculum addresses the following technical skill sets needed by the manufacturing industries: reading a ruler, exercising safe work practices, reading prints/project plans, and cleaning and maintaining work areas. Based on these conclusions, research objective number three can be addressed.

Research objective number three was to identify modifications that could be made to the manufacturing technology education curriculum to meet the needs of Manitowoc County manufacturing employers. Based on the conclusions of research objective number two, it is recommended that the technology education curriculum be modified to address the employability skills of integrity and listening. Based on the findings listed above integrity traits could be evaluated by incorporating a rubric of assessing students' ability and willingness to follow rules of the workplace, and the ability to continue working independently without constant coaching or instruction from the instructor. Listening skills also need to be developed through practice responding to oral directions and feedback to complete a task or job. A technical skill that should be added to the curriculum is to incorporate a component that deals with selecting, maintaining, and using tools of the industry. This could involve the addition of a course of study in which students learn about the different facets of the manufacturing industry through observation and participation in activities requiring the use of tools specific to industry.

Recommendations for Further Research

While this study has provided valuable information for the improvement of the technology education curriculum at Manitowoc Public High School, it is by no means comprehensive. The information gained through this study is specific to the manufacturing industry, which addresses only one of the seven primary components of any technology education curriculum; that being the manufacturing component. The other three components; construction, transportation, and communications have yet to be addressed in a thorough manner. It is recommended that another study of similar depth in the areas of construction, transportation, and communication be conducted in order to ensure that Manitowoc Public Schools technology education curriculum is optimal.

The data that has been collected will be disseminated to the companies that participated in the survey project per there request. Furthermore the information will be used to improve all of the technology education classes in the MPSD area. This can be accomplished through discussions with the current CTE Adviser, Principles, Superintendent, School Counselors and fellow Career and Technical Education Instructors.

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APPENDIX A

Instrument

From: Clayton C. Nei

Lincoln High School
Wilson Junior High School
(920) 683-4859 (5929)

To: Manufacturing Trade Employer/Director of Human Resources
Various Manufacturing Trade Employers of Manitowoc County, WI 54220
Dear Manufacturing Trade Employer:

My name is Clayton C. Nei, and I am a technology education instructor at Manitowoc High School. I am currently pursuing a Master's Degree from the University of Wisconsin-Stout. I am contacting you in hopes that you will assist me on a thesis project that I am developing to improve the technology education curriculum in my school as well as to positively impact you directly by providing you with a larger pool of qualified job applicants.

My thesis topic investigates the importance of the employability skills and technical skills that students might possess as they graduate from high school. Employability skills consist of basic skills, thinking skills, and personal qualities viewed as necessary to be successful in most any job, while technical skills refer to specific skills related to a particular industry. I hope to determine the knowledge, skills, and attitudes viewed as important by Manufacturing trade employers in order to make instruction at Manitowoc High School and junior high schools more relevant, while at the same time providing you—the employer—with more qualified applicants. I believe that this is an important study that will provide valuable information useful to educators and employers alike. With your input, we can determine the knowledge, skills, and attitudes that are most important for our students to possess to become successful employees.

I wish to come to your business and address your employees to explain and administer the survey over the noon hour. The survey is designed in such a manner that it can be completed in only a few minutes. The survey consists of three parts and is on one page, back-to-back; completing both sides. If you have any questions regarding the thesis project or how the information will be used, please contact me at the address/phone number above.

Your participation in this survey is voluntary, and I assure you that your individual response will be kept strictly confidential. For those who decide to assist me in this pursuit, I thank you in advance for your help.

Sincerely,

Clayton Nei

APPENDIX B

Manufacturing Employability Skills Survey

Please Mark

Gender: Male _____ Female _____

Age Group: 18-25 _____ 26-30 _____ 31-35 _____ 36-40 _____ 41-45 _____
46-50 _____ 51-55 _____ 56-60 _____ 61-65 _____ 66-70 _____

Listed below are manufacturing/industry standard **employability skills** compiled from a wide variety of research questions. Please circle the number that would fit into the importance you place on each skill. In other words, how important is it for an entry-level/new employee to possess the following skill set?

Employability Skills
Relative Importance Skill
Greater.....Less Than

5 4 3 2 1	**Speaking Skills**: Manufacturing and Industry must have workers that can express himself/herself using the spoken word and can communicate effectively with fellow workers, supervisors and/or clients/customers.
5 4 3 2 1	**Listening Skills**: Manufacturing and Industry workers must receive, interpret and respond correctly and appropriately to oral instructions and communications.
5 4 3 2 1	**Reading/Writing Skills**: Manufacturing and Industry employees must interpret written materials and can effectively express himself/herself in written form.
5 4 3 2 1	**Mathematics Skills**: Manufacturing and Industry employees must perform basic arithmetic functions such as division and multiplication and can accurately interpret graphs, diagrams and measurement instruments
5 4 3 2 1	**Computer Skills**: Manufacturing and Industry employees must understand the basics of how computers work and how to use them for obtaining information.)
5 4 3 2 1	**Technology Skills**: Manufacturing and Industry employees understand the proper procedures for selecting, setting up, operating and maintaining machines commonly used in the workplace.
5 4 3 2 1	**Teamwork Skills**: Manufacturing and Industry employees are a sociable, friendly and polite person who is able to work cooperatively with others.
5 4 3 2 1	**Responsibility Traits**: Manufacturing and Industry employees consistently work hard, can be relied upon to complete a task, and is dependable in regard to attendance and punctuality.
5 4 3 2 1	**Integrity Traits**: Manufacturing and Industry employees are honest and trustworthy and consistently follows the rules established in the workplace and in society.

5 4 3 2 1	**Personal Health Traits**: Manufacturing and Industry employees consistently demonstrates a concern for his/her personal well-being and maintains acceptable standards in regard to hygiene, physical appearance and dress
5 4 3 2 1	Manufacturing and Industry employees read and interpret blueprints/schematic project prints.
5 4 3 2 1	Manufacturing and Industry employees demonstrate proficiency/skill with manual/mechanical drafting and reading of prints/schematics.
5 4 3 2 1	A Manufacturing and Industry employee cleans, maintains and organizes work areas.
5 4 3 2 1	Manufacturing and Industry employees can plan progression of work procedures.
5 4 3 2 1	Manufacturing and Industry employees determines/calculates appropriate materials and equipment needed for a project
5 4 3 2 1	Manufacturing and Industry employees reads a standard ruler and metric ruler accurately to the 16^{th} of an inch
5 4 3 2 1	Manufacturing and Industry employees demonstrate knowledge and application of basic industry safety.
5 4 3 2 1	Manufacturing and Industry employees demonstrate knowledge of trade-specialized vocabulary.

Please provide the information requested below. The information is strictly confidential and will only be used for the purposes of this research. You will not be further contacted nor identified by other parties.

A. Using the list below, please indicate the number that best describes the building trade you represent:

#: ____

1.	Engineer
2.	Welder
3.	Machinist
4.	Tool and Die
5.	Set-up Specialist
6.	Sheet Metal Fabricator
7.	Purchasing
8.	Maintenance
9.	Logistics
10.	Production Planning
11.	Materials Manager.
12.	Warehousing
13.	Painter
14.	Electrical
15.	Finisher
16.	Assembler
17.	Injection Molder

18.	Quality Assurance
19.	Other

B. Please check one: _____ union _____non-union

Thank you for participating in this research project. I hope we both can benefit from the results!

NOTE: Questions or concerns about the research study should be sent to Clayton C. Nei, the researcher, at (920) 775-3639, or Dr. Howard Lee, research advisor, at (715) 232-1251. Questions about the rights of research subjects can be addressed to Sue Foxwell, Research Administrator, UW-Stout Institutional Review Board for the Protection of Human Subjects in Research, 152 Vocational Rehabilitation Building, Menomonie, WI, 54751, phone (715) 232-1126