INDUSTRIAL EMPLOYER'S PERCEPTIONS ABOUT TECHNOLOGICAL LITERACY AS AN EMPLOYABILITY SKILL FOR NEW EMPLOYEES IN MARATHON COUNTY WISCONSIN.

By

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ABSTRACT

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The purpose of this study was to determine to what extent selected industrial employers of Marathon County value technological literacy and to what extent technological literacy is valued in entry-level employees. With the focus of technology education being directed toward producing graduates who are "technologically literate" this study was conducted to determine if industrial employers found these same traits as valuable to them in regard to hiring new employees, the success of new employees, and the ability of these employees to advance within the company.

With the goal of measuring the perceived value of technological literacy for entry-level employees in mind a thirty-four question survey was conducted with Marathon County's thirty largest industrial employers. The survey asked the respondents to rate

selected standards and benchmarks of the Wisconsin State Standards for Technology Education with a Likert scale type of survey. The survey concluded with some questions regarding the perceived value of technological literacy for the success and advancement of new employees.

The survey was well received and a response rate of 46.7% provided a statistically adequate sample with which to suggest that the results are representative of the sample group. The respondents, as a group, placed a high value on overall technological literacy and their responses indicated that employers perceived the greatest value to be for new employees ability to advance in their career.

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I would like to take this opportunity to extend some words of thanks to some very special people without who's help and support I could have never succeeded at this endeavor. First, I would like to thank my children, Blaine and Brittiany, for supporting me with their words of encouragement, their push to help me see what is truly important in life, and their never ending confidence in my abilities. The time, money, and resources dedicated to daddy's education I'm sure cost you two more then money could account for. Remember that with hard work and determination, you can accomplish your goals and nothing takes the place of a quality education. My hope is that I may be able to set an example by demonstrating that goals that are worthwhile never come easily. I hope you both can come to realize that the self-satisfaction of attaining these goals and the gaining of knowledge is priceless and can never be taken from you.

I would also like to thank my mother and father, the example of how they lived their lives and reached for and attained their goals in life, now and always will inspire me.

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Finally, I would like to thank all the students and parents that I have had the pleasure of working with over the years. The reason we teachers answer this calling is rewarded over and over with the confidence and trust you give us when you allow us to influence your lives.

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Chapter I

Introduction

Background of the Problem

The competitiveness of industry in the United States is dependent upon a skilled workforce. Mr. Thomas Beard states: "There's hardly a company in business that hasn't suffered from a woeful lack of skilled operators and technicians. But if more equipment builders, schools and users make comparable commitments to developing America's most precious resource, it's people, we will be well on the way to eradicating the most worrisome threat to our long term competitiveness"(Beard, T.L. 1989, p.36).

As educators and employers consider the changes in technology, what are their concerns?

> Employers face enormous changes in a highly competitive global marketplace. The new economy demanded new ways of thinking, new ways of managing, and new ways of working. As the nature and look of jobs changed, the level of education and skills required also changed. Many educators faced the challenge of preparing young people to participate in the increasingly complex and changing world of work by calling on employers to articulate and communicate their needs better (McLaughlin, 1992, p.1).

Recent journal articles and industry reports indicate that, nation wide, employers are dissatisfied with the readiness of high school graduates to enter the workforce. Brown contends, "education in this country continues to fall behind

what is required to sustain high-technology based industries" (Brown, S.F.,1992, p. 25). Even if the U.S. is able to continue developing new technologies and makes the capital expenditures necessary to utilize those developments, great improvements in productivity will be unlikely unless workers have the level of education and skill needed to handle the advanced technologies (Berger, 1987). Johnson concludes, "It is true that technology is having a definite effect on the nature and characteristics of the workforce. New occupations are being created while traditional occupations are being changed or eliminated. The workers that fill these changing occupations must update their knowledge and skills to remain employable. A wider variety of skills are now needed by the workforce" (Johnson, S.D., 1991, p. 4). Plant Engineering magazine reports that "It is not uncommon to see 14 out of 15 job applicants refused employment because of a lack of basic skills" (Seveska, R., 1992, p. 136). "Employers, policy makers, and educational leaders are starting to agree that all citizens need to be technologically literate in order to succeed in today's world" (Satchwell & Dugger, 1996, p. 5). Reports indicate that employment is being lost to overseas companies because U.S. companies cannot put together adequately capable workforces. The National Association of Manufacturers has estimated that forty percent of companies have had trouble upgrading production techniques because of inadequately skilled workers (Marshal, 1995).

With this being the rhetoric of the nation as a whole, one might easily be concerned that the businesses in a local area are also affected with similar problems. "With the unemployment rate below 4% employers in Marathon

County are continually on the lookout for workers to use for replacement and expansion in their businesses" (Shaver, 1997, p. A1). In May of 2001 in a conversation with John Kreager, human resources manager of Marathon County's seventh largest employer, Greenheck Fan, I was told of the difficulties that company has with hiring qualified workers. They typically hire under qualified workers and train them on the job, because they have such a desperate need. John also expressed that even the current workforce is sent for training to upgrade their skills as new technology is implemented.

Marathon County, Wisconsin's largest county, is located in north central Wisconsin and is accessed principally by highways I-35 and 51 going north and south, and highway 29 going east and west. It has an area of 1,545 square miles, contains 988,848 acres of real estate. Marathon County has over 3,300 employers, populations of about 126,393 persons of which over 73,000 are in the workforce and a county unemployment rate of 3.5 percent (Wisconsin Department of Workforce Development, 2000) (U.S. Census, 2000).

School districts, the state, and the nation have also recognized the need to improve the curriculum to meet the challenges of our technological society. The State of Wisconsin has published standards for education in technology education that outline the need for technological literacy of graduates. In the Wisconsin's Model for Academic Standards for Technology Education it states that "course offerings must include elements to ensure all students will graduate technologically literate" (Wisconsin DPI Bulletin No. 9006, 1998, p. XV). In the national spotlight the Technology for All Americans Project has published that

"the first priority of technology education is to provide technological literacy to all students" (International Technology Education Association, 1996, p. 35). The D.C. Everest Area School system, located in Marathon County, has also put together standards for their technology education program with the goal of technological literacy for students.

This research is intended to provide an insight to the extent to which selected industries in Marathon County value technological literacy and to what extent technological literacy is valued in entry-level employees. It is also a good way to give ownership to the industrial community in the efforts of the education system to promote technological literacy for graduates.

Statement of the problem

The problem is that it is unknown to what extent selected industrial employers of Marathon County value technological literacy and to what extent technological literacy is valued in entry-level employees.

The purpose of the study

The purpose of this study is to determine to what extent selected industrial employers of Marathon County value technological literacy and to what extent technological literacy is valued in entry-level employees.

Objectives of the study

This study will focus on the following objectives:

1. Identify to what extent technological literacy components are valued by selected industrial employers of Marathon County in entry-level employees.
2. Analyze to what extent selected industrial employers of Marathon County value technological literacy in entry-level employees.

Significance of the study

1. The results of this study will be used to validate the efforts of the local school district's efforts in aligning of the goals of the technology education department with the Wisconsin Standards for Technology Education.
2. The results of this study will also be shared with the administrators, staff, and school board, participating businesses, and the chamber of commerce.

Scope and delimitations of the study

This study will be limited to select employers in Marathon County, Wisconsin and will not be able to be generalized to any area out side of that location. This study does not include all standards from the Wisconsin State Standards for Technology Education and therefore may not determine conclusively that all state standards would be embraced or rejected by all employers. This study has been limited to only the largest thirty industrial employers of Marathon County, Wisconsin and therefore may not be generalized to all employers, businesses or persons.

On the following pages the term "technological literacy" will be defined and explained by some the leaders in education and industry. The components that make up technological literacy will be identified and explained in a way that is intended to justify

their use in the school system and their value for industry. Much will be made of the link between what is being taught and the needs of graduates to acquire and advance in careers that have a technical nature.

Chapter II

Review of Literature

The review of literature for this study will focus on the perceived need for and definition of technological literacy and the components of technological literacy that comprise its make up.

The Need for Technological Literacy

Most of our population is not being educated properly to function in the everyday world today, this is a time in which technologically literate citizens must make critical decisions affecting the global community (Kozak, 1992). Educational leaders are in agreement that the status quo is no longer sufficient today. "… the core subjects in our schools will be amended. The core subjects of one hundred years ago are no longer enough to adequately produce technologically prepared citizens …" (Satchwell & Dugger, 1996, p. 11). "Because high tech will have an ever-increasing impact on all aspects of society, it is more important than ever for educational planners to develop a comprehensive plan for technological literacy education" (Naylor, 1985, p. 2).

Our nation devotes much time and research into understanding what technologies are important for our country's continued success, prosperity and national security. As a result of this commitment, the White House publishes the National Critical Technologies Panel Report, an annual report that identifies important technologies. In that report it is stated: "Because the U.S. economy is broad and technologically advanced, many technologies are important to some aspect of the economic prosperity or national security" (White House Office of Science and Technology Policy, 2000, Appendix A,

p.1). Indeed our country's prosperity and even national security hangs in the balance of our being able to deal with and understand technology.

Leading our nation through its most prosperous years in history, President Clinton was keenly aware that technological literacy is a need for our youth and nation to succeed. In his administration's documentation on the subject he expressed to the nation his position as follows:

> "Just as 100 years ago the nation struggled with the transition from an agrarian to an industrial economy, today we confront the transition from an industrial to a global, technological economy. Technology … has become an engine of our economic growth and has fundamentally changed the ways we learn, how we do business, and the skills students in America need to flourish in the world of work. … Today, technological literacy … is a new basic that our students must master. … Beginning in 1995, President Clinton challenged the nation's parents, teachers, government, community, and business leaders to work together to ensure that all children in America are technologically literate by the dawn of the 21st Century—equipped with the communication, math, science, and critical thinking skills essential for the 21st-century economy" (President Clinton's Call to Action for American Education in the 21st Century, 1997, pp. 1 & 2).

It is not only our youth that need to be technologically literate, but the nation's citizenry as a whole must be knowledgeable about technology. Indeed, our duty as

educators is to produce good citizens that can contribute to society in a productive way. As far as the common citizen's need for knowledge of technology it is not enough that only a few persons understand technology. The complex issues with which communities, neighborhoods, regions, and nations must deal surround technology's effects on a host of areas: family work and leisure patterns and structure, genetic engineering of foods, organ donation, toxic waste, air quality, alternative energy sources, contraception, increased life expectancy, and health care reform. Decisions about these issues should be shared by informed citizens and be based on a full spectrum of perspectives and values, not just those of the scientific and technological elite (Selby, 1993). Indeed even the quality of our personal and work life is connected and affected by our attitudes about technology according to Kerka:

> "The quality of that life [sic] has a great deal to do with the attitudes, values, and abilities with which people deal with technology. In both life and work, people need flexibility and the attitudes and skills of lifelong learning to cope with technological change. Both education and training are needed: a trained person has the skills with which to use, create, and adapt technology and an educated person has the commitment and point of view that give meaning to the practice of those skills" (Kerka, S., 1994, p. 3).

An education professional has concluded in recent study that "… technology must play a larger role in students' curriculum"(Roberts, S., 2000, p. 24). Additionally it has been proposed that the best way to achieve technological literacy is through our schools (National Commission on Excellence in Education, 1983; National research Council,

1996). In his paper entitled "Productivity, the Workforce, and Technology Education", Johnson addresses our nations growing concerns about our ability to maintain the quality of life and competitiveness in industry by stating: "In response to the competitiveness problem, this country must strive to develop a highly skilled, adaptive workforce that develops and uses technology. This effort would result in a renewed competitive advantage through improved technologies and innovative, creative, and highly educated workers" (Johnson, S., 1991, p. 1). In the concluding statements of an article written by Kozak, of the University of North Texas, a point was made that it is not good enough today to just teach new technology skills, but to prepare people to know how to learn in order to stay technologically literate as technology advances (Kozak, M., 1992).

Success of an individual, both socially and economically, in our world has come to be directly dependent on his or her abilities and wise use of technology (Fanning, 1996).

The Definition of Technological Literacy

The writers of the Technology For All Americans Project defines technological literacy as the ability to use, manage, and understand technology. Identified as much more than being able to operate a computer, they further define a technologically literate person as a person who understands and appreciates the importance of fundamental technological developments (I T E A, 1996). The State of Wisconsin's Department of Public Instruction adds that a technologically literate person can better contribute to the global society and that technology is the way in which people have changed the world to satisfy their needs and wants. Technological literacy includes the ability to use, manage,

and understand the improvements and developments in how we as humans communicate, travel, build structures, make products, cure disease, and provide food. Technological literacy includes knowledge and skills in how to use, manage, and understand technology and the benefits and risks of current and future technology (Wisconsin DPI Bulletin No. 9006, 1998).

The Components of Technological Literacy

What are the components of technological literacy? With respect to the needs of this study, the guidelines set up through the Wisconsin State Standards for Technology Education seem to be the most legitimate source of the components that are relevant. Clarification of the intent of the components will be provided by the writings of, and about, the Technology For All Americans Project.

As stated in the standards, technological literacy is comprised of four components namely: the nature of technology, systems, human ingenuity, and the impact of technology (Wisconsin DPI Bulletin No. 9006, 1996).

Nature of Technology

The first component of technological literacy is the Nature of Technology, in other words, it is the extension of human capability (Wisconsin DPI Bulletin No. 9006, 1998). This component helps us to understand that it is technology that helps us shape our world and although different from the natural world, technology uses science and the natural world to solve problems and enhance our lives. This use can many times have moral and ethical issues that need to be considered at the prospect of the use of the technology. One

set of generally accepted characteristics were pointed out by Satchwell and Dugger (Satchwell & Dugger, 1996) as they sited Johnson, Foster and Satchwell with the following:

- "Technology is applied human knowledge. It is more than applied science.
- Technology is application based. It is a combination of knowing, thinking, and doing.
- Technology extends human capability. It enables humans to adapt to and change the physical world around them.
- Technology exists in social domains as well as physical domains. There are both "hard" technologies (e.g., tools, equipment, etc.) and "soft" technologies (e.g., management systems, software, Internet, etc.)" (Johnson, Foster & Satchwell, 1989, p. 12).

Systems

Systems make up the next component of a technologically literacy. Systems are made up of individual components and that each component affects the operation of the system and its relationship to other systems (Wisconsin DPI Bulletin No. 9006, 1998). Understanding systems thinking is thought to be important because of the sophistication and influence that systems have on our everyday lives. Technologically literate persons use a strong systems-oriented thinking approach to solving technological problems (ITEA, 1996). It is important for students to understand and identify the ways that

technological systems are planned, organized, designed, built, controlled, and how they have and will evolve to satisfy human needs and desires (Wisconsin DPI Bulletin No. 9006, 1998).

Human Ingenuity

Human ingenuity is the component of technological literacy that outlines how one would define problems, gather information, explore options, devise a solution, evaluate the outcome, and communicate the results (Wisconsin DPI Bulletin No. 9006, 1998). "These abilities [designing and developing technological systems] can be developed in students through experiences in designing, modeling, testing, troubleshooting, observing, analyzing, and investigating" (ITEA, 1996, p. 18).

Impact of Technology

The fourth and final component of technological literacy is the impact of technology. Fanning put it this way: "The consequences of new and pervasive technology are not all positive. There are costs associated with the evolution of the technological system: social conditions and interaction are altered, the accelerated use of natural resources and related consumption impacts the environment …"(Fanning, J., 1996, p. 3). The impact of technology is described as the ability to understand that technology affects society and the environment in ways that are both planned and unplanned and desirable and undesirable (Wisconsin DPI Bulletin No. 9006, 1998). In the Technology For All Americans Project publication it is put this way:

> "People make decisions about technological activities every day. However, the growing complexity of technological systems means that all technological decision-making should include an assessment of the impacts and consequences of an implemented or proposed technological system. All technological activity impacts humans, society, and the environment. Moreover, technological activity involves tradeoffs and risks. Decision makers should understand real vs. implied risks associated with technological developments" (ITEA, 1996, p. 22).

Conclusion for the Review of Literature

In the state of Wisconsin these four components have been set fourth as a guideline to technology education and the achievement of technological literacy for all graduates. Our goal is to provide "… technological literacy level of high school graduates to [sic] provide the foundation for a lifetime of learning about technology" (ITEA, 1996, p. 40).

In a recent study, it was found that major employers are looking for prospective employees with general, or basic, skills that seem to be relevant to most workers. The employers were looking for people who can communicate, think, and continue to learn throughout their lives. They also value someone who can demonstrate positive attitudes and behaviors, responsibility, and adaptability. Further the employers defined the term think as: think critically and act logically to evaluate situations, solve

problems, and make decisions; understand and solve problems using technology, instruments, tools, and information systems and knowledge from various fields (McLaughlin, 1992).

Today employers are thought to be more interested in evaluating employability skills than in the past. Employability skills refer to those skills required to acquire and retain a job (Saterfiel & McLarty, 1995).

It is the premise of this study that the path set forth for technology education at the local, state, and national level meets these employer needs well. The focus of this study is to determine if employers of Marathon County Wisconsin view technological literacy as valuable and if they value technological literacy traits as employability skills.

Chapter III

METHODS AND PROCEDURES

Introduction

The purpose of this study is to determine to what extent selected industrial employers of Marathon County value technological literacy and to what extent technological literacy is valued in entry-level employees. The methods and procedures used in this study of industrial employers are explained in this chapter under the headings of methodology, research population, instrumentation, procedures followed, and treatment of data.

Methodology

The needs analysis survey was used for fulfilling the objectives of this study. A one-page cover letter ("Appendix B"), research consent form ("Appendix C"), a copy of the Wisconsin's Model Academic Standards for Technology Education, posted return envelope, and a two-page instrument was developed with thirty-four items for the respondent to react to through a graduated 5-point scale ("Appendix A"). All subjects received identical surveys. The survey approach encompassed sending out the survey instrument and sending out a follow up letter ("Appendix D") to the identified population. Receiving and collecting the responses and having them analyzed to provide the raw data from the survey. From the raw data values were determined for the items on the survey, and those values provided information in regard to the objectives.

Research Population

The population for this study was the thirty largest industrial employers of Marathon County, Wisconsin, based on the number of employees. The list of company names, contact persons, and addresses was acquired from the 2001 Wisconsin Manufacturers Directory (Wisconsin Manufacturers & Commerce, 2001). The survey was sent to human resources personnel listed in the Wisconsin Manufacturers Directory for the selected companies. If a human resource person was not listed in the directory the survey was sent to the owner, CEO, or president of the company as listed in the directory.

Instrumentation

The instrument is made up of thirty-four items for the respondents to evaluate on two sides of one page. The survey instrument has been constructed so that the respondents could be evaluated on the 5-point Likert scale. Tim Mero, vocational education coordinator of the D.C. Everest Area School District, approved the content validity of the instrument. A copy of the survey instrument is included as "Appendix A" of this study.

The survey instrument was developed by the author of this study from the Wisconsin State Standards for Technology Education (Wisconsin DPI Bulletin No. 9006, pp 1, 1996) and reviewed by the investigation advisor and technology education personnel at the D.C. Everest High School. The instrument was then presented to a member of the Marathon County Industrial Resource Committee for consideration and input.

The survey instrument is a two-part survey. The first part of the survey was made up of components of the State standards selected by the author that he deemed pertinent to

industrial employers. The second part of the survey instrument examines the extent to which industries value a technologically literate workforce in entry-level positions.

The intent of the formation of the survey instrument was two fold. First, the author wanted to orient the respondents to the components of technological literacy. To do this, the survey used the components of technological literacy set forth by the State of Wisconsin for technology education. The first part of the survey instrument explores the extent to which the employer values individual components of technological literacy in employees for entry-level positions at the respondents company. With the integrity of the research in mind the author used the selected components without major revisions. Secondly, to have the research population respond to questions regarding if the employer valued technological literacy as useful for persons to be hired, succeed, and advance within the company ("Appendix A").

Procedures Followed

The research process consisted of problem identification, literature review, survey development, survey administration, treatment of data, summarization of data, and generation of recommendations.

Treatment of Data

The U.W.-Stout Statistical staff did an analysis of the survey. Interpretations of the results have been compiled into a readable format and conclusions drawn with the assistance of the investigation advisor, and D.C. Everest technology education staff members. The final draft of the report will be made available to participating businesses,

administrators, staff and faculty of Marathon County educational institutions, and the Marathon County Industrial Resource Committee.

Chapter IV

ANALYSIS OF RESULTS

The purpose of this study was to determine to what extent selected industrial employers of Marathon County value technological literacy and to what extent technological literacy is valued in entry-level employees.

Selected industrial employers from Marathon County Wisconsin were surveyed in the spring of 2002. The survey consisted of two sections that addressed the two objectives of this study. The survey was conducted using a five point Likert Scale. The scale rankings were as follows: Not Valuable = 1, Somewhat Valuable = 2, Valuable = 3, Very Valuable = 4, and Extremely Valuable = 5. Results for these questions are the average of the responses received from the survey population. Data generated for each survey item included the number of responses were received for each item, the mean of the responses, the response representations of the mean for the results as listed in the survey, and the standard deviation. The author also noted which responses were not selected by any of the respondents in the study.

The first objective of this study was to identify to what extent technological literacy components are valued by selected industrial employers of Marathon County in entry-level employees. This objective was addressed by asking the respondents to place a value on selected components of technological literacy as identified by the Wisconsin State Standards for Technology Education. The components used were drawn from the state standards and selected by the author as being relevant to industrial employers and arranged by the four standard areas as defined by the Wisconsin state standards namely:

A. Nature of Technology, B. Systems, C. Human Ingenuity, and D. Impact of Technology. At the end of each series of components respondents were asked to value the standard as it read in the state standards in regard to an entry-level employee.

The second objective of this study was to analyze to what extent selected industrial employers of Marathon County value technological literacy in entry-level employees. This objective was addressed by part two of the survey with three questions constructed by the author in regard to the value of technological literacy by an entry-level job applicant, the value of technological literacy for success of an entry-level employee, and the value of technological literacy for advancement in a job for a entry-level employee.

Return Percentage

The return of the surveys in this study was fourteen out of thirty, or a percentage of 46.7%. A recent study of response rates for mailed surveys cites many instances of published research by reputable organizations that had response rates at, or below, the return rate obtained by this study (Hager, Wilson, Pollak, & Rooney, 2002). Noting the above study (Hager, et el, 2002) the return rate of this study appears to be sufficient. The surveys were collected and presented to Christine Ness, Information and Operations System Coordinator, at UW-Stout for analysis. The findings of this data follow.

RESULTS OF THE STUDY

Part one: Technological Literacy Components:

To what extent are technological literacy components are valued by industrial employers of Marathon County for entry-level employees?

This section was divided into the four content standards for Technology education set fourth by the state of Wisconsin. Components used in this survey are listed under each of the content standards, and the final question in each section is a restatement of the description of the content standard as found in the state standards document.

A. **Nature of Technology**

1. Employees will discover that technology is know-how that extends human capabilities to solve problems or enhances the quality of life while science helps us to discover what is natural

# of responses out of 14	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
14	2.36		.93	5= extremely valuable

2. Employees will show that technology has allowed us to further the efforts of science and, in turn, science has enabled us to develop better technology

# of responses	Mean	Response Representation	Standard Deviation	Responses Not selected
14	2.57	2= somewhat valuable 3= valuable	1.22	All selected at least once

3. Employees will explain the need for and application of knowledge and skills from other disciplines when engaging in technological activities

out of 14	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
14	3.14	3= valuable 4= very valuable	1.03	All selected at least once

4. Employees will contrast the increasing complexities of technology with its ease of use

# of responses out of 14	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
	2.71	2= somewhat valuable	.83	5= extremely valuable

5. Employees will understand that humans are faced with moral and ethical issues because technology is enabling very significant modifications to the natural world

# of responses out of 14	Mean of responses	Response Representation	Standard	Responses Not selected
	2.29	2= somewhat valuable 3= valuable	1.20	All selected at least once

6. Employees will explain why decisions regarding the use of technology are dependent on the situation, application, or perception of the group using it

# of responses	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
		2= somewhat valuable 3= valuable	1.03	All selected at least once

7. Employees will explain how scientific and technological research can contribute to improved quality of life and a better standard of living

	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
14	2.79	2= somewhat valuable 3= valuable	1.19	All selected at least once

Standard A. Nature of Technology. The above are selected components of the content standard called the Nature of Technology. The standard reads: "Students in Wisconsin will understand that technology is an extension of human capability." How much would you value an entry-level employee with your company that had this understanding?

# of responses out of 14	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
13	2.46	2= somewhat valuable 3= valuable	.66	4= very valuable 5= extremely valuable

B. **Systems**

1. Employees will identify the parts of a system and explain how the parts working together allow the system to do things the individual parts are unable to do alone

# of responses out of 14	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
14	3.21	3= valuable 4= very valuable	1.05	1= not valuable

2. Employees will compare and contrast the function of each of the following common elements of technological systems: inputs, processes, outputs, and feedback

	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
14	3.07	3= valuable 4= very valuable	1.14	All selected at least once

3. Employees will identify potential sources of failure in a system; such as, defective parts, maintenance needs, a large number of complex components, or use in applications beyond its original purpose

# of responses out of 14	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
14	3.57	3= valuable 4= very valuable	.76	1= not valuable 2= somewhat valuable

4. Employees will identify all the resources necessary for a given system; analyze how the use of the resources will be affected by consideration for cost, availability, appropriate application, and regard for the environment

# of responses out of 14	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
14	3.50	3= valuable 4= very valuable	.94	1= not valuable

5. Employees will assess the impact new and improved products and services have had on the quality of life; explain how the development of new tools, materials, and processes is necessary to maintain and improve high productivity and quality

	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
14	3.07	3= valuable 4= very valuable	.92	1= not valuable

6. Employees will select and apply appropriate processes to transform information into its most useful format

# of responses out of 14	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
14	3.79	3= valuable 4= very valuable	.70	1= not valuable 2= somewhat valuable

Standard B. Systems. The above are selected components of the content standard called Systems. The standard reads: "Students in Wisconsin will recognize that systems are made up of individual components and that each component affects the operation of the system and its relationship to other systems." How much would you value an entry-level employee with your company that had this understanding?

# of responses out of 14	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
14	3.21	3= valuable 4= very valuable	.89	1= not valuable

C. Human Ingenuity

1. Employees will show how modern inventions and innovations have evolved as a result of new knowledge and technology

	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
14	2.36	2= somewhat valuable 3= valuable	.84	5= extremely valuable

2. Employees will explain the value of technical knowledge and teamwork in the development of a device or process

# of responses out of 14	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
14	3.07	3= valuable 4= very valuable	.83	1= not valuable 5= extremely valuable

3. Employees will explain how changing the physical characteristics of material or the format of information can increase its usefulness

# of responses out of 14	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
14	3.29	3= valuable 4= very valuable	.83	1= not valuable

4. Employees will implement and evaluate strategies to solve technological problems that are likely to be successful

# of responses out of 14	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
14	3.64	3= valuable 4= very valuable	.84	1= not valuable 2= somewhat valuable

5. Employees will measure, collect, and analyze data in order to solve a technological problem

# of responses out of 14	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
14	3.79	3= valuable 4= very valuable	.89	1= not valuable

6. Employees will select materials and other resources for a technological design and develop practical solutions

# of responses out of 14	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
14	3.79	3= valuable 4= very valuable	.97	1= not valuable

7. Employees will present a design solution that accounts for production of a device; how the device would be operated, maintained, replaced, and disposed of; and, who will sell and manage it

# of responses out of 14	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
14	3.36	3= valuable 4= very valuable	1.01	1= not valuable

8. Employees will apply basic engineering concepts in the design and creation of solutions to various problems or opportunities

# of responses out of 14	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
14	3.64	3= valuable 4= very valuable	.84	1= not valuable

9. Employees will select and apply appropriate processes to alter the characteristics of material to make it useful in different situations

	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
14	3.29	3= valuable 4= very valuable	.83	1= not valuable

Standard C. Human Ingenuity. The above are selected components of the content standard called Human Ingenuity. The standard reads: "Students in Wisconsin will be able to define problems, gather information, explore options, devise a solution, evaluate the outcome, and communicate the results." How much would you value an entry-level employee with your company that had this understanding?

# of responses out of 14	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
14	3.86	3= valuable 4= very valuable	.77	1= not valuable 2= somewhat valuable

D. Impact of Technology

1. Employees will identify the advantages, disadvantages, risks, and benefits of given technologies

# of responses out of 14	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
14	3.50	3= valuable 4= very valuable	.94	5= extremely valuable

2. Employees will explain the importance of making projections, studying scenarios, and making thoughtful decisions because of the direct and indirect effects technology will have on the future

# of responses out of 14	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
14	3.14	3= valuable 4= very valuable	.95	5= extremely valuable

3. Employees will analyze how the values and beliefs of different people can influence their perceived risks and benefits of a given technology

# of responses out of 14	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
14	2.93	2= somewhat valuable 3= valuable	1.07	5= extremely valuable

4. Employees will evaluate the relative appropriateness of a given technology by comparing the risks with the benefits or the advantages with the disadvantages

# of responses out of 14	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
14	3.36	3= valuable 4= very valuable		All selected at least once

5. Employees will show how the effects of a given technology may be unacceptable under one set of circumstances but acceptable under a different set of circumstances

# of responses out of 14	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
14	3.14	3= valuable 4= very valuable	.77	1= not valuable 5= extremely valuable

Standard D. Impact of Technology. The above are selected components of the content standard called Impact of Technology. The standard reads: "Students in Wisconsin will understand that technology affects society and the environment in ways that are both planned and unplanned and desirable and undesirable." How much would you value an entry-level employee with your company that had this understanding?

# of responses out of 14	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
		3= valuable	.55	1= not valuable 5= extremely valuable

Part two: Over all Technological Literacy

To what extent selected do industrial employers of Marathon County value technological literacy in entry-level employees?

This section of the survey was intended to have employers evaluate how overall technological literacy for an entry-level employee would be valued. The questions were formulated by the author to determine if employers valued this knowledge for applicants for entry-level positions, for success of entry-level employees, and for the benefit of the entry-level employee in regard to advancement opportunities.

1. How valuable do you feel technological literacy is when considering applicants for entry-level positions?

# of responses out of 14	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
14	3.07	3= valuable 4= very valuable	.47	1= not valuable 5= extremely valuable

2. How valuable do you feel technological literacy would be to success on the job for someone in an entry-level position?

# of responses out of 14	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
14	3.14	3= valuable	.66	1= not valuable 5= extremely valuable

3. How valuable do you feel technological literacy would be to advancement in a job for someone in an entry-level position?

# of responses out of 14	Mean of responses	Response Representation	Standard Deviation	Responses Not selected
14		4= very valuable	.78	1= not valuable 2= somewhat valuable

Chapter V

Summary, Conclusions, and Recommendations

Technology education in the state of Wisconsin and the nation is continually in a state of change. Standards have been developed for technology education by committees made up of industry and education leaders that are being set forth as a framework with which to mold local technology education programs. This study was designed to gauge local industrial employer's support for the standards that have been developed by the state of Wisconsin. The study was designed to address the following objectives:

1. Identify to what extent technological literacy components are valued by selected industrial employers of Marathon County in entry-level employees.
2. Analyze to what extent selected industrial employers of Marathon County value technological literacy in entry-level employees.

Methods and Procedures

After identifying the problem and developing a purpose for the study a review of literature lead to the development of the objectives of the study. The development of the survey instrument was specifically tailored to evaluate perceived values of those components of technological literacy within each of the state drafted standards for technology education that seemed to be relevant to industrial employers. A cover letter and copy of the State of Wisconsin Standards for Technology Education and the thirty-four-question survey were sent out to the research population. The largest thirty industrial employers of Marathon County, Wisconsin were selected as the research population and the survey was sent to the respective company's human resources person or other

company executive in charge of hiring new employees. Of the thirty surveys sent out a total of fourteen were returned for a percentage of 46.7% return rate. This is a strong enough response to be a representative sample of the research population. The returned surveys were sent to UW-Stout for data analysis.

Major Findings

This study found that the standards of "Systems" valued at 3.79 and "Human Ingenuity" valued at 3.86 were valued most and the "Nature of Technology" standard was valued least at 2.46 by employers in the study. Employers rated technological literacy as "valuable" when considering a person for entry-level positions and also "valuable" for success on the job for those employees, but their strongest endorsement for technological literacy was for advancement opportunities for someone in an entry-level position with a "very valuable" rating.

In the "Nature of Technology" standard employers most strongly endorsed the component of "application of knowledge and skills" with a rating of 3.14, or valuable. The Author was not surprised by the ratings returned for the "Nature of Technology" standard at 2.46 which is between the 2 or "somewhat valuable" and the 3 or "valuable" rating as this standard deals with what could be considered less concrete elements of technological literacy and might not be considered as economically important to industrial employers in lean economic times.

The "Systems" standard showed that employers valued the components dealing with "selecting and applying processes", #6, "use of resources", #4, and "identifying potential sources of failure", #3, as the highest with ratings of 3.79, 3.50, and 3.57 respectively valuing them between "valuable" and "very valuable". The "not valuable" response was

not selected by any of the employers and standard deviations between .70 and .94 for these three components showed a very high agreement for the values given. The "Systems" standard was rated at a 3.21 with a standard deviation of .89 demonstrating that employers found the standard as "valuable" or "very valuable" for an entry-level employee.

The author was pleased with the endorsement of the standard "Human Ingenuity" by the employers with a rating of 3.86 and a standard deviation of .77 showing that they valued this standard approaching the "very valuable" rating. The two most valued components of this standard were the "measure, collect, and analyze data", #5, and the "select materials and develop practical solutions", #6, both with a rating of 3.79 nearing the "very valuable" rating for entry-level employees. All except one of the nine components of this standard were valued above the three (3=valuable) level and of those, the research population never selected the rating of "not valuable".

The fourth standard, "Impact of Technology", was rated at the "valuable" level with a standard deviation of .55, the lowest standard deviation in part one of the study, showing a very strong agreement of the value of the standard for entry-level employees. The component of the "Impact of Technology" standard showing the most value to employers was #1, the "identify the advantages, disadvantages, risks and benefits of given technologies" component being rated at 3.5 between the "valuable' and "very valuable" level.

Conclusions

The state and national push to develop standards for education has produced standards for technology education that have been adopted for the state of Wisconsin and from the

results of this study it can be concluded that industrial employers find value in the standards and components that have been identified. It can also be concluded that "technological literacy" is seen as valuable for the consideration and success of entry-level employees. From this study it can be concluded that employers feel that being technologically literate can enhance the potential for advancement of entry-level employees.

With the return rate of 46.7% for this study, one can conclude that even in this economically challenging time, employers have their eyes on the future and feel that their input into the educational system is a worthwhile use of their time.

One can conclude that the State of Wisconsin Standards for Technology Education are directing the school systems in the right direction and that the industrial employers of Marathon County, Wisconsin are supportive of the effort. This study shows strong support from industrial employers for "technological literacy" as valuable for entry-level employee's success and advancement opportunities.

Recommendations

Using the results of this study, the author hopes to promote the technology education efforts of the D.C. Everest Area School District and other school districts in trying to produce students who are "technologically literate". The support demonstrated by the industrial employers of this county is very likely shared by industrial employers in other places. The author recommends that this study and other studies like it can be used to increase support for technology education programs, which can lead to stronger relationships with industry and even better programs for students.

Recommendations for further study

It is recommended that this study be repeated in other counties and perhaps even on a statewide scale to determine if the results are repeatable. Other studies could be initiated to determine why some components are not as highly valued as others, which could lead to component revisions, additions, or deletions. One might find that lower values relate more to employer misinformation, than to the components and standards content. Research could uncover areas of misalignment of the education system and societal needs. Research might also be valuable to determine if more effort needs to be expended in educating industry as to the efforts of technology education to produce more technologically literate graduates and how a technologically literate workforce could impact their industry.

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APPENDIX A: SURVEY

Technological Literacy in entry-level employees

Part one: Technological Literacy Components

In regard to the following components of technological literacy,
how valuable are they for entry-level employees?

Selected components of the content standard:

Response Scale
Check the box that best indicates how much you value each item in an entry-level employee.

A. Nature of Technology

Employees will:

	not valuable	somewhat valuable	valuable	very valuable	extremely valuable
1. Discover that technology is know-how that extends human capabilities to solve problems or enhances the quality of life while science helps us to discover what is natural					
2. Show that technology has allowed us to further the efforts of science and, in turn, science has enabled us to develop better technology					
3. Explain the need for and application of knowledge and skills from other disciplines when engaging in technological activities					
4. Contrast the increasing complexities of technology with its ease of use					
5. Understand that humans are faced with moral and ethical issues because technology is enabling very significant modifications to the natural world					
6. Explain why decisions regarding the use of technology are dependent on the situation, application, or perception of the group using it					
7. Explain how scientific and technological research can contribute to improved quality of life and a better standard of living					
Standard A. **Nature of Technology**. The above are selected components of the content standard called the **Nature of Technology**. The standard reads: "Students in Wisconsin will understand that technology is an extension of human capability." How much would you value an entry-level employee with your company that had this understanding?					

Selected components of the content standard:

Response Scale
Check the box that best indicates how much you value each item in an entry-level employee.

B. Systems

Employees will:

	not valuable	somewhat valuable	valuable	very valuable	extremely valuable
1. Identify the parts of a system and explain how the parts working together allow the system to do things the individual parts are unable to do alone					
2. Compare and contrast the function of each of the following common elements of technological systems: inputs, processes, outputs, and feedback					
3. Identify potential sources of failure in a system; such as, defective parts, maintenance needs, a large number of complex components, or use in applications beyond its original purpose					
4. Identify all the resources necessary for a given system; analyze how the use of the resources will be affected by consideration for cost, availability, appropriate application, and regard for the environment					
5. Assess the impact new and improved products and services have had on the quality of life; explain how the development of new tools, materials, and processes is necessary to maintain and improve high productivity and quality					
6. Select and apply appropriate processes to transform information into its most useful format					
Standard B. **Systems**. The above are selected components of the content standard called **Systems**. The standard reads: "Students in Wisconsin will recognize that systems are made up of individual components and that each component affects the operation of the system and its relationship to other systems." How much would you value an entry-level employee with your company that had this understanding?					

Selected components of the content standard:

C. Human Ingenuity

Employees will:

Response Scale
Check the box that best indicates how much you value each item in an entry-level employee.

	not valuable	somewhat valuable	valuable	very valuable	extremely valuable
1. Show how modern inventions and innovations have evolved as a result of new knowledge and technology					
2. Explain the value of technical knowledge and teamwork in the development of a device or process					
3. Explain how changing the physical characteristics of material or the format of information can increase its usefulness					
4. Implement and evaluate strategies to solve technological problems that are likely to be successful					
5. Measure, collect, and analyze data in order to solve a technological problem					
6. Select materials and other resources for a technological design and develop practical solutions					
7. Present a design solution that accounts for production of a device; how the device would be operated, maintained, replaced, and disposed of; and, who will sell and manage it					
8. Apply basic engineering concepts in the design and creation of solutions to various problems or opportunities					
9. Select and apply appropriate processes to alter the characteristics of material to make it useful in different situations					
Standard C. **Human Ingenuity**. The above are selected components of the content standard called **Human Ingenuity**. The standard reads: "Students in Wisconsin will be able to define problems, gather information, explore options, devise a solution, evaluate the outcome, and communicate the results." How much would you value an entry-level employee with your company that had this understanding?					

Selected components of the content standard:

D. Impact of Technology

Employees will:

Response Scale
Check the box that best indicates how much you value each item in an entry-level employee.

	not valuable	somewhat valuable	valuable	very valuable	extremely valuable
1. Identify the advantages, disadvantages, risks, and benefits of given technologies					
2. Explain the importance of making projections, studying scenarios, and making thoughtful decisions because of the direct and indirect effects technology will have on the future					
3. Analyze how the values and beliefs of different people can influence their perceived risks and benefits of a given technology					
4. Evaluate the relative appropriateness of a given technology by comparing the risks with the benefits or the advantages with the disadvantages					
5. Show how the effects of a given technology may be unacceptable under one set of circumstances but acceptable under a different set of circumstances					
Standard D. **Impact of Technology**. The above are selected components of the content standard called **Impact of Technology**. The standard reads: "Students in Wisconsin will understand that technology affects society and the environment in ways that are both planned and unplanned and desirable and undesirable." How much would you value an entry-level employee with your company that had this understanding?					

Part two: Over all Technological Literacy

In regards to technological literacy, to what extent does your company value technological literacy in entry-level employees?

Response Scale
Check the box that best indicates how much you value each item in an entry-level employee.

Technologically Literate Applicants and Workers

	not valuable	somewhat valuable	valuable	very valuable	extremely valuable
1. How valueable do you feel technological literacy is when considering applicants for entry-level posisions?					
2. How valuable do you feel technological literacy would be to success on the job for someone in an entry-level position?					
3. How valuable do you feel technological literacy would be to advancement in a job for someone in an entry-level position?					

APPENDIX B: Cover Letter

To: «Courtesy_Title» «First_Name» «Last_Name»
«Title»
«Company»
«Postal_Address»

Dear «Courtesy_Title» «Last_Name»,

As you are keenly aware, education of our youth in this country is a responsibility that we realize is vitally important not only for the youth of this country, but also for the continued and future economic well-being of the nation. The preparation of young people to be productive and contributing citizens is in everyone's best interest. The continued advancement of the complexity and use of technology has presented the state and nation with challenges in preparing youth for the world they face. The call has come out to prepare youth by making them "technologically literate". Encompassing much more than just working with computers, it is the ability to use, manage, and understand technology.

The state of Wisconsin has also recognized the need to promote technological literacy and have developed a set of state academic standards for technology education that are meant to guide schools in preparing technologically literate graduates.

I am contacting you today to enlist your input on the value of technological literacy. «Company», being a prominent industry in Marathon County your input is valuable to help guide the local educational system to prepare youth for their future. I am conducting a study to find out to what extent selected industrial employers of Marathon County value technological literacy in entry-level employees. Working with the University of Wisconsin-Stout, I am conducting this study to gauge the level of local support for the state and national effort to promote technological literacy. The results of this study will be made available to parents, teachers, school boards, and citizens of Marathon County so that they may better understand the value local industry places on technological literacy.

The enclosed survey has been composed of selected components and standards from the Wisconsin's model academic standards for technology education. I have also enclosed the complementary copy of the standards for you to have. The survey and return envelope for you to use has no coding or tracers so you can rest assured that anonymity of your responses will be preserved.

Your input on this subject is vitally important to the proper education of our youth. I appreciate your time and effort to complete this survey, the input you will provide in the next few minutes while filling out this survey will be useful and will provide us an insight that would be hard to get in any other way.

Sincerely,

John M. Glynn, Industrial Technology Education
D.C. Everest Area School
6500 Alderson St., Weston, WI 54476
Phone: Work 359-6561 Home 359-8985

APPENDIX C: Consent Form

CONSENT FORM

I understand that by returning this survey, I am giving my informed consent as a participating volunteer in this study. I understand the basic nature of the study and agree that any potential risks are exceedingly small. I also understand the potential benefits that might be realized from the successful completion of this study. I am aware that the information is being sought in a specific manner so that no identifiers are needed and so that confidentiality is guaranteed. I realize that I have the right to refuse to participate and that my right to withdraw from participation at any time during the study will be respected with no coercion or prejudice.

Note: Questions or concerns about the research study should be addressed to John Glynn, the researcher, at 715-359-8985 or Dr. Steve Schlough, the research advisor, 715-232-1484. Questions about the rights of research subjects can be addressed to Sue Foxwell, Human Protections Administrator, UW-Stout Institutional Review Board for the Protection of Human Subjects in Research, 11 Harvey Hall, Menomonie, WI, 54751, phone (715) 232-1126.

APPENDIX D: Follow-up Letter

To: «Courtesy_Title» «First_Name» «Last_Name»
«Title»
«Company»
«Postal_Address»

Dear «Courtesy_Title» «Last_Name»,

A few days ago I sent you a letter with a (sand colored) survey about the value of technological literacy for entry-level employees, in the hope that you might help guide the local schools in your area to provide graduates better able to fill the needs of your company. I would like to take this opportunity to thank you for participating in this study and giving a small amount of your time to provide your input.

«Company», being a prominent industry in Marathon County, your insight is valuable to help guide the educational system to prepare youth for their future.

In the event that you didn't find time to fill out the survey, please take a few minutes right now to do so in order that we as educators can better serve you. If the survey has been misplaced, please feel free to contact me and I will be happy to send you another.

Your input on this subject is vitally important to the proper education of our youth. I appreciate your time and effort to complete this survey. The input you provided, or will provide, will be useful and provide us an insight that would be hard to get in any other way.

Sincerely,

John M. Glynn,
Industrial Technology Education
D.C. Everest Area High School
6500 Alderson St., Weston, WI 54476
Phone: Work 359-6561 Home 359-8985