A CONSUMER STUDY EVALUATING THE EXTENT TECHNOLOGY EDUCATION TEXTBOOKS USE 1993 BENCHMARKS FOR SCIENCE LITERACY

by

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ABSTRACT

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A review of how well introductory technology education textbooks incorporate the 1993 Benchmarks for Science Literacy were investigated. Important technology education definitions, readability, organization of content and actual substantive coverage of five sample issues in technology from Chapter 3, Nature of Technology, 1993 Benchmarks for Science Literacy text were determined for each textbook. The results indicated that only three of the seven introductory technology education textbooks studied have substantive coverage of the 1993 Benchmarks for Science Literacy. The table profiles allow a technology educator to begin to identify some textbook series that may be worthy of further investigation. The findings can help educators draw conclusions about what the textbook series can be expected to accomplish in terms of its potential for helping students learn issues in technology from Chapter 3 (Nature of Technology), 1993 Benchmarks for Science Literacy.

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CHAPTER 1

INTRODUCTION

This chapter will outline the different curriculum renovations occurring within Technology Education and the resources available to educators for selecting textbooks for new curriculum. Middle school educators are placing greater emphasis on the characteristics of the age group when developing appropriate curriculum. Middle school students experience dramatic physical, mental and social changes during the transescent years. Curriculum at the middle level is becoming more student centered and less content centered. "Middle schools must move from a highly departmental approach to an approach that reflects the developmental needs of students" (Merenbloom, 1988, p. 4). "Developers of instructional materials can use *Benchmarks for Science Literacy* to guide the creation of materials to support the work of teachers who are trying to foster science literacy for all students" (AAAS, 1993, p.3). Middle school technology education's challenge is to develop curriculum and select textbooks that reinforce the goals in *The Benchmarks for Science Literacy* and contain concepts and learning experiences that are developmentally appropriate and attentive to the special needs of early adolescents in their transescent years.

Technology education in the United States is in a transitional stage. In 1981, the Jackson's Mill Industrial Arts Curriculum Theory was rapidly adopted in industrial arts education and maintained a pre-vocational content based curriculum. Today, the technical education movement has a strong emphasis on technological literacy. "The great urgency is not "computer literacy" but "technological literacy," the need for students to see how society is being reshaped by our inventions, just as tools of earlier eras changed the course of history. The challenge is not learning how to use the latest piece of hardware, but asking when and why it should be used (Boyer, 1983, p.111). Middle school technology education curriculum in many school districts are technology education in name only and still follow the pre-vocational Industrial Arts curriculum of the past.

Other school districts have adopted new approaches to technology education and implemented expensive fancy new technology centers with modular workstations that focus around technology topics.   In today's rapidly changing advanced technological world many middle school technology educators are struggling to keep pace. Technology educators in urban school districts are faced with the difficult task of developing appropriate inexpensive curriculum that teaches the same concepts and principles of the new modular workstations.

Technology surrounds us everywhere and the mere size of the discipline prevents us from teaching everything at once. Curriculum developers divide the discipline up differently. The Jackson's Mill Industrial Arts Curriculum theory divides technology into job-related content areas. "The document created from this meeting, the Jackson's Mill Industrial Arts Curriculum Theory, identified four curriculum content areas: communication systems, construction systems, manufacturing systems and transportation systems" (MacDonald and Zargari, 1994, p.10). The foundation for this curriculum is the breadth of the content area and the core concepts are taught within this content area exclusively. Unfortunately the practicing teacher's hidden curriculum in industrial arts centered around different projects. The modular approach adopted in Pittsburgh, Kansas divides technology into technology topic areas. Modular workstations are time driven in design and every topic area is given the same attention. "Ten days are allowed to complete the module-which is appropriate to the attention span of the middle level student" (Iley, Neden and Winchester, 1986, p.19). Kenneth Welty, a professor of technology education at the University of Wisconsin-Stout, is an advocate of developing curriculum from an original conceptual outline.

Developing curriculum from a conceptual outline is student centered and attentive to the needs of practicing teachers in less advantaged school districts. This approach could divide technology into objects (sixth grade), processes or design (seventh grade) and enterprises (eighth grade). Developing curriculum from core concepts important to middle school students is built around the idea that "less is more" (AAAS, 1993). "One of the fundamental premises underlying the principle that less is more is the notion that all the ideas, concepts, and skills that constitute technological knowledge have equal value in the lives of young people" (Welty, 1996, p.5). Core concepts in each grade level have a horizontal component that will stress broad generalizations that cuts across a variety of technologies. "Technology teachers that embrace this philosophy strive to help children begin to develop a conceptual knowledge base and the thinking skills necessary for a lifetime of building new understandings, without concentrating on unnecessary details" (Welty, p.5). For example, a seventh grade design course construction would have curriculum that might contain a design experience in civil engineering, architectural engineering, mechanical engineering and graphics that would result in student ownership of the concept of design and application of design to any type of technology. Joseph Novak, Purdue University, in writing about the role of concepts in science teaching preferred "not to belabor the definition of terms but choose instead to provide an illustration for the term used, for example, evolution is a major concept in biology, and then proceed to use the term with reasonable consistency" (Harris and Klausmeier, 1966, p. 241).

Designers of curriculum from a conceptual outline should follow three rules. The curriculum must be totally inclusive (applicable to all technology), mutually exclusive (content areas are separate and unique) and operationally appropriate (will it work?). The taxonomy of teaching core concepts and constructs in each grade level horizontally is maintained while progressive vertical building on old understandings is incorporated in each successive grade level in the concept based curriculum approach.

Many scholars feel meaningful learning activities in technology education curriculum should be structured from simple to complex, utilize real world examples, incorporate group work, individually maintain holistic ideas and capitalize on interdisciplinary themes. Learning activities can be designed for guided inquiry, cooperative learning, constructivist discussions, role-playing and simulations. In the search for meaning in adolescent education, research has shown that "it follows from this that intelligence, at all levels, is an assimilation of the datum into structures of transformations, from the structures of elementary actions to the higher operational structures" (Piaget, 1969, p.29).

Constructivist researchers contend that educators construct knowledge from already known or perceived knowledge by asking open ended questions with multiple correct answers and teaching holistical concepts and comparing them to real world examples. "Schools can better reflect the complexities and possibilities of the world. They can be structured in ways that honor and facilitate the construction of knowledge" (Brooks and Brooks, 1993, p.6). Educators in all disciplines are focused on making curriculum that reflects the real world. Research has shown that students attach meaning to things they already understand. John Dewey wrote in his explanation of the formation of knowledge that "the mind is simply endowed with the power of producing various qualities in reaction to the various realities which act upon it" (Dewey, 1966, p. 69).

Assessment strategies are important to curriculum choice if educators agree that it assists in the learning process. Advocates of reform in education have adopted the performance assessment or authentic assessment as alternatives to standardized multiple-choice tests which can be impersonal and mechanistic. "Because of the widespread and inherent mismatch between the student-centered orientation of teachers and the depersonalized orientation of fill-in-the-bubble testing, alternative assessment practices will undoubtedly continue to gain favor among teachers" (Cizek,1993, p.39). A study by the BSCS, a non-profit research and development group, that worked on an innovative curriculum for middle school science and technology categorized assessment tools in three strategies: "informal assessment strategies (those you can use daily to monitor progress), formative assessment strategies (those you can use to determine a student's strengths and weaknesses and provide feedback for cognitive and affective growth), and summative assessment strategies (those that you can use to determine a final grade or other endpoint in a student's progress)" (Powell, 1993, p.37).

Middle school technology education teachers are faced with making difficult choices between how, how much, what, when and why should a particular concept or area be part of a curriculum. Industrial arts curriculum derives its curriculum from fields of study or job related content areas, modular education derives its curriculum from topics of technology (hardware driven) and fits them in equal time capsules and curriculum developed from a conceptual outline derives its curriculum from generalized progressive concepts of technology and cuts across content areas of technology. All three approaches imply tradeoffs between breadth and depth of knowledge covered. All three have philosophical differences; industrial arts curriculum believes in a pre-vocational framework, modular education believes in exploration or breadth and curriculum developers who use a conceptual outline believe in depth or ownership of applicable concepts. Educators will make informed choices based upon the needs and learning abilities of the adolescent child. Curriculum developed from a conceptual outline is child centered and addresses many of the problems plaguing teachers in the field. Facilities and budget constraints will also be outside factors in curriculum and textbook selection. The final question to be asked in designing curriculum and textbook selection is what is best for the students?

Benchmarks for Science Literacy is a report that was developed to aide in curriculum reform by telling educators what knowledge and skills students should acquire by the end of high school so that they are ready to become adults. In 1989, six school district teams with twenty-five educators in each team across the country developed a common set of benchmarks that were critiqued by hundreds of experts and educators. After three years, the final report included goals for different grade levels in technology and science education.

Benchmarks were developed as a tool for educators to use in curriculum reform.

The report is informed by research, avoids technical language, and concentrates on the common core of learning that contributes to the science literacy of all students. Chapter three of the Benchmarks for Science Literacy is called "The Nature of Technology" and within this chapter are grade six to eight technology education goals for middle students to know at the end of grade Eight. This report has given technology educators a standard that they can use to help critique textbooks and curriculum. "Benchmarks is a tool to be used by educators in designing a curriculum that makes sense to them and meets the standards for science literacy recommended in Science For All Americans" (AAAS, 1993, p.1). Together the standards or benchmarks in science and technology and sound middle level pedagogy will provide classroom teachers the information necessary to make informed decisions on appropriate textbooks, learning activities and content areas.

Statement of the Problem

A review of literature shows that technology education is in the process of curriculum reform. Research also states that the *1993 Benchmarks for Science Literacy* is a tool that will assist technology education educators in developing new curriculum and selecting appropriate textbooks for middle school students. Therefore, the purpose of this study is to review by survey instrument introductory technology education textbooks with a copyright of 1993 or greater, and evaluate how well they meet the goals of the *1993 Benchmarks of Science Literacy*.

Questions of the Study

1. Are the table of contents of introductory technology education textbooks organized around content areas or technological concepts?
2. Are the technology education textbooks using consistent definitions for important terms like technology, technological literacy and impacts of technology?
3. Are the technology education textbooks written so a young middle school student can read the text?
4. Are the issues in technology from chapter 3 of the *1993 Benchmarks of Science*

Literacy covered in the objectives of the chapter?

5. How well are the issues in technology from chapter 3 of the *1993 Benchmarks of Science Literacy* covered in the regular text and how much consideration was given to each issue?

6. Are the issues in technology from chapter 3 of the *1993 Benchmarks of Science Literacy* covered in the activities of the textbook?

Definition of Terms

Authentic assessment

"Making your assessment strategies match your instructional practices" (Powell, 1993, p.36).

Constructivist

"Structure learning around primary concepts" (Brooks and Brooks, 1993, p.V).

Guided inquiry

"Learning experiences are presented in the form of laboratory activities designed to help students discover and experience technical and scientific concepts" (Welty, 1996, p.16).

Module

"An educational unit which covers a single subject or topic" (Webster, 1986, p.763).

Pedagogy

"The field of study that deals with methods of teaching and learning in school" (Webster, 1986, p.36).

Readability

"The factors that affect success in reading and understanding text including interest/motivation, legibility and complexity of words and sentences in relation to the reading ability of the reader" (Johnson, 1999, p.2).

Taxonomy

"Subdivided concepts in some systematic fashion" (Harris and Klausmeier, 1966, p.143).Technological literacy

"The ability to understand technology and evaluate the effects on people and the environment" (Thode and Thode, 1994, p.430).

Transescent

"Pupils usually found in grade 6,7,8 who are in transitional phase of life between childhood and adolescence" (Eichhorn, 1966, p.31).

CHAPTER 2

REVIEW OF LITERATURE

Transition

This chapter outlines the historical changes in technology education, the nature of an adolescent, sound educational pedagogy and alternative choices for reform. General education in America has been criticized strongly in the national spotlight for not providing a safe environment, not having competent teachers and not graduating students with the necessary skills to receive gainful employment in a high technological world. Technology educators are concerned with the nature and role of technology education. "It is most critical that the industrial arts/technology education profession draw on its rich history and wealth of curriculum materials to establish a program that can explore, explain, and use the modern American technology" (Phillips, 1985, p.18). Curriculum leadership has changed from university centered in the seventies to state centered in the eighties and vendor centered in the nineties. Technical education has continuously adjusted to the socio-economic conditions of the educational environment.

Universities lead the way for curriculum development following the highly influential *A Guide to Improving Instruction In Industrial Arts*, published by the Industrial Arts Division of the AVA (American Vocation Association) in 1968 (Martin, 1979, p.39). Ohio State under the direction of Donald Lux and Willis Ray developed the Industrial Arts Curriculum Project (IACP) which was an outstanding curriculum tested and implemented in two classes, the World of Construction and the World of Manufacturing. Industrial arts was a general education curriculum until Congress under the Education amendment of 1972, allowed funds for vocational education to be used for industrial arts education if certain requirements were met. "In order to use their vocational funds for industrial arts education, the various states had to include the program in their State plans for vocational education" (Martin, 1979, p.40). Industrial arts' first intention of being general education was instead evolving into pre-vocational in order to obtain financial rewards from the federal government. Industrial arts' goals of career exploration, vocation, consumerism and skill development did not adequately reflect the technological advances of the nineteen eighties society.

Upon completion of the Jackson's Mill Industrial Arts Curriculum theory in 1981 at Charleston, West Virginia, industrial arts was now called technology education. "Technology is a body of knowledge and the systematic application of resources to produce outcomes in response to human needs and wants" (Savage and Sterry, 1990, p.7). "New goals of curriculum with emphasis on the study of industry and technology, consumerism, development of intellectual process and interpersonal behavioral skills" (Zargari and MacDonald, 1994, p.10). Industrial arts education needed to address the changes from an industrial based economy to a service based economy in the *information age.* Technology education curriculum was suppose to get away from the craft oriented trades approach and focus on multi-and interdisciplinary laboratory activities that explored the technological world through technologies like lasers, CNC (computer numeric control) machines, robotics, CAD/CAM (computer aided drafting/manufacturing) and high tech. telecommunications. To meet these new goals, vendors or commercial retailers were developing modular workstations that covered many of these new topical areas. New curriculum was being developed by private citizens who where out of the loop of education. The expensive modular workstations from such vendors as Lab Tech. and Synergistic offered package deals that included month long inservices to learn their different modules. To get on board with the new technology education movement was being associated with how many modules do you have in your curriculum.

Technology educators who are experiencing financial difficulties and would like to genuinely meet the goals of technical education are being shut out of the movement due to the lack of alternative economically affordable curriculum addressing the same concepts in an innovative way. The 1989 State Curriculum Guide for Wisconsin divides technology education into four content areas and five levels of instruction, two of the levels pertain to the middle schools (WDPI, 1988). Level II of the State Curriculum Guide is the introduction to technological systems which is a single course offering that explores all four area of technology (manufacturing, construction, communications and transportation or energy). Level III explores one or more of each of the four areas as a single course offering. Textbooks and curriculum guides covering the study of technology education in many schools are the old industrial arts curriculum. Adoption of the many new technical education textbooks being written such as Technology In Your World by Michael Hacker and Robert Barden and Technology by Brad and Terry Thode of Delmar Publishing are slow to be purchased in many districts due to the lack of appropriate associated learning activities and grade level study guides.

The vendor modular workstations of the 1990's have offered school districts a quick easy transition from the old wood shop facility with industrial arts curriculum to the new carpeted office setting with technical education curriculum if you have the financial resources to do so. Ken Welty, a professor at the University of Wisconsin-Stout, believes that while it is true that modular workstations explore a lot of content areas, they do not give proper time considerations to the concepts and content that students *must* know instead of what sometimes is *nice* to know. Topics of technology all the way from Meg-lev trains to manufacturing are given the same time consideration. Does the content and concept of Meg-lev trains deserve equal time as Manufacturing? Ken Welty also believes modular education offered by vendors such as Cybernetics and Lab-tech. offer breadth at the expense of depth in cook-book curriculum packages that short circuit the genuine learning that occurs between the teacher and the student. Designing curriculum from a conceptual outline curriculum offers technology education teachers in middle schools an alternative approach utilizing already existing tools and facilities. Designing curriculum from a conceptual outline is a method of writing curriculum that all school districts could choose utilizing high technological human resources, textbooks and learning activities to give meaning that is applicable to all technology.

Student Centered

The fundamental rationale for schooling at the middle level is to foster healthy personal and academic growth and development of students during their young adolescent years. Eichhorn researched the psychology of the adolescent child and found many implications to curriculum development. "The findings of his studies show the unique developmental stresses placed on young adolescents, and document dramatically the enormous diversity found in "normal" development among children between the ages of 10 and 14" (Johnston, 1986, p.36). Middle level research is showing that arriving at the right answer is not always the most important and that it is the process employed by the student that has real value. Experimentation, visualization, abstraction (the ability to synthesize concepts), and extension or building upon other knowledge are all strategies that middle school students employ when solving problems. Attention to group identity, high academic learning time, monitored homework, and opportunities for student responsibilities are features of an effective middle school (Johnston, 1986, p.152). Technology education curriculum writers must be attentive to other disciplines and research has shown that it is valuable to coordinate thematic units with other disciplines to tie learning together. "To make the junior high/middle school curriculum more responsive to the intellectual, emotional and physical needs of early adolescents, the Carnegie Council for Adolescent Development recommends organizing the curriculum around themes that are clearly relevant to the lives of young people" (VEJ, 1990, p.30).

Pedagogy

Old methods of repetitive practice and rote learning does not guarantee knowledge has been passed from teacher to student with genuine meaning. Curriculum theorists have been stressing that connections need to be made between existing knowledge and new knowledge. In other words children know and understand what they have constructed for themselves (Brooks & Brooks,1993: Welty, 1996). "To facilitate genuine intellectual growth, learning activities need to be more than just tactile and enjoyable experiences for young people. They must be designed so that they achieve predetermined goals based on the intellectual and emotional needs of the students as well as the nature of the content being targeted" (Welty, 1996, P.28). Piaget contends that adolescents build a conception of the world through physical and/or mental involvement with objects, with people, and with events (Sigel and Cocking, 1977, p.X). Curriculum must be designed around the way people think as well as the arrangement of the content. Constuctivist theorists believe that teachers need to ask for information from their students in order to develop innovative methods to introduce new concepts and content that is relevant in the lives of their students. Old essentialistic values that were content centered and that regarded school's primary purpose as developing intellect are being replaced by progressive teachers who are student centered teachers that worry about preparing the individual for life. "Behavioral approaches, by ignoring the power and vitality of the inner life of students and their capacity to create personally and intellectually relevant meanings, have interfered with the development of more challenging and fulfilling approaches to learning and teaching" (Caine and Caine, 1991, p.16).

Alternative

Designing curriculum from a conceptual outline is a progressive constructivist method of writing technology education curriculum for local districts that utilizes human resources for curriculum writing with a focus on dividing technology by concepts. Designing curriculum from a conceptual outline is a threaded curriculum that teaches generalizable skills and concepts through multiple experiences. Technology educators are currently utilizing existing industrial arts curriculum while trying to change slowly over to technology education, however there is no leadership in the form of curriculum guides from universities, states and local districts. A collaborative effort is needed from within districts to try and provide directional leadership in the form of curriculum writing. The idea of using curriculum designed from a conceptual outline from grade level to grade level in the middle school is backed by the learning characteristics of adolescents and constructivist pedagogy.

The 1993 Benchmarks for Science Literacy is a comprehensive conceptual outline of goals for students to achieve for middle school in the areas of science, mathematics and technology education. Curriculum reform should be shaped by our vision of the lasting knowledge and skills we want students to acquire by the time they become adults. This ought to include both a common core of learning -- the focus of project 2061-- and a learning that addresses the particular needs and interests of individual students (SFAA 1993). Advocates of the 1993 Benchmarks for Science Literacy believe the current math, science and technology curriculum should be concerned with covering the goals of their study and reduce unnecessary breadth in current curriculum. Technology education textbook authors are concerned with covering content and many times they do an inferior job of illustrating concepts. Middle school technology education teachers can many times do a better job of curriculum construction by utilizing trade journals and books such as How Things Work to convey concepts then by relying on a technology education textbook (Welty, 1995).

CHAPTER 3

METHODOLOGY

Introduction

The methods and procedures used in this study of how well introductory technology education textbooks cover the goals of the 1993 Benchmarks for Science Literacy are explained in this chapter under the headings of subjects, instruments, procedures and data analysis.

Subjects

The subjects of this study are nationally written introductory technology education textbooks with copyright no earlier than 1993. The textbooks were located from Racine Unified School District and other Technology Educator's personal libraries. The subjects of this study are easily accessible technology education textbooks.

Instrument

The instrument for this study will be a questionnaire designed with the purpose of answering the questions raised in the statement of the problem (see Appendix 2). The survey will include the name of the textbook, the publisher and copyright date along with ten questions. The same evaluation process and survey will be utilized on each subject of the study. A readability study will be conducted by using Microsoft Word and also comparing text to the Fry Readability Graph.

Procedures

Questions will be researched through the preface, table of contents, objectives, indexes and the glossary of each textbook. Each text will have the introductory pages and preface read first before systematically researching the answers to each question. The coverage of content and instructional quality of the selected benchmarks will be rated. The coverage of content will be listed from no coverage to a whole chapter. The instructional quality will be based on the potential for learning to take place and was listed from poor to excellent. The readability of each text will be evaluated by the Flesch-

Kincaid Formula from Microsoft word and the Fry Readability Graph. The first, middle and last paragraph of chapter one of each text will be used as text for the readability studies. Using the profiles of all the texts in the tables, a conclusion about what the textbook series can be expected to accomplish in terms of its potential for helping students to learn the benchmarks and successfully read the text can be drawn.

Limitations

Analysis of only the printed student and teacher editions were used and no support materials, test banks, software and other supplements available from publishers were part of this study. This evaluation was not an attempt at a broad and comprehensive review of content, but a in-depth analysis of a sample of five benchmarks (see Appendix 1) that represented the skills and concepts a student should know at the end of grade eight. Other important data such as the process of design was not reviewed and overall content accuracy for the whole discipline was not a focus. The number of textbooks were constrained by the available textbooks in Racine, Wisconsin and the full Technology Education library was not utilized for this study.

Data Analysis

Descriptive results of the survey will be shown in figures directly following the evaluation results of each question in chapter four. Data analysis for the ten questions will be analyzed each for their particular philosophies and to the extent it actually covered the content in the Benchmarks for Science Literacy. Each question's results will be compared to all the textbook responses for inconsistencies or patterns of responses. The results will be used for concluding priorities of particular authors and success in meeting the benchmarks.

CHAPTER 4

DATA ANALYSIS

Qualifications for Research

The ten question survey (see Appendix 2) was used for all seven textbooks analyzed for this study. The qualifications for being part of this study was that the Technology Education textbooks were written as a general textbook for an Introduction to Technology course. The survey was written in a format to help illustrate a particular author's organization of the technology discipline when comparing their degree of success in meeting the National Benchmarks of Science and Technology on Issues in Technology in Chapter three (see Appendix 1). All Technology Education textbook authors have particular biases and philosophies of how technology textbooks should be published.

Table 1
Organization of Technology Content Areas

Textbooks	Content Areas
Living With Technology	Communication, Production, Transportation, Agriculture, Medical, and Energy.
Experience Technology	Communication, Production, Transportation, Energy/Power and Biotechnology.
Introduction To Technology	Communication, Production, and Transportation
Design/Prob. Solving In Technology	Communication, Production, Transportation and Construction.
Technology	Communication, Construction, Manufacturing, and Transportation.
Technology "Shaping Our World"	Communication, Construction, Manufacturing, and Transportation.
Understanding Technology	Communication, Production and Transportation.

Content Organization

The authors of each of textbooks have presented the organization of Technology Education content areas in a variety of different ways (see Table 1). All authors agreed that communication, transportation and production were definite content areas, however Technology (Thode, Thode 1994) and Technology "Shaping our World" (Gradell, Welch, Martin 1996) separated production into specific areas of manufacturing and construction. The textbooks Living With Technology (Hacker, Barden 1993) and the text Experience Technology (Harms, Kroon, Weigel 1993) added new content areas along with the traditional communication, transportation and production. Living With Technology (Hacker, Barden 1993) added agriculture, medical and energy as part of their content areas to convey the new technological innovations and careers in these three areas. The textbook Experience Technology (Harms, Kroon, weigel 1993) also added energy and biotechnology to the main content areas to teach students future trends toward energy needs and advancements in the rapid changing field of biotechnology. The authors of the study have different opinions on what the main content areas of Technology Education are.

Table 2

Definition of Technology

Textbooks	Definitions
Living With Technology	The use of knowledge to turn resources into goods and services that society needs.
Experience Technology	Apply the principles of science to do something.
Introduction to Technology	The practical use of human knowledge.
Design/Prob. Solving In Technology	The human process of applying knowledge to satisfy our needs and wants and to extend our

	capabilities.
Technology	Using critical thinking skills, resources and the devices people have invented to solve problems.
Technology "Shaping Our World"	A process we use to solve problems by designing and making products and structures.
Understanding Technology	The technical means people use to improve their surroundings.

Technology Definition

All the authors of this study had a different definition for the term technology (see table 2). Every definition expressed the idea of an application of human knowledge to do something. Definitions that included phrases like needs and wants of society/ surroundings and application of knowledge were found randomly in three different definitions. The phrases use of resources, solving problems and products or services were found two times each in the different definitions. Finding one definition that all authors would agree upon would be a difficult task. Four authors believe technology involves doing something and three defined technology as satisfying our needs and resolving our problems.

Table 3

Definition of Technological Literacy

Textbooks	Definitions
Living With Technology	Able to understand the fundamental concepts of technology, and to make informed choices of which technology to use and the likely impacts of using it.
Experience Technology	Not Given.
Introduction to Technology	The ability to use technology.

Design/Prob. Solving In Technology	Not Given.
Technology	The ability to understand technology and evaluate the effects of technology on people and the environment.
Technology "Shaping Our World"	Not Given.
Understanding Technology	Not Given.

Technological Literacy Definition

The term technological literacy wasn't even important enough for four authors to include the term in a textbook (see table 3). Living With Technology (Hacker, Barden 1993) and Technology (Thode, Thode 1994) implied that technological literacy was an understanding of technology and an evaluation of the impacts of technology to people and the environment. Introduction to Technology (Pierce, Karwatka 1993) interpreted technological literacy as the ability to use different technologies. As students go to work in an increasing technological world the term technological literacy has increasing importance and it is disturbing that four authors chose to leave the definition out of their textbook. Student's attitudes toward new technology is vital to how successful they will be in the future.

Table 4

Definition of Impacts of Technology

Textbooks	Definitions
Living With Technology	The effect technology has on people, society, economy, and the environment.
Experience Technology	Ways in which technology affects the world and society.

Introduction To Technology	Not Given
Design/Prob. Solving In Technology	The new problems created by the solutions to old problems.
Technology	Effects on other areas unrelated such as the environment.
Technology "Shaping Our World"	Effects of technology.
Understanding Technology	Effects of technology.

Impacts Definition

The definition for impacts of technology were given for all textbooks in the study except the textbook Introduction to Technology (Pierce, Karwatka 1993) (see table 4). Technology "Shaping Our World (Gradell, Welch, Martin 1996) and Understanding Technology (Wright, Smith 1998) gave a vague three word definition for the term impacts phrasing it as meaning effects of technology. This definition leaves middle school students with a poor interpretation of a term that deserves more explanation. Three authors chose to explain impacts as the effects technology has good or bad on the world. One author defined impacts as dealing with the creation of new problems from the technological solution of old problems. Technological advancements used improperly can create more problems then what it was invented to solve originally. Students must learn to question new technology by weighing the positive impacts against the negative impacts on society and the environment. Authors' disregarding the importance of the term impacts have not read the National Benchmarks of Science and Technology.

Table 5

Flesch-Kincaid Readability Test

Textbooks	Reading Ease	Grade Level

Living With Technology	65.2	7.4
Experience Technology	61.3	7.1
Introduction to Technology	49.7	8.3
Design/Prob. Solving In Technology	52.9	10.6
Technology	55.4	9.5
Technology "Shaping Our World"	56.8	7.8
Understanding Technology	45.1	9.8

Table 6

Fry Readability Test

Textbooks	Age	Grade
Living With Technology	11	6
Experience Technology	15	10
Introduction To Technology	13	8
Design/Problem Solving In Technology	14	9
Technology	12	7
Technology "Shaping Our World"	9	4
Understanding Technology	15	10

Readability of Textbooks

Authors of technology textbooks are faced with the dilemma of not knowing which grade level technology educators are teaching the introductory course. Another problem facing authors is the difficult task of writing textbooks so their readable for middle school students with complicated terms and concepts inherent in all fields of technology. The results of the study on readability of textbooks for middle school students were based on the evaluation of both the Flesch-Kincaid Readability Test and the Fry Readability Test (see table 5 and table 6). Living With Technology (Hacker, Barden 1993), Experience Technology (Harms, Kroon, Weigel 1993) and Technology "Shaping Our World" (Gradell, Welch, Martin 1996) have grade level readability suited to the middle school according to the Flesch-Kincaid Formula. The Fry Readability test had four textbooks with readability scores at or below middle school level. Design and Problem Solving In Technology (Hutchinson, Karnitz 1994) and Understanding Technology (Wright, Smith 1998) were written above the middle school age level for both readability studies.

Table 7

Table of Contents Units Structure

Textbooks	Units
Living With Technology	Impacts, Communication, Production, Energy, Biotechnology.
Experience Technology	Introduction to Production Systems, What Production systems need, Manufacturing, Construction and The Future.
Intro. to Technology	Introduction to Technology, Communications, Productions, Transportation and Special Topics.
Design/Prob. Solving In Techn	Introduction to Technology, The Design Process, Principles of Structures, Mechanisms, Electronics, Pneumatics and Human Factor Engineering.

Technology	Introduction to Technology, Design and Production, Automation and Business, Transportation and Communication.
Technology "Shaping Our World"	Introduction to Technology, The Design Process, Communication, Manufacturing, Construction and Transportation.
Understanding Technology	Introduction to Technology, Resources and Technology, Technological Systems and Technology and Society.

Table of Contents Organization

Analysis of the table of contents brought about three different organizational approaches to the different textbooks (see Table 7). Living With Technology (Hacker, Barden 1993), Experience Technology (Harms, Kroon, Weigel 1993) and Introduction to Technology (Pierce, Karwatka 1993) all organized their respective textbooks around content areas like communication, production and transportation. Technology (Thode, Thode 1994) and Technology "Shaping Our World" (Gradell, Welch, Martin 1996) organized the table of contents by technological process in the beginning and then proceeded to technology content areas. Design and Problem Solving In Technology (Hutchinson, Karnitz 1994) and Understanding Technology (Wright, Smith 1998) began their textbook with explanations of the different process and systems in technology and threaded those concepts through different content areas which related to the system or process covered.

The table of contents enables an instructor to match their personal beliefs and styles of teaching to an author of similar technological philosophies. If an instructor wants breadth of knowledge of all content areas then their are three textbooks available. If an educator's philosophy is to cover important concepts on systems and process in technology first and illustrate the use of those in different content areas then their are two textbooks available for them as well. Technology educators and Universities are still striving to find out which method of organization is appropriate for an Introduction to Technology course. High School Technology Educators may be of the belief that teachers need to explore all content areas that are offered in high school for exploration reasons. Middle School teachers may want to stress more concepts in technology and thread those through relative content areas so young people have ownership of important concepts such as design. If an instructor designs curriculum around holistic learning experiences then they be inclined to purchase a textbook like Understanding Technology (Wright, Smith 1998) or Design and Problem Solving In Technology (Hutchinson, Karsnitz 1994). Students are able to experience and learn more when the concepts and skills are linked together than they would if all the concepts and skills were isolated and taught separatively (Bean, 1995).

Table 8

Chapter Organization

Textbooks	Contents
Living With Technology	Introduction, Objectives, Special Interest Boxes, Summaries, Terms and Careers.
Experience Technology	Introduction, Objectives, Terms, Impact Boxes, Review, Questions and Activities.
Introduction to Technology	Introduction, Terms, Objectives, Tech-Talk Boxes, Summary Questions.
Design/Prob. Solving In Technology	Introduction, Illustrations, Impacts, Observations and analysis.
Technology	Objectives, Terms, Careers, Technofacts, Special Article Boxes and Design Brief.
Technology "Shaping Our World" Activities.	Introduction, Objectives, Terms, Test and

Understanding Technology	Introduction, Terms, Objectives, Activities, Test and Questions.

Chapter Organization

Studying the organization of textbooks helped give an outline to the structure of individual Technology Education textbooks in the study (see Table 8). Individual chapter organizations can sound very educational in the preface of the textbook, however many textbooks have bells and whistle type boxes and technofact areas periodically pasted in the chapters that are unrelated to the substance of the chapter and often confuse middle school students. Analysis of the organization of the chapters involved writing down consistently used heading for chapters of each text and comparing the research finding to what the author's preface explained about the chapter layouts. Every chapter had an introduction, however only five textbooks included objectives at the beginning and terms to know. Out of those five textbooks, only three had questions and activities at the end of every chapter. Experience Technology (Harms, Kroon, Weigel 1993) and Design and Problem Solving In Technology (Hutchinson, Karnitz 1994) surprisingly both included an impacts section for each chapter.

Technology Issues

In analyzing the issues in Technology Education for grades six to eight from the Benchmarks in Science and Technology, references will be made on issues one to five by naming it issue one, two, three, four or five (see Appendix 1). The issues are in paragraph form and duplicating each issue word for word each time it's referenced in the following analysis would make for difficult reading.

To effectively analyze the five issues in technology from the Benchmarks in Science and Technology it was important to survey coverage of each topic contained in the five issues by researching three different areas of each textbook. First, analysis of whether or not each issue was covered in the objectives of the chapters was researched as well as to what degree it was clearly and successfully covered in the objectives section. The rating system (0-3 points) was used to represent the range of not covered to Excellent coverage. The rating (0-3) for each issue represents no coverage (0), minimal coverage (0.1-1.4), partial coverage (1.5-2.4) all the way to substantive coverage (2.5-3.0). Second, researching the indexes, table of contents and glossaries to discover how well each issue was covered in the text of the chapter and how much attention was given to each issue. Finally, the whole textbook was researched for activities that were given to students to reinforce the five issues from the Benchmarks in Science and Technology.

Table 9

Benchmarks In Objectives

	Benchmark Issues					
Textbooks	1	2	3	4	5	Average
Living With Technology	2.5	3.0	3.0	2.5	3.0	2.8
Experience Technology	2.0	0.0	0.0	0.0	0.0	0.4
Introduction to Technology	1.5	2.0	2.5	0.0	3.0	1.8
Design/Prob. Solving In Technology	3.0	2.5	3.0	3.0	2.5	2.8
Technology	2.0	3.0	2.5	1.5	3.0	2.4
Technology "Shaping Our World"	2.0	3.0	2.5	0.0	2.0	1.9
Understanding Technology	2.0	0.0	3.0	0.0	2.0	1.4

Objectives Research

Living With Technology (Hacker, Barden 1993) and Design and Problem Solving in Technology (Hutchinson, Karnitz 1994) thoroughly covered each issue in the objectives section of the chapters (see table 9). They both had clearly stated objectives at the beginning of the chapters informing students about the importance of the five issues of technology. Technology (Thode, Thode 1994) covered all five issues in the objectives fairly well with an above average rating or more for each issue. Introduction to Technology (Pierce, Kartwatka 1993), Technology "Shaping Our World" (Gradell, Welch, Martin 1996) and Understanding Technology (Wright, Smith 1998) had failed to cover at least one issue, but did an average job on the other objectives. Experience Technology (Harms, Kroon, Weigel 1993) failed to cover four issues in technology in the objective research entirely and barely covered issue one. Surprisingly only two textbooks succeeded in giving clear objectives for all five issues from the Benchmarks in Science and Technology.

Table 10

Benchmarks In Text

Textbooks	Benchmark Issues 1	2	3	4	5	Ave
Living With Technology	3.0	3.0	3.0	1.0	3.0	2.0
Experience Technology	2.5	1.0	3.0	1.0	1.0	1.7
Introduction to Technology	1.0	2.5	2.0	0.0	2.5	1.6
Design/Prob. Solving In Technology	3.0	2.5	3.0	2.0	3.0	2.7
Technology	2.0	3.0	2.5	1.0	2.5	2.2
Technology "Shaping Our World"	3.0	3.0	3.0	2.0	3.0	2.8
Understanding Technology	3.0	2.0	3.0	2.0	3.0	2.6

Textbook Integrity

Researching each textbook by way of the index, glossary and table of contents; the five issues were checked for integrity of coverage of each issue in the text and how much of the text was actually devoted to the issue (see table 10). The rating (0-3) for each issue represents no coverage (0), minimal coverage (0.1-1.4), partial coverage (1.5-2.4) all the way to substantive coverage (2.5-3.0). Four textbooks did an outstanding job of covering all five issues and surprisingly two of the four did poorly on expressing these issues in the objectives research. Living With Technology (Hacker, Barden 1993) and Design and Problem Solving In Technology (Hutchinson, Karnitz 1994) covered each issue entirely and had whole chapters devoted to at least one issue. Technology "Shaping Our World" (Gradell, Welch, Martin 1996) and Understanding Technology (Wright, Smith 1998) also devoted chapters to issues and clearly cover the topics, however they did not include objectives of the issues they covered to assist the reader. Technology (Thode, Thode 1994) did a surface level coverage of the issues and many issues were inferred to and not directly covered. Experience Technology (Harms, Kroon, Weigel 1993) and Introduction To Technology (Pierce, Kartwatka 1993) did a poor job of covering the issues and failed to cover at least one issue entirely. In fact issue 2 and issue 4 were not even covered in the respective texts.

Table 11

Benchmarks In Activities

Textbooks	Benchmark Issues 1	2	3	4	5	Average
Living With Technology	2.5	3.0	2.5	0.0	2.5	2.1
Experience Technology	0.0	0.0	0.0	0.0	2.0	0.4
Introduction To Technology	0.0	0.0	0.0	0.0	0.0	0.0
Design/Prob. Solving In Technology	2.5	2.0	3.0	0.0	3.0	2.1

Technology	2.0	2.5	3.0	2.0	2.5	2.4
Technology "Shaping Our World"	2.0	3.0	3.0	0.0	0.0	1.6
Understanding Technology	1.5	0.0	2.5	0.0	2.5	1.3

Activities Covered

After exhaustive research of all textbook activities, each activity related to an issue was ranked on how well it covered the issue (see Table 11). Technology (Thode, Thode 1994) had activities that covered each issue, but the activities were average at best and didn't give clear problems of the entire portion of the issues. Living With Technology (Hacker, Barden 1993) and Design and Problem Solving In Technology (1994) covered four activities with very good problems, however they failed to make an activity for at least one issue. Technology "Shaping Our World" (Gradell, Welch, Martin 1996) and Understanding Technology (Wright, Smith 1998) had activities for three issues. Experience Technology (Harms, Kroon, Weigel 1993) and Introduction to Technology (Pierce, Karwatka 1993) did extremely poor covering only one issue or less in their activities. Activities reinforce the concepts and objectives in the chapter and two authors failed to create an adequate activity that covered important issues in technology from the Benchmarks in Science and Technology.

CHAPTER 5

CONCLUSION

Challenge

The direction Technology Education curriculum and instruction will take into the new millennium is uncertain. Paradigm shifts are happening so rapidly that even our best technology forecasters couldn't have anticipated the information explosion that occurred the last decade. The challenge to the profession, therefore, is to embrace these opportunities as the driving force for educational change to both the content being taught and the method of delivering learning experiences to students (Bensen, 1992, p.6). Less advantaged school districts with very limited budgets have the greatest need for new Technology Education textbooks that cover concepts and have meaningful inexpensive learning experiences students need to learn for the middle school grade levels. Introductory Technology Education courses have primarily been associated with the middle school student and prevocational career specific courses are many times offered at the high school. The 1993 Benchmarks for Science Literacy are a set of goals that all children should understand for mathematics, science and technology education. Middle School Technology Education textbooks and many school district's curriculum need standardization and the 1993 Benchmarks for Science Literacy are a great resource and conceptual outline for developing a new direction for technology education.

Nature of Technology

Students appreciation of how technology effects their daily lives can be learned by studying how life was like in different technological eras of the past. Technological changes have provided people with a much better lifestyle. Students need to admire the past inventions and constructions of the past. Predicting the future suggest changes in human life that might occur from yet-uninvented-technology (AAAS, 1993). Students studying the future discuss the impacts of new technology and the need for individuals to become technologically literate.

There are several methods to studying the future. Trend analysis tracks a particular technology such as automobiles and locomotives with reliable data that appears with regularity in newspapers or other publications. A line graph could predict the trends of locomotives and automobiles into the year 2000 by extending the slopes of the lines into the future. Delphi studies are another method of predicting the future. In a Delphi study, expert opinions are collected to gain a consensus or agreement about the future trend of a particular technology. Technologists also use scenario writing to illustrate the future. Scenario writing is based upon real trends that exist in society and all scenarios are inferred from real data and analyzed for possible complex interactions in the future (Hendricks, Sterry 1996).

The synergy that comes from building upon the past helps students understand that they not only live in a natural environment, but also a built environment. In the chapter on "The Nature of Technology" in the Project 2061 report entitled *Science for All Americans*, the following is stated about technology:

> In the broadest sense, technology extends our abilities to change the world: to cut, shape, or put together materials; to move things from one place to another, to reach farther with our hands, voices, and senses. We use technology to try to change the world to suit us better. The changes may relate to survival needs such as food, shelter, or defense, or they may relate to human aspirations such as knowledge, art, or control. But the results of changing the world are often complicated and unpredictable. They can include unexpected benefits, unexpected costs, and unexpected risks-any of which may fall on different social groups at different times. Anticipating the effects of technology is therefore as important as advancing its capabilities (AAAS, 1989, p.39).

Textbook Compliance

The goals of Chapter 3 in The 1993 Benchmarks for Science Literacy were to give experts and educators in the field of technology a standard conceptual outline that students should know by the end of grade 8. To assist the experts and educators in developing appropriate curriculum for middle school students one would think your best resource would be an introductory Technology Education Textbook. Unfortunately, this study has found that Introductory Technology Textbooks lack consistency in the type of content they cover, omissions of important Nature of Technology definitions, complex readability and failure to completely cover the five issues from chapter 3, *The Nature of Technology* from the 1993 Benchmarks for Science Literacy.

Technology Education textbooks and the Technology Education experts in the field must come to an agreement about how and exactly what content areas are to be divided in this discipline. The definition of technology is so widespread among authors of Technology Education textbooks that educators are using different definitions from class to class across the country. There needs to be a consensus on the definition of technology that all educators can stand on which is timeless and incorporates the nature of a rapidly increasing technological world. The terms technological literacy and impacts of technology were also inconsistent in general meaning among the authors of this study. Four authors omitted the term technological literacy altogether. Unfortunately, there has been very little agreement both within and outside of the technology education profession on what is meant by the term technological literacy (Bensen, 1992, p.10). Some textbooks devoted whole chapters to the impacts of technology, while another didn't even include impacts as a term.

Table 12

Textbook Ranking

	Benchmarks Averages			Final
Textbooks	Objectives	Text	Activities	Average
Living With Technology	2.8	2.0	2.1	2.3

Experience Technology	0.4	1.7	0.4	0.8
Introduction To Technology	1.8	1.6	0.0	1.1
Design/Prob. Solv. In Tech.	2.8	2.7	2.1	2.5
Technology	2.4	2.2	2.4	2.3
Technology "Shaping.World"	1.9	2.8	1.6	2.1
Understanding Technology	1.4	2.6	1.3	1.8

The five issues that were sampled from chapter 3, *Nature of Technology* from the 1993 Benchmarks for Science Literacy, importance in the creation of Technology Education textbooks was partial coverage at best (see table 12). Experience Technology (Harms, Kroon, Weigel 1993) failed to write objectives and activities for four out of the five sampled issues in technology. The issues in Chapter 3, *Nature of Technology* from the 1993 Benchmarks for Science Literacy were nonexistent and failure to cover these issues may be attributed to the fact that the textbook was written the same year as the 1993 Benchmarks for Science Literacy. Introduction to Technology (Pierce, Kartwatka 1993) also failed to effectively cover the five issues which raises questions of whether or not they read the 1993 Benchmarks for Science Literacy. Technology "Shaping Our World" (Gradell, Welch, Martin 1996) and Understanding Technology (Wright, Smith 1998) did a poor job of writing objectives and ommitted definitions, but average job of covering the five issues in technology with at least partial coverage randomly throughout the text. Design and Problem Solving in Technology (Hutchinson, Karnitz 1994) readibility was above the 9th grade and the authors omitted technological literacy from the textbook, however they substantively covered all five issues in the 1993 Benchmarks for Science Literacy.

Technology (Thode, Thode 1994) and successfully covered all the definitions in technology and the five sampled issues from Chapter 3, *The Nature of Technology*, 1993

Benchmarks for Science Literacy. Living With Technology (Hacker, Barden 1993) is an excellent textbook which thoroughly covered all definitions and issues as well as creating wonderful activities that reinforced the five issues. Ironically, Living With Technology (Hacker, Barden 1993) was published the same year as the 1993 Benchmarks for Science Literacy and it is clear that the two authors were in agreement with the experts who collaborated in writing the goals of the 1993 Benchmarks for Science Literacy.

Textbooks Versus Practice

The inequities in school district's funding across the nation should challenge authors of Technology Education textbooks to write textbooks that are exclusively written for middle school students that include activities which are inexpensive and convey important concepts in technology. Experts, Professional Technology Organizations and Universities should expend their greatest energy toward developing all curriculum and textbooks under the premise that most school districts do not have the money or facilities to work with simulations that require compact discs and modular workstations to run them. Technology Education textbook authors must realize that many of their clients work out of the proverbial *"Industrial Arts Laboratory"*. Consensus and standardization of what concepts should be taught in middle school technology education classrooms across the country is the challenge for our discipline.

Technology Education is a discipline in the process of discovering itself. The sooner leaders in the technology profession mandate that Technology Education textbook author's comply with the goals of the collaborative efforts of such organizations as the 1993 Benchmarks for Science Literacy the sooner curriculum will effectively cover the concepts students should know by the end of grade 8.

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APPENDIX 1
1993 BENCHMARKS FOR SCIENCE LITERACY
Five Samples From Chapter 3 Nature Of Technology

By the end of the 8th grade, students should know that.......

Issue 1

Technology cannot always provide successful solutions for problems or fulfill every human need.

Issue 2

Technology has strongly influenced the course of history and continues to do so. It is largely responsible for the great revolutions in agriculture, manufacturing, sanitation and medicine, warfare, transportation, information processing, and communications that have radically changed how people live.

Issue 3

New technologies increase some risks and decrease others. Some of the same technologies that have improved the length and quality of life for many people have also brought new risks.

Issue 4

Rarely are technology issues simple and one-sided. Relevant facts alone, even when known and available, usually do not settle matters entirely in favor of one side or another. That is because the contending groups man have different values and priorities. They may stand to gain or lose in different degrees, or may make very different predictions about what the future consequences of the proposed action will be.

Issue 5

Societies influence what aspects of technology are developed and how these are used. People control technology (as well as science) and are responsible for its effects.

APPENDIX 2
TEXTBOOK SURVEY

Name of book .________________________________.

Publisher .____________________________________.

Copyright .________.

1. Development of types of technology content areas
   a)
   b)
   c)
   d)
   e)
2. Definition of Technology
   a)
   b)
   c)
   d)
   e)
3. Definition of technological literacy
   a)
   b)
   c)
   d)
   e)

4. Definition of Impacts of Technology
   a)
   b)
   c)
   d)
   e)
5. Readability of textbook for grade 6 to 8.
   a)
   b)
   c)
   d)
6. Organization of table of contents
   a)
   b)
   c)
   d)
   e)

7. Chapter organization
   a)
   b)
   c)
   d)
   e)

8. Are their objectives covering Issues in Technology clearly stated for the following? (True or False)

If so, to what degree do they actually cover the following issues? (1to 5)
scale 1 = text did an excellent job of covering issue. (3.0 RANK)
scale 2 = text did an above average job of covering issue. (2.5 RANK)
scale 3 = text did an average job of covering issue. (2.0 RANK)
scale 4 = text did a below average job of covering issue. (1.0 RANK)
scale 5 = text failed to cover issue entirely. (0.0 RANK)

Note: Answers will have two designations a letter for true/false and number for how well the textbook covers the material. Example (T1)

Issues in technology

Objectives cover the issue that *technology cannot always provide successful solutions for problems or fulfill every human need.......*

True .____.
False

Objectives cover the issue that *technology has strongly influenced the course of history and continues to do so. It is largely responsible for the great revolutions in agriculture, manufacturing, sanitation and medicine, warfare, transportation, information processing, and communications that have radically changed how people live.......*

True .____.
False

Objectives cover the issue that *new technologies increase some risks and decrease others. Some of the same technologies that have improved the length and quality of life for many people have also brought new risks......*

True .____.
False

Objectives cover the issue that *rarely are technology issues simple and one-sided. Relevant facts alone , even when known and available, usually do not settle matters entirely in favor of one side or another. That is because the contending groups may have different values and priorities. They may stand to gain or lose* *in different degrees, or may make very different predictions about what the future consequences of the proposed action will be.......*

True .____.
False

Objectives cover the issue that *societies influence what aspects of technology are developed and how these are used. People control technology (as well as science) and are responsible for its effects........*

True ._____.
False

9. In what fashion or to what degree does the textbook cover the following issues in technology?
Multiple choice answers and scale (1 to 5) will be given for each issue.

scale 1 = text did an excellent job of covering issue.	(3.0 RANK)
scale 2 = text did an above average job of covering issue.	(2.5 RANK)
scale 3 = text did an average job of covering issue.	(2.0 RANK)
scale 4 = text did a below average job of covering issue.	(1.0 RANK)
scale 5 = text failed to cover issue entirely.	(0.0 RANK)

<u>Issues in technology</u>

The degree to which the textbook covers the issue *technology cannot always provide successful solutions for problems or fulfill every human need.......*

a) Whole chapter devoted to issue
b) Paragraph devoted to issue
c) One or two sentences devoted to issue
d) Implied reference or single word reference to issue
e) No reference at all to issue

Answerer .__________.

The degree to which the textbook covers the issue *technology has strongly influenced the course of history and continues to do so. It is largely responsible for the great revolutions in agriculture, manufacturing, sanitation and medicine, warfare, transportation, information processing, and communications that have radically changed how people live.......*

a) Whole chapter devoted to issue
b) Paragraph devoted to issue
c) One or two sentences devoted to issue

d) Implied reference or single word reference to issue
e) No reference at all to issue

Answerer . .

The degree to which the textbook covers the issue *new technologies increase some risks and decrease others. Some of the same technologies that have improved the length and quality of life for many people have also brought new risks......*

a) Whole chapter devoted to issue
b) Paragraph devoted to issue
c) One or two sentences devoted to issue
d) Implied reference or single word reference to issue
e) No reference at all to issue

Answer . .

The degree to which the textbook covers the issue *rarely are technology issues simple and one-sided. Relevant facts alone , even when known and available, usually do not settle matters entirely in favor of one side or another. That is because the contending groups may have different values and priorities. They may stand to gain or lose in different degrees, or may make very different predictions about what the future consequences of the proposed action will be.......*

a) Whole chapter devoted to issue
b) Paragraph devoted to issue
c) One or two sentences devoted to issue
d) Implied reference or single word reference to issue
e) No reference at all to issue

Answer . .

The degree to which the textbook covers the issue *societies influence what aspects of technology are developed and how these are used. People control technology (as well as science) and are responsible for its effects........*

a) Whole chapter devoted to issue
b) Paragraph devoted to issue
c) One or two sentences devoted to issue
d) Implied reference or single word reference to issue
e) No reference at all to issue

Answer . .

10. Activities were developed to cover the following issues in technology. (True/False)

If so, to what degree do the activities actually cover the following issues? (1to 5)
scale 1 = text did an excellent job of covering issue. (3.0 RANK)
scale 2 = text did an above average job of covering issue. (2.5 RANK)
scale 3 = text did an average job of covering issue. (2.0 RANK)
scale 4 = text did a below average job of covering issue. (1.0 RANK)
scale 5 = text failed to cover issue entirely. (0.0 RANK)

Note: Answers will have two designations a letter for true/false and number for how well the textbook covers the material. Example (T1)

Issues in technology

Activities were developed to cover the issue that *technology cannot always provide successful solutions for problems or fulfill every human need.......*

True ____. Example activity.________________________________.
False

Activities were developed to cover the issue that *technology has strongly influenced the course of history and continues to do so. It is largely responsible for the great revolutions in agriculture, manufacturing, sanitation and medicine, warfare, transportation, information processing, and communications that have radically changed how people live.......*

True ____. Example activity.________________________________.

False

Activities were developed to cover the issue that *new technologies increase some risks and decrease others. Some of the same technologies that have improved the length and quality of life for many people have also brought new risks......*

True ____. Example activity.________________________________.

False

Activities were developed to cover the issue that *rarely are technology issues simple and one-sided. Relevant facts alone , even when known and available,usually do not settle matters entirely in favor of one side or another. That is because the contending groups may have different values and priorities. They may stand to gain or lose in different degrees, or may make very different* *predictions about what the future consequences of the proposed action will be*.......

True _.____.   Example activity._________________________________.
False

Activities were developed to cover the issue that *societies influence what aspects of technology are developed and how these are used. People control technology (as well as science) and are responsible for its effects*........

True _._____.   Example activity._________________________________.
False