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MARYLAND HIGH SCHOOL PRINCIPALS' PERCEPTIONS
OF TECHNOLOGY EDUCATION

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the
Degree of Doctor of Philosophy in the Graduate School
of The Ohio State University

By
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* * * * *

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ABSTRACT

This study investigated the perceptions of Maryland high school principals regarding technology education program characteristics, program goals, and teaching-learning strategies. Also, this study examined principals' perceptions of barriers to local technology education program implementation. Principals' perceptions and demographic data were collected using a mail survey instrument sent to 103 Maryland high school principals (65% return rate). The instrument was validated by a panel of experts and field tested. Reliability was determined by pilot testing and analyzed using Cronbach's alpha and test-retest procedures. The alpha coefficient was .67. Test-retest procedures yielded 74% agreement between the two test administrations. Descriptive statistics were used to describe the results of the study.

Findings indicated favorable perceptions and identified areas for technology education program improvement. Principals reflected strong agreement on program characteristics involving emphasis on problem solving, use of varied instructional strategies, and increased student interest. Lesser agreement was expressed concerning collaboration with
other school departments and changes in facilities. Principals perceived technology education programs to prepare students to demonstrate knowledge about technology and technology systems, and solve problems through skilled use of resources. Lesser agreement was found concerning ethical decision making and recognizing multicultural contributions in the evolution of technology. Teaching-learning strategies with emphasis on problem solving methods, student use of tools, materials, and processes, and development of critical and creative thinking yielded strong agreement. Principals expressed lesser agreement regarding student involvement in technology student organizations. Findings concerning barriers to program implementation identified the greatest barriers to be insufficient budgets, inadequate facilities, lack of instructional resources, and scheduling. The least barriers were parents and students being informed about the program, lack of certified teachers, and conflicts with other school system priorities. Recommendations included encouraging collaboration with other programs, providing more direction for updating facilities, and encouraging support for technology student organizations.
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CHAPTER 1
INTRODUCTION

In the early 1980s, national reports such as Nation at Risk (National Commission for Excellence in Education, 1983), Educating Americans for the 21st Century (Commission on Precollege Education in Mathematics, Science, and Technology, 1983), and High School: Report on Secondary Education in America (Boyer, 1983), underscored the need for studying about technology as a way to improve our economic and educational competitiveness. The national reports and reforms led to subsequent standards projects, including Science for All Americans (1989), Benchmarks for Scientific Literacy (AAAS, 1993), and Technology for All Americans (ITEA, 1995). These standards identified the need for persons to develop technological knowledge and skills to be competitive and productive in a global society. National standards efforts have translated into state mandates, curricular frameworks, and changes in graduation requirements that include technology education.

In 1993, the Maryland State Board of Education adopted a one credit high school graduation requirement in technology education for all students beginning with the 1997 graduating class (COMAR, 1993). This mandate
requires all high school students to complete one credit of technology education in an approved program. The new requirement was put in place in response to efforts by the Technology Education Association of Maryland, technology educators, and testimony from different public and private groups highlighting the need for a technologically literate citizenry (Andrew, Gray, Smith, & Valesey, 1994). In addition to the one credit technology education requirement, an advanced technology education requirement was adopted to help better prepare students for either a career or postsecondary education. Students not enrolling in two years of foreign language or participating in a vocational program, must earn two credits in advanced technology education courses in order to graduate. These developments in technology education coincided with other changes in the graduation requirements, increasing the number of core courses and credits required for high school graduation in Maryland (MSDE, 1993).

Critical to successful implementation of technology education programs is the support of the school principal (Daiber, 1990; Draghi, 1991; Raizen, Sellwood, Todd, & Vickers, 1995). The principal, as an instructional leader, establishes instructional priorities, communicates program goals to staff and students, implements school-based action plans and allocates resources according to local goals and school priorities (Drake & Roe, 1986). Principals “must have a clear understanding of the critical role technology education can
play in the general curriculum and they must communicate the value of technology through the priority and resources they give to it” (Raizen et al., 1995). The principal’s understanding of and support for technology education as a basic educational requirement is essential to developing technological literacy and competence in all students. Due to significant curriculum changes, principals’ perceptions of their technology education programs may vary and may or may not reflect current curriculum and instructional practices.

This study investigated Maryland high school principals’ perceptions of technology education. The results of this study identified high school principals’ perceptions of program characteristics of technology education, the goals of technology education, implementation of appropriate teaching-learning strategies, and barriers to program implementation. State and local action on these findings can help provide students with a basic technological literacy upon graduation.

**Statement of the Problem**

Passage of the technology education high school graduation credit requirement in 1993 established new curriculum and instructional priorities in Maryland high schools. Technology education curriculum reforms created a need for new content and activities reflecting problem solving and technology
systems, renovation of facilities to reflect new processes and instructional approaches, and appropriate student assessments. Maryland principals may be unfamiliar with the new curricular emphases or may still support programs with a traditional industrial arts focus. Moreover, principals may or may not be providing necessary instructional leadership for updating technology education and communicating the new program requirements to parents and community members.

The problem in this study was that principals' perceptions of their respective technology education programs may or may not reflect the current state curriculum goals and instructional priorities. This study sought to investigate the perceptions of Maryland high school principals of the technology education program in their schools. Such a study was necessary to determine principal perceptions of the extent to which Maryland high school programs reflected recent changes in technology education.

**Purpose of the Study**

The main purpose of this study was to describe the perceptions of Maryland high school principals toward technology education in their respective schools. Second, this study provided data for Maryland state and local level administrators, teacher educators, and teachers regarding principals' views of their technology programs. The findings of this study may promote greater collaboration and better communication between teachers.
and administrators, and mobilize school resources for improving effectiveness of technology education programs. Further, actions resulting from these findings may contribute to professional development efforts and implementation of technology education programs.

**Research Questions**

Research questions were used to guide this descriptive research investigation. This study addressed the following questions:

1. What are selected demographics with respect to Maryland high schools?
   a. What is the total student enrollment at each high school for 1995-96?
   b. What courses meet the technology education requirement?

2. What are selected demographics regarding Maryland high school technology education programs?
   a. What is the student enrollment in the technology education program at each school?
   b. How many teachers are in the technology education program at each school?

3. What are selected demographics regarding high school principals?
   a. How many years has each principal served at his or her school?
b. In what area(s) is each principal certified?

4. What are Maryland principals' perceptions of the extent to which their technology education programs reflect agreement with state program characteristics?

5. What are Maryland principals' perceptions of the extent to which their technology education programs reflect agreement with state program goals?

6. What are Maryland principals' perceptions of the extent to which their technology education programs reflect agreement with state-recommended teaching and learning strategies?

7. What barriers do principals perceive as preventing the implementation of technology education?

8. What is the overall perception, i.e., the Quality Indicator Score, of each Maryland high school principal regarding his or her technology education program?

9. What demographic characteristics explain the greatest amount of unique variance in the overall perceptions of principals toward technology education?
Definition of Terms

The following terms were defined within the context of this investigation:

Technology: Technology will be defined as, “the application of ingenuity and resources to extend human capabilities” (ITEA, 1996). In Maryland, technology is similarly defined as, “the application of knowledge, tools, and skills to solve practical problems and extend human capabilities” (MSDE, 1994, p. 39). Thus, technology involves the application of resources and thinking skills to solve practical problems related to people’s needs and wants in the human-created environment.

Program Characteristic Indicator: A measure of principal perceptions of the extent to which his or her technology education program reflects agreement with state-recommended program characteristics. The Program Characteristic Indicator (PCI) score is the mean score of program characteristics items for each principal.

Program Goal Indicator: A measure of the extent to which program goals, as perceived by principals, reflect agreement with state goals for technology education. The Program Goal Indicator (PGI) score is the mean score for responses to program goal items for each principal.

Teaching-Learning Indicator: A measure of principal perceptions of the extent to which his or her technology education program reflects agreement with recommended teaching-learning strategies for technology education.
The Teaching-Learning Indicator (TLI) score is the mean score for responses to the teaching-learning items for each principal.

**Quality Indicator Score:** A measure of the extent to which each principal’s perceptions of his or her technology program reflects agreement with state-recommended program characteristics, program goals, and teaching-learning strategies. In this study, the Quality Indicator (QI) score is the mean of the sum of the scores for the Program Characteristic Indicator, Program Goal Indicator, and Teaching-Learning Indicator items as perceived by each principal.

**Assumptions**

This investigation was based on the following assumptions:

1. All Maryland public high schools offer courses that fulfill the basic technology education requirements.

2. Maryland high school principals have been informed of the technology education graduation requirement and associated expected outcomes for technology education by state or local education agencies.

3. Principals, not their subordinates, would complete the survey instrument.
Limitations

The study was limited to Maryland public high schools, their principals and corresponding technology education programs. Private and parochial schools as well as combined middle/ high schools, K-12 schools, evening and specialty high schools were excluded from this study.

Significance of the Study

The results of this investigation provides direction for state and local educational agencies in Maryland to develop effective strategies for informing principals of technology education curriculum developments and instructional emphases. Principals with a clear vision of what students need to know, do, and value about technology will effectively focus resources toward implementation of quality technology education programs. These efforts will help Maryland students realize the goal of technological literacy upon high school graduation.
CHAPTER 2
REVIEW OF THE LITERATURE

Introduction

This chapter will provide an overview of literature concerning educational reforms and standards, transitions to technology education at national and state levels, the role of the principal as an instructional leader, and technology education research related to this study. The first section will address the influence of national reports and subsequent educational standards efforts. The second section will discuss the influence of education reports on technology education and support for technological literacy. The next section will deal with developments in Maryland technology education, followed by the role of the school administrator in providing leadership and instructional support. The last section of this review will address research supporting the need for this investigation.

National Reports and Standards Efforts

In the 1980s, there were numerous reports stating concerns about declining American economic competitiveness and the need to be
knowledgeable about technology. The National Commission on Excellence in Education (1983) issued a landmark report identifying problems and issues affecting education in the United States. This report, Nation at Risk: The Imperative for Educational Reform, expressed concern over declining educational achievements and global competitiveness of high school graduates. The need to be knowledgeable about technology was specifically cited in the report:

Knowledge of the humanities must be tied to science and technology if the latter are to remain creative and humane, just as the humanities are to be informed by science and technology if they are to remain relevant to the human condition. (p. 10)

Recommendations for improving education included developing a content core, establishing higher standards and expectations, and strengthening graduation requirements. Other reports, such as High School: Report on Secondary Education in America (Boyer, 1983) reinforced concerns regarding the condition of American education.

Science education standards were developed through Science for All Americans—Project 2061 (1990) and culminated in the Benchmarks for Scientific Literacy (1993). This set of standards specifically addressed technology as a human endeavor rather than as an artifact. The following excerpt from Benchmarks for Scientific Literacy documented the nature of technology as a human enterprise:
In today's world, technology is a complex social enterprise that includes not only research, design and crafts, but also finance, manufacturing, management, labor, marketing and maintenance. (p. 41)

These standards explicitly cited technology as contributing to the human-created world:

> 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, senses . . . . (p. 41)

Also, the standards incorporated the study of technology in an historical perspective:

> There is growing awareness that technology works in everyday life to shape the character of civilization. (p. 41)

The latest science standards effort by the National Research Council (1995) dropped extensive references to technology and technological literacy. This change in science content focus further emphasizes the need for formal study about technology.

There are several direct references to studies about technology in the history standards document, *Expect Excellence: National Standards for Social Studies* (NCSS, 1996). The document specifies thinking skills and historical understandings as the two types of standards to be addressed in history education. Technology is treated as a key human endeavor to be studied in the context of human history. National Council for the Social Studies standards that relate to historical understandings are those,
drawn from the record of human aspirations, strivings, accomplishments, and failures in at least five spheres of human activity: the social, political, scientific/technological, economic, and philosophical/religious/aesthetic. They also provide the historical perspectives required to analyze contemporary issues and problems confronting citizens today. (NCSS, Chapter 1, 1996)

Included in the criteria for developing history standards is the statement, "standards in U. S. and world history should integrate fundamental facets of human culture such as religion, science and technology, politics and government, economics, interactions with the environment, intellectual and social life, and the arts" (NCSS, 1996). Thus, the history standards include technology as a significant human endeavor that must be understood within a historical context and with other cultural facets.

In describing policy issues, the National Council for the Social Studies document views commitment to such standards as a basis for change, "defining for students the goals essential to success in a rapidly changing global economy and in a society undergoing wrenching social, technological, and economic change" (NCSS, 1996, p. 97). Although the standards do not provide explicit examples of how technology can be studied in a historical context, it is clear that the history standards recognize technology as a key realm of human activity, as a central influence in historical events, and as a facet of culture that must be understood in the context of human history.
The **National Standards for Arts Education** (Consortium of National Arts Education Associations, 1994) address the role of the arts in human experiences (including technology), the benefits of arts education, the application of thinking skills, and self-expression. One of the major emphases in the arts standards involves the relationship between the arts and technology:

That the transforming power of technology is a force not only in the economy but in the arts as well. The arts teach relationships between the use of essential technical means and the achievement of desired ends. The intellectual methods of the arts are precisely those used to transform scientific discovery into technology. (Consortium of National Arts Education Associations, *Summary Statement*, 1994)

The development of necessary thinking skills and technical means apply to the study of the arts as it does to technology education. The arts standards emphasize the connection between the arts and technology and cite the importance of studying this relationship.

Another section in the arts standards addressed the role of the arts with other subjects, stating,

[It] provides a firm foundation for connecting arts-related concepts and facts across the art forms, and from them to the sciences and humanities. For example, the intellectual methods of the arts are precisely those used to transform scientific disciplines and discoveries into everyday technology. (*Summary Statement*, 1994)

Although the standards did not address the converse role of the arts in technological discoveries that lead to scientific developments, the arts
standards recognized an arts-technology connection that is important for students to understand.

Examination of national subject matter standards shows support for the study of technology, as a sphere of human activity (history, science) and as a technical means (the arts). This examination of standards lends support for technology education as a basic educational requirement.

**Technology Education: Transition and Standards**

The 1980s marked a transitional period from industrial arts to the study of technology as the focus of technology education programs. Technology education was and continues to be viewed from conflicting perspectives and differences in focus and goals. Criticisms included lack of consensus over direction and future (Dugger, 1980; Snyder & Hales, 1981), differences over philosophies and theoretical perspectives (Erickson, 1992; Herschbach, 1992) and differing content organizers, disciplinary frameworks and methodologies (DeVore, 1992; Savage & Sterry, 1990; Snyder & Hales, 1981; Towers, Lux, & Ray, 1966). The Jackson's Mill Industrial Arts Curriculum Theory (Snyder & Hales, 1981) was developed in response to concerns in the 1970s over curriculum focus and direction and attempted to establish consensus among leaders in the field. This framework set the stage for the development of standards. The 1980's saw the emerging transition from industrial arts to technology education. The American Industrial Arts Association changed its
name to International Technology Education Association in 1985 and status studies (Dugger, 1980) reflected transition, albeit marginal, from traditional industrial arts courses to technology education courses. The development of the Conceptual Framework for Technology Education (Savage & Sterry, 1990) ended the 1980’s transition with a refinement of the Jackson’s Mill Industrial Arts Curriculum Theory through consensus efforts among technology education leaders.

The 1990s reflect a range of program offerings, from technology education and Tech-Prep to design and technology and modular technology. Recent developments in curriculum were accompanied by a renewed effort to obtain national consensus. In 1994, the Technology for All Americans standards project was established with funding from the National Science Foundation and National Aeronautics and Space Administration and with support from the International Technology Education Association. One assumption underlying the project is that few school systems in the U. S. currently have articulated programs in technology education from kindergarten through 12th grade. The project literature cites lack of consensus regarding technology education, confusion between technology education and other disciplines, inadequate school resources and insufficient numbers of teachers prepared to teach technology education as concerns underlying program implementation (ITEA, 1995). Phase I of this two-phase project
resulted in the document, *Technology for All Americans: Rationale and Structure for the Study of Technology Education* (ITEA, 1996). Phase II will involve the development of standards reflecting what children should know about and be able to apply and evaluate technology. For this project, standards were defined as statements that provide evidence to make judgements about the quality and appropriateness of programs.

**Technological Literacy**

Central to the development of national standards is the recognition of the need to develop technological literacy. Technological literacy is a widely espoused educational goal with many definitions and intents. For this study, technological literacy will be defined as, “a concept used to characterize the extent to which an individual understands and is capable of using technology” (Dyrenfurth, 1991). Technological competence, a term becoming prominent in research literature and reports, was defined in the draft document *Technology for All Americans: A Rationale and Structure for the Study of Technology* (ITEA, 1995) as, “the ability to understand, create, use, manage, and assess technology” (p. 9). Technological literacy is acknowledged by many educational organizations as an important goal in education.

The National Science Foundation in *Educating Americans for the Twenty-first Century* (1983) regarded technological literacy as a basic capability. *Science for All Americans* (AAAS, 1990) and *Benchmarks for
Scientific Literacy (AAAS, 1993) also supported the need for technological literacy and distinguished it from scientific literacy. The International Technology Education Association (ITEA), in its Professional Improvement Plan (1989) and later in its ITEA Strategic Plan, 1994-95 (1994), identified as its main mission the advancement of technological literacy.

In the Council of Technology Teacher Education 40th Yearbook, Technological Literacy (CTTE, 1991), Dyrenfurth, Hatch, Jones, and Kozak reviewed literature from many fields to determine the "root ideas" underlying technological literacy. They were: democratic needs, nature of life, dehumanization/humanization, new liberal arts directions, nature of job/competitiveness/workforce literacy, and technology as a discipline. The authors stated, "These six conclusions combine to present a powerful argument for the significance of technological literacy" (p. 2). These foundational ideas are in concert with Nation at Risk concerns and standards efforts across school subjects.

Technological literacy as a primary goal for technology in education has been a common thread in technology education reform and developments. DeVore (1980) defined technology as a discipline and cited the importance of developing a basic literacy in technology. Maley (1987) cited five functions that citizens need to be able to perform to be technologically literate:
• a user of a vast array of technology,
• a decision-maker—both personal and as a citizen regarding technology,
• a purchaser and consumer of a wide variety of technology,
• a key element in the further use and development in technology,
• a worker and wage earner in an increasingly technological workplace. (p. 46)

Hatch (1985) investigated dimensions of technological literacy and identified three dimensions: practical, civil, and cultural; these dimensions parallel three purposes of schooling: work, public affairs, and private culture (Gagnon, 1995). Technological literacy, therefore, is a fundamental requirement for a productive and satisfying life.

**Maryland Technology Education: Historical Developments**

Historical developments in Maryland’s technology education programs were an outgrowth of dissatisfaction with traditional industrial arts programs. The industrial arts programs reflected a trade and job analysis focus, an emphasis on projects and project teaching methods, and teacher-centered activities. In the late 1940s and 1950s, Dr. Donald Maley, Professor of Industrial Education, University of Maryland, spearheaded efforts to establish a philosophical foundation for a student-centered program with a greater focus on advancements in industry and technology and with learning tied to
human development and societal needs. This foundation provided the basis for key curriculum developments in Maryland.

In 1952, with input from educators and graduate students, a research and experimentation unit for the junior high school was developed from this philosophical foundation. In 1953, an anthropological unit was designed, with a focus on how past developments in technology have impacted society. In 1955, a unit with a contemporary technology emphasis and a line production unit were developed and field tested. These efforts were combined into a structured program for students in grades seven through nine, called The Maryland Plan. The Maryland Plan components were first introduced at the teacher education level. Program implementation occurred in the 1960's as the University of Maryland program graduates entered teaching positions. A senior high school sequence was added in 1967 (Lux & Maley, 1979). The program was published in the text, The Maryland Plan-The Study of Industry and Technology in the Junior High School (Maley, 1973).

The Maryland Plan differed in content and focus from many programs developed in the late 1950's and 1960's. While many of the innovative programs focused primarily on the content of industry, the Maryland Plan put primacy on the learner (Householder, 1979). The program presented a past, present, and future focus of industry and technology rather than on a fixed content of materials, processes and products. Emphasis was placed on
personal development, consumer literacy, societal responsibility, problem solving, group work, technical development, research and experimentation skills, and communication of results (Maley, 1979). Elements of the Maryland Plan impacted technology education in Maryland and other states and influenced recent state-level changes in technology education.

Several developments provided impetus for promoting technology education as a Maryland high school graduation requirement. National reports such as Nation at Risk (1983) cited the need for states to promote technological literacy and strengthen graduation requirements. Also, reports such as Learning a Living: A Blueprint for High Performance: A SCANS Report for America 2000 (Secretary's Commission on Achieving Necessary Skills, 1992), concerned with employability of youth and changing work skills, cited the need for changes in education. These reports influenced Maryland's education reforms, particularly in efforts to develop more rigorous graduation requirements. The goal for revising requirements was to better prepare learners for careers and/or further education; a changing workforce due to the increases in the service sector of the Maryland economy stimulated changes in educational programs and preparations.

In technology education, a number of developments influenced the inclusion of technology education as a basic requirement for graduation. (See Appendix A: Timeline.) In 1987, the Metro Area Supervisors of Industrial
Arts and Technology Education, an ad hoc group assembled to address statewide concerns, called for a state level educational effort for technology education curriculum development and implementation. The Maryland State Department of Education funded a Technology Education Symposium Series, made up of teachers, supervisors, teacher educators, business representatives, and teachers from other school disciplines. Eight symposia were held between 1987 and 1991. The symposia groups established technology education content focus direction, and groundwork for program implementation in Maryland (Andrew, Gray, Smith, & Valesey, 1994).

In 1992, a formal proposal for a graduation requirement in technology education was submitted to the Maryland State Board of Education. In 1993, business and professional groups testified before the State Board of Education regarding the importance of technology education in developing technological literacy and preparing students for work and citizenship roles. The Maryland State Board of Education approved a one credit technology education graduation requirement for all high school students. (See Appendix B: Code of Maryland Annotated Regulations.) Maryland public school systems began offering courses to meet the requirement in September, 1993.

In Maryland Reaches for the Goals: A Report on Maryland’s Priorities for Education and Progress Toward National Education Goals (MSDE, 1993),
the revised graduation requirements summary included technology education:

The new requirements, the first high school revision of high school diploma standards since 1987, support the attainment of Goal 3 by requiring more challenging academic courses by eliminating the general track, and by mandating service learning. Under the new requirements, all students will take mathematics courses that contain at least basic algebraic and geometric content. Students will take three credits in science, and they will satisfy the requirement by taking courses in life, earth, and physical sciences that include laboratory study. Students will also be required to take a course in technology. (p. 20)

In addition, an advanced technology requirement was included. High school students not pursuing a vocational or academic program that includes two years of a foreign language must earn two additional credits in advanced technology education.

In Maryland, technology education is defined as, "an integrated, experience-based program designed to prepare a population that is knowledgeable about technology" (MSDE, 1994, p. 3). For the purposes of this study, the technology education program will also be defined as a Maryland high school program whose courses are devoted to the study of technology and fulfill the technology education graduation requirement. Eight learner outcomes guide curriculum developments and implementation of technology education programs at the local level. The technology education learner outcomes, in the form of goals, specify that students will:
• demonstrate knowledge and skills in the application of technology systems.
• demonstrate knowledge of the nature, impacts, and evolution of technology.
• demonstrate the ability to solve problems using technology.
• make informed decisions about technological issues.
• demonstrate safe use of technology resources, including tools, machines, and materials.
• apply science, math, and other areas to solve practical problems.
• apply knowledge of and perform tasks representative of technology-based careers.
• recognize multicultural and gender diversity in the evolution of technology. (MSDE, 1994)

The learner outcomes provide the basis for developing technology education activities, implementing instruction, and assessing what students have learned. The outcomes distinguish a technology education course from courses in other school subjects.

Role of Administrators

National reports emphasized the importance of the role of the principal in educational reforms. In the Nation at Risk (1983) report, recommendations involving leadership stated that, "principals and superintendents must play a
crucial leadership role in developing school and community support” (National Commission on Excellence in Education, p. 33). The school principal in the 1980s was an instructional leader with direct and primary responsibility for improving teaching and learning for effective schooling. Drake and Roe, in The Principalship (1986), summarized the principal’s role in the school as identified by 1983 national reports:

He or she is the administrator of direct line action, having first contact with the parents, local community, with the teachers needing resources and direction, with the students in the learning environment, with the staff in central administration, and with outside agencies and institutions wishing to make some impact upon each individual school unit. It is the principal who must articulate to these publics a vision of what should be. (p. v)

In effective schools research, principals, as instructional leaders, are expected to be knowledgeable of and involved in all phases of instructional activities in the school. Smith and Andrews (1989), summarized research involving key characteristics of the effective principal. The principal with strong leadership:

• places priority on curriculum and instruction.
• is dedicated to school and school district goals.
• effectively mobilizes and allocates resources to accomplish school goals.
• creates a climate of high expectations.
• functions as a leader with direct involvement in instructional policy.
• monitors student progress toward school achievement and teacher effectiveness.
• demonstrates commitment to academic goals.
• involves faculty and other groups in school decisions.
• establishes order and discipline by minimizing learning disruptions.

(p. 8)
Thus, the principal as instructional leader influences conditions and resources related to curriculum and instruction at the school level.

The role of the principal in the 1990s is changing due to school restructuring efforts. Conley (1993) summarizes effective principal behaviors from a study involving restructuring efforts in selected Oregon schools. These principals demonstrated:

• clear sense of purpose linked to vision.
• use of data to develop and implement a vision.
• allocation of resources according to the vision.
• creation of new structures for decision making.
• providing information to teachers.
• less direct leadership and more teacher support.

(p. 82)
The principal in this administrative role transition still remains a key influence in curriculum and program implementation. In this reconceptualization of the
administrative role, the principal must be able to formulate a vision of education that is comprehensive and is linked to the changing needs and values of society.

**Administrators and Technology Education Research**

Despite the key role of administrators in the implementation of curriculum, few studies investigated perceptions of principals toward technology education. Draghi (1991) studied factors influencing technology education program decisions by school decision makers, primarily principals, in Ohio schools. Data were collected using a census survey. Results indicated that the factors which most influenced decision makers regarding technology education programs were interests of students, student enrollments, costs, and faculty administrative input. Also, Draghi found that Ohio school district program decision makers held a positive attitude toward technology education and believed the goals were worthwhile, although their perceptions of what comprised technology education differed.

Daiber (1990) surveyed Illinois school principals to determine why principals differed in their attitudes toward implementation of technology education. Using an ex post facto research design, data and demographic information were collected using a survey instrument. The results of the study indicated a moderate correlation between a principal's understanding of technology education and his or her attitudes toward program
implementation and preference for learner outcomes. Principals with a high-knowledge level of technology education exhibited more positive attitudes toward implementing technology education and preference for technology education learner outcomes than low-knowledge level principals.

Hibberd (1986) surveyed Pennsylvania secondary school principals to determine their attitudes toward industrial arts/technology education. Data were collected using a questionnaire with semantic differential scales and items requesting demographic data. Results indicated that most principals perceived industrial arts as traditional rather than innovative, were not planning any changes in staffing, and, "curricular matters were rated least of their concerns" (p. iv). Hibberd found that those principals who provided support in terms of expanding industrial arts/technology education offerings had a more positive attitude toward industrial arts/technology education.

Zuga (1994) in a review of research literature in technology education found, "in general, the few studies done regarding public administrator and teacher perceptions revealed positive attitudes about technology education" (p. 57). However, this author indicated, "studies of perception point to a difference of opinion held by technology education teachers and school principals as well as leaders in the field" (p. 16). In an updated review of research in technology education, Zuga (1996) cited that between 1987 and 1995, administrators comprised three percent of the populations studied.
In *Critical Issues and Problems in Technology Education*, Wicklein (1992) conducted a four round Delphi study to identify present and future problems and issues facing the technology education profession. In the fourth round of rankings, one highly ranked problem facing technology education was the "inaccurate understanding and support of technology education by administrators and counselors." Wicklein further stated, "The need to gain support of school administrators, school counselors, other teachers within the school . . . was viewed as critical to the future development of technology education" (p. 27). Positive perceptions of high school principals toward technology education are essential in order to focus school resources and provide appropriate instructional program support.

Other studies involving administrators and their perceptions have been conducted. Similar research designs and methodologies were used to describe perceptions and attitudes toward change, curriculum initiatives, and school programs.

Shook (1994) conducted a Delphi study to determine key change agents and techniques to effect the transition from industrial arts to technology education. The expert panel consisted of technology education teachers, technology teacher educators, and school administrators. In the third and final Delphi round, the principal was identified as the third most important change agent after the technology education classroom teacher and technology
instructors of exemplary programs. The state supervisor of technology education and technology teacher educator faculty were ranked fourth and fifth respectively.

In identifying the techniques most effective in leading to change, the techniques ranked highest involved motivating the change agent, developing financial support, informing change agents what technology education is, and showing change agents such as principals how technology education interests and involves students. Thus, through Delphi study consensus, the principal is viewed as an important change agent in the transition to technology education whose support, participation, and interest are essential to positive program change.

Studies outside the field of technology education have examined perceptions of administrators and other change agents toward programs and school initiatives. Hairston (1993) conducted a study to gather information concerning administrator perceptions about awareness, support for, and implementation of the Maryland Schools for Success goals and National Education Goals. In addition, data was collected regarding level of funding and degree of implementation using a survey questionnaire. Sixteen goals were ranked according to level of agreement or disagreement using a Likert-type scale. Hairston found significant differences between superintendents and principals on awareness of goals, between urban and non-urban
principals on implementation of goals, and financial support. Finally, significant correlations were found between National and Maryland goals for awareness, level of support, commitment, and implementation.

Braun (1994) surveyed secondary school principals and administrators of vocational programs to determine their perceptions and attitudes toward Tech-Prep initiatives in Texas. Braun administered a mail survey instrument to collect data concerning status, curriculum, philosophy, benefits, and barriers to Tech-Prep programs. Descriptive statistics were used to analyze the data. Results showed a significant difference in attitudes toward items regarding curriculum, philosophy, and administration of Tech-Prep. Also, data collected identified 23 barriers and a number of benefits associated with Tech-Prep programs. Braun concluded that both principals and vocational administrators supported Tech-Prep, with vocational administrators having stronger attitudes.

Balentine (1993) examined the perceptions of Alabama secondary principals and home economics teachers toward home economics program effectiveness. A survey research design guided by hypotheses were used. Data concerning principal and teacher perceptions were gathered using a survey questionnaire. Significant differences were found for perceptions of principals and teachers toward curriculum and teaching methodology. Additional hypothesis testing with demographic data yielded no significant differences.
Summary

The review of literature provided a theoretical and philosophical foundation for investigating perceptions of high school principals toward technology education. The review included discussion of curricular reforms in technology education and summaries of previous studies involving administrators' perceptions of school programs and resulting major findings.

The first section of this review of literature provided a summary of educational reform efforts in the 1980s and subsequent development of national subject matter standards. Reform documents cited concerns about declining educational achievements and the need for students to study technology. The concern over decline in educational achievement spurred standards projects in a number of school subjects. Review of the standards literature reflected support for the study of technology and for technology education as a basic school requirement. This study attempted to determine whether or not the perceptions of high school principals reflected results of standards efforts through a state level curriculum framework.

The next section addressed the transition from industrial arts to technology education and the continuing development toward national standards for technology education. Also, this section presented developments in Maryland leading to the mandated graduation credit requirement for technology education. A review of literature concerning key program goals,
program characteristics, recommended teaching-learning strategies, and possible barriers to implementation was conducted. This information provided the content basis for development of the mail survey instrument used in this study.

The final section of the review of literature presented research concerning the role of the principal in educational reforms. The principal was identified as an instructional leader with direct responsibility for instructional activities and formulation of vision. Also, technology education research involving school administrators' perceptions was reviewed. This research highlighted the importance of having a knowledge base concerning the subject matter, the factors that influenced support for local programs and extent of program implementation. Studies in other fields involving principals' perceptions were presented. These studies revealed common findings concerning principals' views and program support.

Chapter 3 will present the research design for this study and the methodology used to conduct this investigation. Information concerning instrumentation, data collection, and data analysis for this study will be described.
CHAPTER 3

DESIGN-METHODOLOGY-RESEARCH

Introduction

In this chapter, the research design, methodology, and procedures are described. Information concerning this investigation will be presented in the following sections: (1) Research Design, (2) Population and Sampling, (3) Instrumentation, (4) Validity and Reliability, (5) Data Collection Procedures, and (6) Data Analysis.

Research Design

Salant and Dillman (1994) describe survey research as a means "to estimate the characteristics, behaviors, or opinions of particular populations" (p. 27). According to Fowler (1993), the purpose of survey research is "to provide quantitative or numerical descriptions of some aspect of the study population" (p. 1). A descriptive survey research design was used in this study to collect information and data regarding perceptions of high school principals toward technology education and demographic information concerning school size, technology education programs, and principal data.
The mail survey data collection method was used since it is reasonable in cost to administer, can be accomplished by an individual researcher, provides respondents with confidentiality, and allows for thoughtful responses (Fowler, 1993; Fraenkel & Wallen, 1996; Salant & Dillman, 1994). The survey research design included use of a panel of experts and field testing to establish validity of the instrument, and pilot testing the survey instrument for reliability.

Two mailings and one telephone follow-up were conducted to collect data. Statistical procedures involving measures of central tendency and dispersion were implemented to analyze the data. Results of the data analyses are presented in Chapter 4.

Population and Sampling

This study surveyed Maryland public high school principals. Private school, combined middle/high school, K-12, and specialty school principals were not included in the target population. The survey was in the form of a census, since the accessible population of Maryland high school principals could be surveyed in its entirety. The public high schools were identified using the Maryland State Education Directory (1994-1995) cross-referenced with the on-line Maryland Electronic Capital/Education/K-12 School Directory (1996). Written and telephone verification with local school systems were conducted during several phases of this investigation. Periodic verifications of principals were necessary due to principal retirements,
transfers, and new school transitions. Principals who were selected for field and pilot testing of the survey instrument were not included in the census.

**Instrumentation**

This study was conducted using a three-part survey instrument. A copy of the survey instrument is found in Appendix C. The survey was designed to collect information and data regarding high school principals' perceptions of technology education programs, specifically the extent to which local programs reflected technology education characteristics, goals, teaching-learning strategies, and barriers affecting local programs. Demographic data concerning each school, technology education program, and principal were collected. The survey instrument was developed from the research questions established for this study and review of technology education literature. Table 1 identifies the relationship between research questions and corresponding survey instrument items.

A Likert-type scale was used in Part I: Technology Education Quality Indicators to obtain descriptive information concerning the technology education program. The Likert scale presents issues or opinions and elicits responses that represent a level of agreement or disagreement. Alreck and Settle (1995) state the following guidelines for using Likert scale items: use several scale items; prepare statements that are opinions representative of a
larger issue; make items reflect the range of an issue; avoid items that tend to yield neutral values; and for summated items, prepare items that reflect the

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Survey Item Cross Reference</th>
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</thead>
<tbody>
<tr>
<td>1. What are the demographics with respect to Maryland high schools?</td>
<td>Part III:</td>
</tr>
<tr>
<td>a. What is the total school enrollment at each high school for 1995-1996?</td>
<td>Items 1, 6</td>
</tr>
<tr>
<td>b. What courses meet the technology education requirement?</td>
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</tr>
<tr>
<td>2. What are the demographics regarding Maryland high school technology education programs?</td>
<td>Part III:</td>
</tr>
<tr>
<td>a. What is the student enrollment at the technology education program at each school?</td>
<td>Items 2, 3</td>
</tr>
<tr>
<td>b. How many teachers are in the technology education program at each school?</td>
<td></td>
</tr>
<tr>
<td>3. What are the demographics regarding high school principals?</td>
<td>Part III:</td>
</tr>
<tr>
<td>a. How many years has the principal served at his or her school?</td>
<td>Items 4, 5</td>
</tr>
<tr>
<td>b. In what area(s) is each principal certified?</td>
<td></td>
</tr>
<tr>
<td>4. What are Maryland principals' perceptions of the extent to which their technology education programs reflect agreement with state program characteristics?</td>
<td>Part IA:</td>
</tr>
<tr>
<td></td>
<td>Items 1, 2, 3, 4, 5, 6, 7, 8, 9</td>
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<tr>
<td>5. What are Maryland principals' perceptions of the extent to which their technology education programs reflect agreement with state program goals?</td>
<td>Part IB:</td>
</tr>
<tr>
<td></td>
<td>Items 10, 11, 12, 13, 14, 15, 16, 17, 18, 19</td>
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<tr>
<td>6. What are Maryland principals' perceptions of the extent to which their technology education programs reflect agreement with state-recommended teaching and learning strategies?</td>
<td>Part IC:</td>
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<td></td>
<td>Items 20, 21, 22, 23, 24, 25, 26, 27, 28</td>
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<tr>
<td>7. What barriers do principals perceive as preventing the implementation of technology education?</td>
<td>Part II</td>
</tr>
<tr>
<td>8. What is the overall perception, i.e., the Quality Indicator Score, of each Maryland high school principal regarding his or her technology education program?</td>
<td>Part I, Section A, B, C</td>
</tr>
<tr>
<td>9. What demographic characteristics explain the greatest amount of variance in the overall perceptions of principals toward technology education?</td>
<td>Part III</td>
</tr>
</tbody>
</table>

Table 1. Research Question and Survey Instrument Item Cross Reference
pro and con sides of an issue. The response choices for Part I were Strongly Disagree (SD), Disagree (D), Agree (A), Strongly Agree (SA), and Don't Know (DK). The items developed for Part I, Section A: Technology Education Program Characteristics were derived from characteristics of technology education programs developed at the state and national levels (TTEA, 1985; MSDE, 1994). Principals indicated the extent to which they agreed or disagreed that the program characteristics in this section reflected the technology education programs in their schools.

In Part I, Section B: Technology Education Goals, principals described the extent to which their technology education programs reflected agreement with the Maryland goals for technology education. The goal items included present learner outcomes for technology education and former industrial arts goals. In Section B, items 11, 12, 14, 16, 18, and 19 were based on the state goals for technology education (MSDE, 1994). Items 13, 15, and 17 reflected goals for traditional industrial arts programs.

For Part I, Section C: Technology Education Teaching-Learning Indicators a Likert-type scale was used to describe principals' perceptions reflecting instructional characteristics they may or may not have observed in their local technology education programs. The teaching and learning indicators were taken from Technology Education: A Maryland Curriculum
Framework (1994) and related resources (Technology Education Association of Maryland, 1994; MSDE, 1995).

For Part II: Barriers Preventing Technology Education Implementation, a ranking was used to obtain data on barriers to local implementation of technology education. A forced ranking scale should have less than ten items, focus on the relative position of items, have clearly stated items, and data analysis for ordinal data must be used (Alreck & Settle, 1995). The first nine items in this part were close-ended and unordered. The last item, "Other," was open-ended to allow for responses not listed in the ranking. The list of barriers were selected from a review of research regarding implementation of technology education (Draghi, 1990; Hibberd, 1986; Wicklein, 1992).

Part III: Demographic Information consisted of close-ended and partially close-ended questions regarding school size, technology education program, and principal data. This part was designed to gather descriptive information regarding school and technology education student enrollments, number of technology education teachers in the school, number of years the principal had been at the school, certification area(s) for each principal, and the high school technology education courses that fulfilled the technology education graduation requirement.
Validity and Reliability

To determine the content validity of the descriptive survey instrument a panel of experts was used. Each panel member was selected for his or her expertise in technology education and knowledge of the technology education developments in Maryland.

The panel consisted of three teacher educators, a state specialist for technology education, a state special programs coordinator; three local supervisors/coordinators for technology education, and a director of a center for career and technology education studies. On May 1, 1996, members of the panel were sent a cover letter explaining the purpose of the panel, the survey instrument with a return envelope, and a feedback form. The panel critiqued the survey instruments and provided input regarding content, clarity, and wording using a survey feedback form (Appendix D). Once the comments from the panel were returned, the feedback was compiled and used to revise the instrument. Overall, the panel feedback indicated item clarity and appropriateness of survey statements with minor changes in wording of items and survey format.

On May 15, 1996, a field test was conducted to check for content validity and overcome response bias. The revised instrument, with cover letter explaining the field testing procedure and return envelope, were sent to a small random sample of principals (n = 5) taken from the census group. The
field test group was not used in the actual study. The field test respondents confirmed the clarity of items, suggested some rewording of the introduction, and indicated the survey could be completed within a 10-15 minute time frame.

On May 30, 1996 a pilot test was conducted to establish reliability of the survey instrument. Ten high school principals were randomly selected to participate from the census population. Each pilot study participant received an advance facsimile indicating OSU correspondence would arrive the next day. The contents of the mailing consisted of a cover letter, a pilot survey, and a token OSU pen. The mailing was sent in a two-day priority mail envelope with a postage stamp depicting a space shuttle. Follow-up phone calls were made on anticipated mail arrival dates to ensure all mailings were received by the participants. Two new principals were selected to participate during the follow up since one school did not have a technology education program and a principal had retired from another school. Follow-up continued until all pilot study mailings were received. Some participants indicated that the pilot study was received close to high school graduations and therefore were returned after this culminating school event.

To determine the reliability of the instrument, Cronbach's alpha was the statistical analysis used for Part I. Cronbach's alpha is used to test for internal consistency of summated Likert-type scale items. The SPSS 6.1 (SPSS Inc.,
1994) statistical package was used to determine the alpha coefficient. A coefficient of .67 was obtained for the pilot study. A post-survey reliability analysis resulted in an alpha coefficient of .87.

After administration of the pilot test, each participant received a second mailing with a retest instrument for Part III of the survey. Participants were instructed to complete the ranking of barriers to implementation a second time. Test-retest procedures were used to determine the reliability of Part III. Such procedures are used to determine reliability of ranked items. Test-retest procedures yielded 74% agreement between the two test administrations.

**Data Collection Procedures**

The first part of this investigation consisted of the preparation of the survey instrument, identification of the sampling frame, and determining validity and reliability. The second part of the study involved administering the survey instrument to 103 high school principals in the census group. The first mailing was sent on June 15, 1996. Each principal was sent a cover letter describing the study, the survey instrument with a return envelope, a complimentary item, and instructions for responding to the survey using a listserv established as an alternative to traditional data collection. Respondents could respond via mail, fax, or listserv. The initial response rate was 37%, or 39 surveys returned. A sampling of nonrespondents by telephone indicated nonresponse was due to either school year closing priorities or changes in
administrative positions. A second mailing was sent to 64 principals on July 7, 1996. The response rate for this second mailing was 19%, or an additional 20 usable surveys returned. Total response rate from the two mailings was 56%. A follow-up by telephone was conducted for a sampling of nonrespondents. This follow up indicated nonresponses were due to principal retirements, administrative transfers, vacations, and teacher placement priorities. An additional 8 usable mail surveys, or 7%, were received after telephone follow-up, bringing the usable survey response rate to 65% or 67 usable surveys. Four surveys were incomplete or returned after the completion of the survey and therefore were unusable.

**Data Analysis**

Once survey administration was completed, the data were analyzed according to the research questions:

1. What are demographics with respect to Maryland high schools?
   a. What is the total student enrollment at each high school for 1995-96?
   b. What courses meet the technology education graduation requirement?

2. What are selected demographics regarding Maryland high school technology education programs?
a. What is the student enrollment in the technology education program at each school?

b. How many teachers are in the technology education program at each school?

3. What are demographics regarding high school principals?
   a. How many years has each principal served at his or her school?
   b. In what area(s) is each principal certified?

4. What are Maryland principals' perceptions of the extent to which their technology education programs reflect agreement with state program characteristics?

5. What are Maryland principals' perceptions of the extent to which their technology education programs reflect agreement with state program goals?

6. What are Maryland principals' perceptions of the extent to which their technology education programs reflect agreement with state-recommended teaching and learning strategies?

7. What barriers do principals perceive as preventing the implementation of technology education?
8. What is the overall perception, i.e., Quality Indicator Score, of each Maryland high school principal regarding his or her technology education program?

9. What demographic characteristics explain the greatest amount of unique variance in the overall perceptions of principals toward technology education?

Descriptive statistical analyses using the SPSS statistical package were used to analyze the data collected with the survey instrument. For Part I, Sections A, B, and C of the survey instruments, frequencies and mean scores were obtained for each item. A Quality Indicator Score, or mean score for Part I items, reflected the extent a principal's perceptions of his or her technology education program reflected agreement with the state curriculum. For Part II, frequencies and modes were determined for each ranked items. For Part III, the demographic information, modes and frequency distributions were used to describe the results of the data gathered regarding the school technology education program and principal. Pearson’s r calculations were used to determine possible relationships between demographics and quality indicators reflecting each principal’s perceptions. Survey results were summarized in table forms with supporting descriptions of the findings. Findings are presented in Chapter 4.
Summary

This chapter provided an overview of the design, methodology, and research procedures for this study. This study employed descriptive research and used the mail survey method for data collection. Data analysis involved measures of central tendency and dispersion.

The initial population selected for this study consisted of 139 Maryland high school principals. The accessible population was later adjusted to be 103. The principals were identified using the state education directory and an online education directory resource.

The survey instrument was developed using information from the Maryland Technology Education Curriculum Framework (1994) and from technology education literature. The instrument was designed to collect data concerning local technology education program characteristics, program goals, teaching and learning strategies, and barriers to implementation. The instrument was critiqued by a panel of experts and field tested to establish validity. A pilot test was conducted to determine reliability of the instrument.

The mail survey was sent to all principals in the accessible population (103). Two follow up procedures, a second mailing and telephone follow-up, were conducted to obtain a 65% return rate. Alternative means for returning the survey instrument, i.e., mail, fax, or computer listserv, were made available to respondents.
The descriptive analysis procedures involved the calculation of frequencies, measures of central tendency and dispersion. A computer statistical package was used to perform calculations. The results of the data analysis are presented in Chapter 4.
CHAPTER 4

FINDINGS

Overview

The purpose of this study was to describe the perceptions of Maryland high school principals toward technology education program characteristics, goals, and teaching-learning strategies in their schools. Also, this study examined principals' perceptions of barriers to implementation of technology education. A mail survey instrument was used to collect data concerning principals' perceptions and to seek responses to the research questions guiding this study. The research questions were:

1. What are selected demographics with respect to Maryland high schools?
   a. What is the total school enrollment at each high school for 1995-96?
   b. What courses meet the technology education graduation requirement?

2. What are selected demographics regarding Maryland high school technology education programs?
a. What is the student enrollment in the technology education program at each school?

3. What are selected demographics regarding high school principals?
   a. How many years has each principal served at his or her school?
   b. In what areas(s) is each principal certified?

4. What are Maryland principals' perceptions of the extent to which their technology education programs reflect agreement with state program characteristics?

5. What are Maryland principals' perceptions of the extent to which their technology education programs reflect agreement with state program goals?

6. What are Maryland principals' perceptions of the extent to which their technology education programs reflect agreement with state-recommended teaching and learning strategies?

7. What barriers do principals perceive as preventing the implementation of technology education?

8. What is the overall perception, i.e., the Quality Indicator Score, of each Maryland high school principal regarding his or her technology education program?
9. What demographic characteristics explain the greatest amount of variance in the overall perceptions of principals toward technology education?

Chapter 4 presents a summary of the findings from the data collected in response to these questions. The findings of this study were summarized in six sections.

A description of the demographic data regarding principals and schools was summarized in the first section. The succeeding five sections correspond with the research questions identified for this study: (1) principals' perceptions of technology education program characteristics, (2) perceptions of program goals, (3) perceptions of teaching-learning strategies, (4) principals' perceptions of program implementation barriers, and (5) overall perceptions of principals toward technology education. The survey was sent initially to 139 Maryland public high school principals. The accessible population was adjusted from 139 to 103 principals due to local policies and procedures concerning external research. The results of the study were determined by responses from 65% of the survey population (n = 103). Three school systems sent letters stating that external studies must be approved by their system; another system indicated their principals did not have time to respond to external research projects. Of the surveys returned, 94% or 67 surveys, were usable; 6% or 4 surveys were returned without responses. Of the 103 surveys
distributed, 68.5% or 71 surveys were returned. Survey distribution and return rates are summarized in Table 2.

<table>
<thead>
<tr>
<th>Items</th>
<th>Frequency</th>
<th>%</th>
<th>Usable Surveys</th>
<th>Frequency</th>
<th>%</th>
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Table 2. Survey Mailing and Follow-up Response Rates (n = 103)

The principals who returned but did not complete surveys indicated they were new to their positions and thus did not have the time to provide responses. Almost all surveys were returned by mail; only two principals returned surveys by fax. One principal expressed interest in the availability of the survey on a computer listserv but responded by mail.

To compare respondents and nonrespondents, t-tests were performed to determine possible differences between the groups. Late respondents were
treated as nonrespondents for the purpose of determining nonresponse error.

For this study, unequal independent t-tests were used to determine whether or not there was a significant difference between 37 early respondents and 30 late respondents on selected survey items. Table 3 presents the results of the t-tests performed on individual items. Results showed no significant difference at the .05 level between early and late respondents. Thus, the results can be generalized to the accessible population for this study.

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Table 3 (continued)

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</table>

p < .05

Table 3. Results of Comparison of Early Respondents to Late Respondents (t-tests)
Demographic Data

Demographic data were collected using a mail survey. Each principal was asked to provide school and academic background data. Table 4 describes the respondents' schools by total student enrollment. The largest number of respondents (27 or 40% of respondents) had enrollments of 1,201 to 1,800 students. One respondent indicated over 2,400 students were enrolled at his school. The mean student enrollment was 1,181 while the median enrollment was 1,350 students.

<table>
<thead>
<tr>
<th>Student Enrollment</th>
<th>Frequency (n = 67)</th>
<th>% of n</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-600</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>601-1,200</td>
<td>22</td>
<td>31</td>
</tr>
<tr>
<td>1,201-1,800</td>
<td>27</td>
<td>40</td>
</tr>
<tr>
<td>1,801-2,400</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>2,401 and Over</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>No Response</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Mean = 1,181; Median = 1,350; SD = 528; min = 120; max = 2,800

Table 4. Respondents' Student Enrollments

Table 5 summarizes the student enrollments in technology education in the respondents' schools. The largest percentage of enrollments was 151-300 students or 37% of respondents' schools. The smallest percentage of enrollment was 3% or 601-750 students. Six percent of respondents did not
indicate technology education enrollments. Mean enrollment in technology education programs was 339 students.

<table>
<thead>
<tr>
<th>Technology Education Student Enrollment</th>
<th>Frequency</th>
<th>% of n*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-150</td>
<td>15</td>
<td>22</td>
</tr>
<tr>
<td>151-300</td>
<td>25</td>
<td>37</td>
</tr>
<tr>
<td>301-450</td>
<td>11</td>
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<td>451-600</td>
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<td>601-750</td>
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<td>751 and Above</td>
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<tr>
<td>No Response</td>
<td>4</td>
<td>6</td>
</tr>
</tbody>
</table>

* rounded to the nearest percent
Mean = 339; SD = 252; min = 0; max = 1,250

Table 5. Technology Education Student Enrollments (n = 67)

Table 6 describes the number of technology education teachers in respondents' schools. The mean was 3.5 teachers, with a mode of two teachers per school. One respondent cited 30 technology teachers; follow-up with the respondents indicated the high number of teachers was due to inclusion of teachers of other subjects. Therefore, this data was excluded from the frequency table. Respondents who cited six or more teachers may also have included other teachers in their count.
### Number of Technology Education Teachers

<table>
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<th>Number of Teachers</th>
<th>Frequency (n = 64)</th>
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<tr>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>No Response</td>
<td>3</td>
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</table>

Mean = 3.5; Mode = 2; SD = 3.9; min = 1; max = 10

Table 6. **Number of Technology Education Teachers**

Table 7 describes the number of years the principal respondents were employed at their present schools. The range was 0-20 years, the mean number of years was 4, with one year the most frequent response. Thus, new principals provided the majority of returns.
<table>
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<tr>
<th>Number of Years at Present School</th>
<th>Frequency (n = 67)</th>
<th>% of n</th>
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<tbody>
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<td>0-5</td>
<td>47</td>
<td>71</td>
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<td>6-10</td>
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<tr>
<td>No Response</td>
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</table>

Mean = 4 years; mode = 1; min = 0; max = 20

Table 7. Principal Respondents' Years at Present School

Table 8 summarizes the areas of certification cited by the respondents and their frequencies. Certification in administration and/or supervision were excluded from this table since such certification is usually a requirement for the position of principal. The areas most frequently cited were Social Studies/History (16 respondents), Science (14 respondents), and English (13 respondents). The areas least cited were Business/Management (2 respondents), Technology Education (2 respondents), and Curriculum (1 respondent). The majority of respondents identified more than one certification area. The findings show that the principal respondents have varied academic backgrounds.
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<th>Principal Certification Areas</th>
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<td>Science</td>
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<tr>
<td>English</td>
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<td>Math</td>
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<td>Special Education</td>
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<tr>
<td>Guidance/Pupil Personnel Worker</td>
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<td>Health/Physical Education</td>
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<td>Technology Education/Industrial Arts</td>
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<tr>
<td>Business/Management</td>
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<tr>
<td>Curriculum</td>
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</table>

Note: Some principal respondents were certified in more than one area, accounting for a frequency total greater than n.

Table 8. Certification Areas of Principal Respondents (n = 67)

Table 9 reports the range of courses that meet the technology education graduation credit requirement and their frequencies. The courses most frequently cited were Basic/Introductory Technology Education (f = 47), Computer Science/Computer Applications (f = 46), and Advanced Technology Education (f = 37). Drafting/Mechanical Drawing was cited in 36 surveys. The courses least cited by respondents as meeting the technology education requirement were Business and courses listed in the category labeled "Other". 
Courses That Fulfill Technology Education Requirement

<table>
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<th>Course</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic/Introductory Technology Education</td>
<td>47</td>
</tr>
<tr>
<td>Computer Science/Computer Applications</td>
<td>45</td>
</tr>
<tr>
<td>Advanced Technology Education</td>
<td>37</td>
</tr>
<tr>
<td>Drafting/Mechanical Drawing</td>
<td>36</td>
</tr>
<tr>
<td>Foundations of Technology</td>
<td>35</td>
</tr>
<tr>
<td>Architectural Drawing</td>
<td>27</td>
</tr>
<tr>
<td>Engineering/Pre-Engineering</td>
<td>20</td>
</tr>
<tr>
<td>Communication</td>
<td>15</td>
</tr>
<tr>
<td>Other (e.g., Food Technology)</td>
<td>11</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>11</td>
</tr>
<tr>
<td>Science/Agricultural Education</td>
<td>8</td>
</tr>
<tr>
<td>Transportation</td>
<td>7</td>
</tr>
<tr>
<td>Construction</td>
<td>6</td>
</tr>
<tr>
<td>Business</td>
<td>1</td>
</tr>
</tbody>
</table>

Note: Principal respondents cited more than one course as fulfilling the graduation requirement, resulting in a frequency count greater than n.

Table 9. Technology Education Graduation Requirement Courses (n = 67)

Courses cited as "Other" were varied and were essentially non-technology education courses. Table 10 cites the courses specified by respondents in the "Other" category. Biotechnology was the most cited course in this category. Also, specialized courses such as Food Technology, Health and Human Services, and Music Technology were identified.


<table>
<thead>
<tr>
<th>Other Required Courses</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biotechnology</td>
<td>3</td>
</tr>
<tr>
<td>Food Technology</td>
<td>2</td>
</tr>
<tr>
<td>Graphics/Design</td>
<td>2</td>
</tr>
<tr>
<td>Child Care</td>
<td>1</td>
</tr>
<tr>
<td>Health and Human Services</td>
<td>1</td>
</tr>
<tr>
<td>Music Technology</td>
<td>1</td>
</tr>
<tr>
<td>Principles of Technology</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 10. "Other" Courses Fulfilling Technology Education Graduation Requirement

Results indicate that traditional courses such as drafting/mechanical drawing and courses in other fields such as family studies and music can be taken to fulfill the technology education graduation requirement.

**Principals' Perceptions of Program Characteristics**

Part IA of the survey instrument, Technology Education Program Characteristics, addressed Research Question 4: What are Maryland principal's perceptions of the extent to which their technology education programs reflect agreement with state program characteristics? Data concerning principals' perceptions were summarized in Table 11 in the form of mean scores using a five-point Likert scale. The higher the mean score for each
program characteristic, the greater the level of agreement between the respondents' perceptions of local technology education

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean Score</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Places emphasis on problem solving in technology education activities.</td>
<td>3.45</td>
<td>.61</td>
</tr>
<tr>
<td>Uses varied instructional strategies.</td>
<td>3.39</td>
<td>.58</td>
</tr>
<tr>
<td>Has increased student interest in technology education classes.</td>
<td>3.31</td>
<td>.80</td>
</tr>
<tr>
<td>Is promoted by the technology teachers in the school.</td>
<td>3.27</td>
<td>.79</td>
</tr>
<tr>
<td>Has technology teachers who are involved in professional development.</td>
<td>3.25</td>
<td>.77</td>
</tr>
<tr>
<td>Represents the diversity of the school population.</td>
<td>3.21</td>
<td>.83</td>
</tr>
<tr>
<td>Uses updated laboratory facilities.</td>
<td>3.17</td>
<td>.76</td>
</tr>
<tr>
<td>Collaborates with other school departments.</td>
<td>3.05</td>
<td>.73</td>
</tr>
<tr>
<td>Has influenced changes in technology education laboratories.</td>
<td>3.03</td>
<td>1.06</td>
</tr>
</tbody>
</table>

Note: The mean score is based on a five-point Likert scale in which 1.00 = Strongly Disagree; 2.00 = Disagree; 3.00 = Agree; 4.00 = Strongly Agree; and 0 = Don't Know

Table 11. Technology Education Program Characteristic Scores (n=67)
program characteristics and state program recommendations. The characteristics with the highest mean scores were the following survey items: 1. Places emphasis on problem solving; 3. Uses varied instructional strategies; and 8. Is promoted by the technology teachers in the school. These characteristics reflect perceptions toward instructional approaches and public relations. Program characteristics with the lowest mean scores and reflecting the least agreement were items eliciting perceptions of collaboration (item 6) and changes in facilities (item 7). The greater the standard deviation, the lower the level of agreement. Characteristics with the greatest standard deviation were item 6, involving changes in facilities (SD = 1.06) and item 9, addressing diversity in the technology education program as a reflection of the school population (SD = .83).

Table 12 reports the Program Characteristic Indicator (PCI), or mean scores frequencies of items 1-9 for respondents. The range was 2.00 with a minimum of 2.00, reflecting disagreement with perceptions of program goals and a maximum of 4.00, reflecting strong agreement with the program goals. The overall PGI mean score was 3.24 and the standard deviation was .52. Overall, most respondents reflected a high level of agreement with technology education program characteristics.
Table 12. Respondents' Program Characteristic Indicator (PCI) Scores

<table>
<thead>
<tr>
<th>PCI Scores</th>
<th>Frequencies (n = 67)</th>
<th>% of n</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.00-3.50</td>
<td>26</td>
<td>38</td>
</tr>
<tr>
<td>3.00-3.49</td>
<td>25</td>
<td>37</td>
</tr>
<tr>
<td>2.50-2.99</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>2.00-2.49</td>
<td>9</td>
<td>13</td>
</tr>
</tbody>
</table>

Overall mean PCI score = 3.24; SD = .53; Range = 2.00; min = 2.00; max = 4.00

Note: The mean PCI score is based on a five-point Likert scale. For this comparison 2.00 = moderate agreement, 3.00 = strong to moderate agreement, 4.00 = strong agreement.

Table 12. Respondents' Program Characteristic Indicator (PCI) Scores

Principals' Perceptions of Technology Education Goals

Part IB of the survey instrument, Technology Education Goals, addressed Research Question 5: What are Maryland principal's perceptions of the extent to which their technology education programs reflect agreement with state program goals? Data concerning principals' perceptions in the form of mean scores were summarized in Table 13.

In this survey section, the higher the mean score for each item, the greater the level of agreement between the respondents' perceptions of local technology education program goals and state program recommendations. The program goals with the highest mean scores were item 11. Demonstrate knowledge about the characteristics of technology; 12. Demonstrate the
<table>
<thead>
<tr>
<th>Item</th>
<th>Mean Score</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demonstrate knowledge about the characteristics of technology.</td>
<td>3.31</td>
<td>.53</td>
</tr>
<tr>
<td>Demonstrate the ability to solve problems about technology.</td>
<td>3.31</td>
<td>.70</td>
</tr>
<tr>
<td>Demonstrate practical understanding of technology systems.</td>
<td>3.30</td>
<td>.60</td>
</tr>
<tr>
<td>Demonstrate skilled use of technology resources to solve practical problems.</td>
<td>3.25</td>
<td>.70</td>
</tr>
<tr>
<td>Demonstrate skilled use of tools and materials to perform industrial operations.</td>
<td>3.02</td>
<td>1.02</td>
</tr>
<tr>
<td>Apply other subjects with technological concepts to solve practical problems.</td>
<td>2.88</td>
<td>.99</td>
</tr>
<tr>
<td>Apply knowledge and skills of industry.</td>
<td>2.84</td>
<td>.86</td>
</tr>
<tr>
<td>Apply technical knowledge and tool skills to leisure activities.</td>
<td>2.62</td>
<td>1.20</td>
</tr>
<tr>
<td>Make ethical decisions about technology issues.</td>
<td>2.45</td>
<td>1.30</td>
</tr>
<tr>
<td>Recognize multicultural contributions in past, present, and future technology.</td>
<td>2.25</td>
<td>1.30</td>
</tr>
</tbody>
</table>

Note: The mean score is based on a five-point Likert scale in which 1.00 = Strongly Disagree; 2.00 = Disagree; 3.00 = Agree; 4.00 = Strongly Agree; and 0 = Don't Know.

Table 13. Technology Education Program Goal Scores (n = 67)
ability to solve problems about technology; and 14. Demonstrate skilled use of technology resources to solve practical problems. The program goals with the lowest mean scores and reflecting the least agreement were items 13, 15, and 17; these goals were industrial arts goals that were included in the section. Also, item 19 reflected little agreement, indicated that principals may not be observing technology assessment activities in technology education programs.

Table 14 reports the Program Goal Indicator (PGI), or mean score of items 10-19 for respondents. The overall mean was 2.92 with a standard deviation of .59. The range was 2.50, with a minimum mean score of 1.50 and a maximum score of 4.00. According to the PGI scores, respondents reflected some agreement with technology education program characteristics.

<table>
<thead>
<tr>
<th>PGI Scores</th>
<th>Frequencies (n = 67)</th>
<th>% of n</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.00-3.50</td>
<td>16</td>
<td>24</td>
</tr>
<tr>
<td>3.00-3.49</td>
<td>14</td>
<td>21</td>
</tr>
<tr>
<td>2.50-2.99</td>
<td>23</td>
<td>34</td>
</tr>
<tr>
<td>2.00-2.49</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>1.50-1.99</td>
<td>4</td>
<td>6</td>
</tr>
</tbody>
</table>

Mean = 2.92; SD = .59; Range = 2.50; min = 1.5; max = 4.00

Table 14. Program Goal Indicator Scores for Respondents
Principals' Perceptions of Teaching and Learning Strategies

Part IC, of the survey instrument, Teaching-Learning Strategies, addressed Research Question 6: What are Maryland principal's perceptions of the extent to which their technology education programs reflect agreement with state-recommended teaching and learning strategies? Data concerning principals' perceptions in the form of scores were summarized in Table 15. For this section, the higher the score for each item, the greater the level of agreement between the respondents' perceptions of local technology education teaching and learning strategies and state program recommendations. The strategies with the highest mean scores were item 22: Places emphasis on problem solving as an instructional method; item 25: Involves student use of tools, machines, and processes; and item 26: Develops critical and creative thinking. Responses to item 28: Involves students in technology student organizations or competitions, had the lowest mean score for this section (mean = 2.73) and reflected the least agreement.

Table 16 reports the frequencies of the Teaching-Learning Indicator (TLI) scores of items 20-28 for respondents. The grand mean was 3.21 with a standard deviation of .57. The range was 2.67, with a minimum TLI score of 1.33 and a maximum TLI score of 4.00.
<table>
<thead>
<tr>
<th>Item</th>
<th>Mean Score</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incorporates cooperative learning and group activities.</td>
<td>3.48</td>
<td>.64</td>
</tr>
<tr>
<td>Places emphasis on problem solving as an instructional method.</td>
<td>3.36</td>
<td>.69</td>
</tr>
<tr>
<td>Involves student use of tools, machines, and processes.</td>
<td>3.34</td>
<td>.74</td>
</tr>
<tr>
<td>Is designed to accommodate all students in your school.</td>
<td>3.31</td>
<td>.72</td>
</tr>
<tr>
<td>Develops critical and creative thinking.</td>
<td>3.29</td>
<td>.71</td>
</tr>
<tr>
<td>Lends itself to interdisciplinary activities.</td>
<td>3.15</td>
<td>.78</td>
</tr>
<tr>
<td>Promotes technology-related career development.</td>
<td>3.15</td>
<td>.91</td>
</tr>
<tr>
<td>Satisfies the diverse learning styles of students.</td>
<td>3.12</td>
<td>.86</td>
</tr>
<tr>
<td>Involves students in technology student organizations or competitions.</td>
<td>2.72</td>
<td>1.01</td>
</tr>
</tbody>
</table>

Note: The mean score is based on a five-point Likert scale in which 1.00 = Strongly Disagree; 2.00 = Disagree; 3.00 = Agree; 4.00 = Strongly Agree; and 0 = Don't Know.

Table 15. **Technology Education Teaching-Learning Indicator Scores (n = 67)**

68
Table 16. Respondents' TLI Scores

<table>
<thead>
<tr>
<th>TLI Scores</th>
<th>Frequencies (n = 67)</th>
<th>% of n*</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.00-3.50</td>
<td>25</td>
<td>37</td>
</tr>
<tr>
<td>3.00-3.49</td>
<td>21</td>
<td>31</td>
</tr>
<tr>
<td>2.50-2.99</td>
<td>15</td>
<td>22</td>
</tr>
<tr>
<td>2.00-2.49</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>1.50-1.99</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

* rounded to the nearest percent
Mean = 3.21; SD = .57; min = 1.33; max = 4.00

Overall Perceptions of High School Principals

To respond to research question 9: What is the overall perception, i.e., the Quality Indicator Score, of each Maryland high school principal regarding his or her technology education program?, an overall mean score for Part I was calculated for each respondent. Table 17 summarizes the QI scores. The Quality Indicator (QI) Score reflects the respondents' perceptions of technology education program goals, characteristics, and teaching-learning indicators for their school program. For each respondent, the QI score is the mean of the Program Characteristics Indicator, the Program Goals Indicator, and the Teaching-Learning Indicator scores. The grand mean for all respondents was 3.12, the standard deviation was .50, and the mode was 4.00. The range of QI scores was 2.24, with a minimum mean score of 1.76 and a maximum mean score of 4.00.
### Table 17. Quality Indicator (QI) Mean Scores for Respondents

<table>
<thead>
<tr>
<th>QI Scores*</th>
<th>Frequencies (n = 67)</th>
<th>% of n</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.50-4.00</td>
<td>18</td>
<td>27</td>
</tr>
<tr>
<td>3.00-3.49</td>
<td>21</td>
<td>31</td>
</tr>
<tr>
<td>2.50-2.99</td>
<td>22</td>
<td>33</td>
</tr>
<tr>
<td>2.00-2.49</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>1.50-1.99</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

* The QI score is the overall mean score for the sum of the PCI, PGI, and TLI scores.

Mean = 3.12; SD = .50; min = 1.76; max = 4.00

### Barriers to Implementation of Technology Education Programs

Part II of the survey instrument collected data concerning respondents' perceptions of barriers to implementation of technology education at their schools and addresses question 7: What barriers do principals perceive as preventing implementation of technology education? Table 18 identifies the modes and mean scores of ranked items in Part II of the survey instrument. Some respondents used a rank number more than once.

Table 18 reports the barriers that most affect implementation of technology education at their schools. The greatest barriers to implementation were, in descending order, insufficient budget, inadequate facilities, lack of instructional and equipment resources, and scheduling.
<table>
<thead>
<tr>
<th>Barrier</th>
<th>Mode</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insufficient budget</td>
<td>1</td>
<td>30</td>
</tr>
<tr>
<td>Inadequate facilities</td>
<td>2</td>
<td>21</td>
</tr>
<tr>
<td>Lack of instructional and equipment resources</td>
<td>3</td>
<td>19</td>
</tr>
<tr>
<td>Difficulty in scheduling classes</td>
<td>4 &amp; 5</td>
<td>10, 10</td>
</tr>
<tr>
<td>Conflicts with other graduation requirements</td>
<td>6</td>
<td>14</td>
</tr>
<tr>
<td>Parents who are not adequately informed about the program</td>
<td>7</td>
<td>19</td>
</tr>
<tr>
<td>Students who are not adequately informed about the program</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Lack of certified technology education teachers</td>
<td>9</td>
<td>15</td>
</tr>
<tr>
<td>Conflicts with community or school system priorities</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Delivery of appropriate hardware</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance of equipment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Materials for student use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Socioeconomic nature of school attendance area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staffing limitations</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 18. **Barriers Preventing Technology Education Implementation**

The barriers that least affect implementation were parents and students informed about the program, lack of certified teachers, and conflicts with other school system priorities. Barriers which were added as "Other" were: staffing
limitations, delivery of appropriate hardware, socio-economic nature of school attendance area, maintenance of equipment, and materials for student use.

Investigation of Variance in Principals' Perceptions

To respond to Research Question 9: What demographic characteristics explain the greatest amount of variance in the overall perceptions of principals toward technology education?, various relationships were explored between selected demographic data and the Quality Indicator scores of the respondents. Table 19 summarizes the results of the data analyses using Pearson's $r$ and $r^2$ to explain the extent of the variance. Student enrollment had the highest $r$ value while numbers of years at the present school had the lowest $r$ value. Overall, the Pearson’s $r$ values were low and were not statistically significant at the .05 level. Thus, variance could not be attributed to these variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>$r$</th>
<th>$r^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal Years at School</td>
<td>.0848</td>
<td>.0072</td>
</tr>
<tr>
<td>Technology Education Enrollment</td>
<td>.1926</td>
<td>.0371</td>
</tr>
<tr>
<td>Technology Teachers</td>
<td>.1380</td>
<td>.0190</td>
</tr>
<tr>
<td>Student Enrollment</td>
<td>.2186</td>
<td>.0480</td>
</tr>
</tbody>
</table>

* $P < .05$

Table 19. $r$ Values Comparing Selected Demographic Variables with QI Scores
Summary

The results of the study were presented in this chapter, in conjunction with the research questions guiding this investigation. The next chapter will summarize the study, present conclusions resulting from the survey findings, and provide recommendations to guide future research.
CHAPTER 5
SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

This research study addressed the need for collecting information concerning high school principal perceptions of technology education in Maryland. The inception of a high school graduation requirement and development of a state curricular framework established conditions for change in Maryland technology education programs. Research concerning principals' perceptions may provide necessary data to further assess program status and focus school resources toward effective implementation of technology education.

Chapter 5 consists of three sections. The first section summarizes the study and research methodology. The second section discusses the findings of this study and draws conclusions pertinent to the findings. The final section identifies key recommendations for subsequent research.

Summary of the Study

This study investigated the perceptions of Maryland high school principals regarding the program characteristics, program goals, and teaching-
learning strategies in the technology education programs in their schools. In addition, this study examined principals' perceptions of the least and greatest barriers to technology education program implementation. Responses to the following research questions were sought in this study:

1. What are selected demographics with respect to Maryland high schools?
   a. What is the total school enrollment at each high school for 1995-96?
   b. What courses meet the technology education requirement?

2. What are selected demographics regarding Maryland high school technology education programs?
   a. What is the student enrollment in the technology education program at each school?
   b. How many teachers are in the technology education program at each school?

3. What are selected demographics regarding high school principals?
   a. How many years has the principal served at his or her school?
   b. In what area(s) is each principal certified?

4. What are Maryland principals' perceptions of the extent to which their technology education programs reflect agreement with state program characteristics?
5. What are Maryland principals' perceptions of the extent to which their technology education programs reflect agreement with state program goals?

6. What are Maryland principals' perceptions of the extent to which their technology education programs reflect agreement with state-recommended teaching and learning strategies?

7. What barriers do principals perceive as preventing the implementation of technology education?

8. What is the overall perception, i.e., the Quality Indicator Score, of each Maryland high school principal regarding his or her technology education program?

9. What demographic characteristics explain the greatest amount of variance in the overall perceptions of principals toward technology education?

To answer these research questions, data were collected using a mail survey instrument sent to Maryland high school principals. Also, selected demographic data were collected to obtain information regarding student enrollments, technology education programs, and principals' academic backgrounds.

The mail instrument was evaluated and validated by a panel of experts in technology education and school administration. Also, the mail survey
instrument was field tested to further establish validity and to evaluate wording and format. Minor changes were suggested by the expert panel and field test group. The recommendations were incorporated in the final survey instrument. To determine the reliability of the instrument, a pilot test was conducted. Statistical analyses for interval and rank-ordered data were used. Cronbach's alpha was used for Part I, Technology Education Quality Indicators, consisting of Likert-type scale items. The alpha coefficient for Part I was 0.67. Test-retest procedures were used to determine the reliability of Part II, which consisted of rank-ordered items. Test-retest procedures yielded 74% agreement between the two test administrations.

The survey was mailed to Maryland high school principals (N = 139). Due to local school system policies involving outside research, the accessible population was reduced to N = 103. Two follow-ups were conducted, one by mail and one by telephone. The resulting principal response rate was 65%. Data was compiled and analyzed using the SPSS computer statistical package. Descriptive statistics were used to present the data; measures of central tendency, frequencies, and measures of dispersions using standard deviations were calculated to describe the results of the study. Results of the mail survey indicated favorable principals' perceptions as well as areas for improvement in technology education programs. The next section will summarize the findings resulting from the analysis of the data collected for this study.
Findings

Overall, the findings indicate favorable perceptions of principals toward program characteristics, program goals, and teaching-learning strategies in Maryland technology education programs. The findings from the data concerning principal perceptions of technology education identified program strengths and areas for a future curricular and implementation focus at the school level. The major findings were:

1. Principals were in agreement that their technology education program reflected state program characteristics such as emphasis on problem solving and use of varied instructional strategies. Also, principals agreed with perceptions regarding the use of problem solving and other thinking skills; student use of tools, machines, and processes; and use of cooperative learning and group activities. The high levels of agreement on these characteristics and strategies may reflect changes in local instructional practices in technology education. This is consistent with findings from the Daugherty and Wicklein (1993) study in which math and science teachers perceived similar program characteristics in technology education programs.

2. Principals perceived the technology education programs at their schools to reflect most state goals for technology education. Goals which were not perceived as met by some local programs were
those reflecting traditional industrial arts goals. One possible conclusion may be that principals are more knowledgeable about technology education and recognize that traditional industrial arts programs do not reflect current goals. This conclusion coincides with a related conclusion drawn by Daiber (1990). In his study, Daiber found that a significant relationship existed between principals' knowledge level of technology education and their support for implementing curriculum changes in the field.

3. Principals did not perceive technology education programs as preparing students to recognize historical, current, and future multicultural contributions of technology. This finding indicates either such instruction was not evident or that such contributions were not given attention in technology education programs. The Technology for All Americans (1996) rationale supported the study of multicultural contributions indicating, "the current state of technological sophistication is the result of contributions of diverse cultures" (p. 30). Further, the rationale cited the importance of studying the evolution of technology in a societal context.

4. Principals did not perceive the technology programs at their school as preparing students to assess technology and make ethical decisions about technological issues. This finding identifies a need
to address values and decision making in technology education.

This finding is consistent with the views of Gilberti (1996), who cited a need for the development of technology-related skills leading to social responsibility and the application of "decision making and values clarification skills to the problems under study" (p. 6). Also, this finding is supported by the Technology for All Americans rationale statement that, "all technological decision making should include an assessment of the impacts and consequences of an implemented or proposed technological system" (p. 22).

5. Maryland principals did not express a high level of agreement between the state program goal and their perceptions regarding student participation in technology education student organizations or competitions. Teachers may not be promoting student organizations in their schools and/or localities may not be providing support through teacher stipends, allocation of resources, or student and teacher rewards for such efforts.

6. Principals perceived several barriers to implementation of technology education. The barriers most frequently ranked were insufficient budget, inadequate facilities, lack of instructional and equipment resources, and scheduling. Daiber (1990) and Draghi (1991) made similar findings in their research studies.
7. The courses cited most frequently as meeting the technology education graduation requirement were traditional or non-technology education courses. This finding is in direct contradiction to the low level of agreement of principal respondents to traditional industrial arts goals in Part I of the survey instrument. Such courses simply may have retained traditional titles and/or may have content and activities that have been updated to meet the goals of technology education. Further investigation is needed to determine whether such courses reflect the goals, characteristics, and use of appropriate strategies of Maryland technology education.

Thus, Maryland high school principal respondents provided perceptions that identify areas for further implementation efforts: developing strategies for including ethical decision making in classroom activities, teaching students about multicultural contributions to technology, and promoting student organizations.

Program implementation barriers as perceived by principals reflected traditional program concerns—budget, facilities, instructional resources. Staffing and student enrollments were not perceived as significant barriers by the principals.
Conclusions

The following conclusions were drawn from the analysis of data and from the findings of the study. In this section, the research questions guiding this study are restated and are followed by the conclusions drawn from the study.

Research Question 1. What are selected demographics with respect to Maryland high schools?

a. What is the total school enrollment at each high school for 1995-96?

b. What courses meet the technology education requirement?

The high school enrollments ranged from very low enrollment (min = 120 students) to high enrollment (max = 2,800 students). Technology education programs therefore, are conducted in both large and small school settings. In addition, a wide range of courses were cited as fulfilling the technology education graduation requirement; the researcher concluded that a number of course offerings including those outside technology education were offered to expediently address student scheduling of courses for the graduation requirement. Further, use of existing courses and courses in other programs may have alleviated some budgetary, facilities, and personnel concerns associated with meeting the new graduation requirement.
**Research Question 2.** What are selected demographics regarding Maryland high school technology education programs?

a. What is the student enrollment in the technology education program at each school?

b. How many teachers are in the technology education program at each school?

Technology education student enrollments in respondents' schools were between 0 and 1250. Fifty-nine percent of enrollments were 300 students or less with 37% of enrollments between 151 and 300. Significant numbers of students in respondents' schools are taking technology education, a conclusion based on the available data.

The number of technology education teachers most frequently cited was two teachers per school with a mean of 3.5 teachers.

**Research Question 3.** What are selected demographics regarding high school principals?

a. How many years has the principal served at his or her school?

b. In what area(s) is each principal certified?

Principals who responded to the survey were primarily new as principals or were relatively new to their schools; seventy-one percent of the responding principals had worked five years or less at their schools. Only 2 of the respondents had more than 15 years of experience. Principals with fewer years
at their school may be spending more time becoming acquainted with the school curricula and may be more informed of the recent changes in state graduation requirements. Also, there may be changes in principals' priorities and focus as they work successive years at their schools. Newer principals may perceive technology education more as an integral part of the school curriculum and less as the former school elective, industrial arts.

**Research Question 4.** What are Maryland principals' perceptions of the extent to which their technology education programs reflect agreement with state program characteristics?

Overall, principals were in agreement in their perceptions of program characteristics as reflected in the Program Characteristics Indicator (PCI) mean score of 3.24; the PCI score is the overall mean score of the means of principal responses for items reflecting technology education program characteristics. Principal respondents' scores reflected relatively strong agreement on items involving emphasis on problem solving (mean = 3.45), use of varied instructional strategies (mean = 3.39), and increase of student interest in technology education classes (mean = 3.31). The levels of agreement on these characteristics and strategies may reflect changes in local instructional practices in technology education and reinforce student activities promoted at the national and state levels.
Research Question 5. What are Maryland principals' perceptions of the extent to which their technology education programs reflect agreement with state program goals?

Principals who responded perceived the technology education programs at their school as reflecting most state goals for technology education. Goals which were not perceived as being met by some local programs were those reflecting traditional industrial arts goals.

Research Question 6. What are Maryland principals' perceptions of the extent to which their technology education programs reflect agreement with state-recommended teaching and learning strategies?

Respondents' Teaching-Learning Indicator scores reflected relatively strong agreement with state-recommended teaching and learning strategies. The items reflecting least agreement in this section dealt with addressing diverse learning styles of students, and involving students in technology student organizations or competitions. Some teachers may still be using traditional instructional strategies such as lecture-demonstrations and may not be incorporating other teaching techniques conducive to students with different learning styles. Also, teachers may not be promoting technology education student organizations in their schools or engaging students in local, state, or national competitions. School systems may not be providing support
through stipends, allocation of resources, or student and teacher rewards for such efforts.

**Research Question 7.** What barriers do principals perceive as preventing the implementation of technology education?

Principals perceived several barriers to implementation to technology education. The barriers most frequently ranked were insufficient budget, inadequate facilities, lack of instructional and equipment resources, and scheduling. Daiber (1990) and Draghi (1991) made similar findings in their research studies. The aforementioned barriers are key principal concerns and are priorities for all school programs. Principals may be more cognizant of these barriers and may more readily see the impact of these barriers on school programs. The least barriers identified by the respondents were students and parents who were not adequately informed and conflicts with other requirements; guidance counselors and other school personnel may be more concerned with such barriers than principals.

**Research Question 8.** What is the overall perception, i.e., the Quality Indicator Score, of each Maryland high school principal regarding his or her technology education program?

The overall perceptions of principals toward their technology education programs were measured by using a Quality Indicator (QI) Score. The QI score for each principal respondent is the mean of the PCI, PGI, and TLI scores. The
mean QI score was 3.12, indicating moderate agreement between the principals' perceptions and technology education program attributes.

However, other statistical data showed diversity in terms of how programs have made progress in adopting state curriculum guidelines; the standard deviation was .50, with a min = 1.76 and a max = 4.00.

**Research Question 9.** What demographic characteristics explain the greatest amount of variance in the overall perceptions of principals toward technology education?

Pearson’s r was calculated for selected demographic variables. Results indicated none of the demographic variables were statistically significant in explaining the extent of variance in the overall perceptions of principals toward technology education. Student enrollment at respondents’ high schools yielded an r value of .22, versus technology education student enrollment (r = .19), technology education teachers (r = .14), or principal years at the school (r = .08). These data may have some practical significance, indicating that school size may impact program perceptions and status.

Thus, a number of conclusions were derived from the analysis of data and determination of results. Principals who responded to the survey perceived technology education programs to reflect the new statewide goals and recommended practices. Principals' perceptions indicate some awareness
of program changes and transitions; a number of respondents disagreed with the industrial arts goals included in the survey.

This research investigation yielded insight into programs that have been subjected to varying degrees of instructional change. The perceptions of principals provide an external view of local programs and their present status. Also, the study identified curricular needs and efforts that can be addressed through in-service workshops, state conference activities, and teacher resource materials. The findings from this study provide the basis for mobilizing and focusing state and local resources to more effectively implement technology education.

The results of this research provide the basis for research in other states where technology education is a school requirement, where state standards have been developed, or where such a requirement is being considered. Future perception studies should include several populations—principals, guidance counselors, teachers, students, and/or community members to gain a more comprehensive view of the status of local programs.

Recommendations

A number of recommendations can be made based upon the results of this study. These recommendations provide direction for practitioners and researchers to enhance implementation of technology education.
1. Technology education programs should address ethical decision making in technology education studies. Individuals must be able to assess the problems and benefits associated with technology and make sound decisions concerning the development and uses of technology. Making responsible personal and social decisions concerning technology are key to developing technological literacy (Gilberti, 1996; ITEA, 1996; Maley, 1987).

2. Encourage teachers to collaborate with other departments, especially in integration efforts. This finding is supported by a study conducted by Daugherty and Wicklein (1993) investigating perceptions of technology, mathematics, and science teachers toward technology education; according to their findings, "respondents indicated a strong need for integrating the discipline as well as utilizing mathematics and science concepts towards the preparation of lifelong learning skills".

3. Provide more direction in updating and improving facilities. Technology education teaching-learning strategies involve group activities, use of a wide range of material and equipment resources, and the application of problem solving methods. Such strategies require technology education laboratory facilities that are more flexible and can accommodate varied student activities. Some
teachers do not have technology education supervisors or coordinators in their local school system, and therefore, may not be receiving the support necessary to renovate traditional industrial arts facilities. The Maryland State Department of Education published a document providing laboratory, equipment, and safety guidelines for technology education facilities. Information from this publication may need to be supported by local workshops and on-site consultations to improve and update current technology education facilities.

4. Conduct further investigations regarding student diversity in technology education programs. Data from this study regarding principals' perceptions indicate some improvements are still needed to ensure that the students in the program are representative of the total school population and that all students are accommodated. Zuga (1996) in a review of research in technology education stated, "neither students' attitudes nor specific groups of students such as females, ethnic minorities, or physically and mentally challenged students have been the topic of much research" (p.10).

5. States and localities should encourage TSA or other technology education organizations at the local level and provide the resources to support student organizations. Such organizations stimulate
interest in technology-related fields as well as career interests in technology education teaching. Further, “student organizations should provide activities that are available to all students to develop leadership at the local, state, and national levels. These activities should reflect the standards of technology education” (ITEA, 1996, p. 44).

6. Promote teacher-principal involvement in professional development and the presentation of technology education at principal academies and superintendent meetings to enable principals to make informed decisions about technology education programs and allocate resources to meet program needs.

7. There is a need for the development of teacher and student resources addressing the past, present, and future multicultural contributions to technology education. With school systems becoming more diverse in population and with increased recognition of the global influences on technology, instructional resources are needed to present a more comprehensive view of technology and to meet the Maryland technology education learner outcome that specifies students will, “recognize multicultural and gender diversity in the evolution of technology” (MDSE, 1994).
8. State and local school systems should continue to encourage and support the implementation of new courses to replace traditional courses. Technology educators in Maryland need to continue to clarify the mission, goals, and activities of technology education to dispel confusion between computer science, educational technology, and the school subject, technology education.

9. On a national level, researchers in and outside the field of technology education should be encouraged to conduct similar studies involving different school populations, i.e., guidance counselors, parents, students, and teachers of other school subjects and disciplines. Such studies would provide a more comprehensive perspective of technology education.

10. Researchers should consider a qualitative component for similar descriptive studies such as this study to yield more detailed perceptions and provide a more comprehensive view of local programs. Much of the research conducted in technology education is descriptive and quantitative in design (Zuga, 1996).

11. Researchers should be encouraged to conduct more school-level research to gather additional descriptive data concerning local programs—their status, effectiveness, perceptions of those who impact or are impacted by technology education.
Although a number of obstacles must be confronted when conducting research at the local schools-time and calendar-year constraints, local research policies, competing demands on study participants—more data are needed to develop a firm view of technology education from within schools and from different viewpoints across the country. Perceptions of principals and key stakeholders may provide valuable insights into technology education and its future curricular directions.
APPENDIX A

MARYLAND TECHNOLOGY EDUCATION
GRADUATION REQUIREMENT TIMELINE
Development of Maryland's Technology Education Graduation Requirements

1987 Metro Area Technology Education Supervisors propose a major state effort in curriculum development and implementation
Maryland State Department of Education sponsors the first Technology Education Symposium
Technology Education Symposium II

1988 Technology Education Symposium III & IV

1989 Technology Education Symposium V & VI
w/TEAM Technology Fairs

1990 Technology Education Symposium VII
w/TEAM Technology Fair
Technology Education leaders enlist aid of Westinghouse Corporation to assist in marketing Technology Education

1991 Technology Education Symposium VIII w/TEAM Technology Fair
Presentations to business and professional groups throughout Maryland
Dissemination of Technology Education - A New and Innovative Educational Program
Engineering Challenges at Baltimore Museum of Industry

1992 Proposal for Graduation Requirement in Technology Education made to State Board of Education
TEAM Technology Fair
Engineering Challenges at Baltimore Museum of Industry
Development of Technology Education - A Maryland Curricular Framework sponsored by Maryland State Department of Education

1993 Testimony supporting Graduation Requirement
TEAM Technology Fair
Engineering Challenges at Baltimore Museum of Industry
Maryland State Board of Education approves the Technology Education graduation requirement in June of 1993
The Program in Technology Education adopted by State Board of Education
School systems begin offering courses to meet the graduation requirement in September 1993

95
APPENDIX B

CODE OF MARYLAND REGULATION
PROGRAM IN TECHNOLOGY EDUCATION
Effective date: August 2, 1993, 20:15 Md.R.

Title 13A STATE BOARD OF EDUCATION
Subtitle 04 SPECIFIC SUBJECTS

Chapter 01 Program in Technology Education
Authority: Education Article, Sec. 2-205(c) and (h), Annotated Code of Maryland

.01 Requirements for Technology Education Instructional Programs for Grades 9--12.

A. Each local school system shall offer a technology education program in grades 9--12 which shall enable students to meet graduation requirements and to select technology education electives.

B. Maryland Technology Education Program. The comprehensive instructional program shall provide for the diversity of student needs, abilities, and interests in the high school learning years, and shall include all of the following goals and subgoals:

1) To demonstrate knowledge and skills regarding diverse technology systems, which includes:
   (a) Applications of a variety of technology systems, and
   (b) Functioning of a variety of technology systems;

2) To demonstrate knowledge of the nature of technology, which includes:
   (a) The relationships and impacts among technological achievement, the environment, the advancement of science, the individual, and society, and
   (b) The evolution of technology resulting from the application of knowledge, tools, and skills to solve practical and extend human capabilities;

3) To demonstrate the ability to solve problems with technology, which includes to:
   (a) Use a systems approach,
   (b) Employ higher-order thinking skills,
   (c) Use collaborative and individual ingenuity,
   (d) Use a variety of resources and processes including information, tools, and materials, and
   (e) Demonstrate the ability to work as a team member.

4) To make ethical decisions about technological issues, which includes to:
   (a) Identify problems resulting from technological achievements,
   (b) Develop and use technology and technological resources,
   (c) Use resources to develop a knowledge base for making informed decisions,
   (d) Assess the impact of technology on the individual, society, and the environment, and
   (e) Make judgements;
(5) To demonstrate in an experiential setting the safe, effective, and creative use of technological resources, for example, tools, machines, and materials, which includes to:
   (a) Create technology for human purposes,
   (b) Use technological resources in a safe and responsible manner, and
   (c) Demonstrate ingenuity and creativity;

(6) To apply science, mathematics, language arts, social studies, and technological processes and concepts to solve practical problems and extend human capabilities;

(7) To apply knowledge of and perform work tasks representative of technology-based careers including engineers, technologists, technicians, and craftspersons, which includes to:
   (a) Identify personal interests and abilities,
   (b) Investigate educational opportunities and requirements,
   (c) Investigate career opportunities, trends, and requirements, and
   (d) Identify and demonstrate factors for employability and advancement;

(8) To recognize the multicultural and gender diversity inherent in the evolution of technology, which includes to:
   (a) Recognize the importance of the historical contributions of men and women of different cultures to the advancement of technology, and
   (b) Understand the current and future implications of multicultural contributions to the advancement of technology.

.02 Curriculum Guides
Consistent with Education Article, Sec. 4-110, Annotated Code of Maryland, each of the local school systems shall provide technology education curriculum guides for the high schools under its jurisdiction.

.03 Student Participation
Each student shall have the opportunity to participate in the technology education program required by this chapter.

.04 Certification Procedures
By September 1, 1994, and each 5 years after that, each local superintendent of schools shall certify to the State Superintendent of Schools that the instructional programming within grades 9-12 meets, at a minimum, the requirements set forth in this chapter.
APPENDIX C

SURVEY INSTRUMENT
Maryland Technology Education
High School Principal Survey

Introduction:

The purpose of this survey is to investigate Maryland high school principals' perceptions of technology education. Technology education is a school subject in which students learn about technology, particularly using resources to solve practical problems. Your professional input will contribute to a state-wide perspective of technology education programs. All responses will be kept confidential and will be used solely for this study.

The Ohio State University
College of Education

June, 1996

Brigitte G. Valesey, Investigator
Michael L. Scott, Ph.D., Advisor

*This research study has been approved for implementation, Ohio State University Protocol #96BO122.
Part I: Technology Education Quality Indicators

Directions: Indicate the extent to which you agree or disagree with each item in Sections A, B, and C by circling one of the following responses:

Strongly Disagree (SD), Disagree (D), Agree (A), Strongly Agree (SA), Don't Know (DK)

Section A: Technology Education Program Characteristics

The technology education program in your school:

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Places emphasis on problem solving in technology education activities.</td>
<td>SD D A SA DK</td>
</tr>
<tr>
<td>Uses updated laboratory activities.</td>
<td>SD D A SA DK</td>
</tr>
<tr>
<td>Uses varied instructional strategies.</td>
<td>SD D A SA DK</td>
</tr>
<tr>
<td>Has increased student interest in technology education classes.</td>
<td>SD D A SA DK</td>
</tr>
<tr>
<td>Collaborates with other school departments.</td>
<td>SD D A SA DK</td>
</tr>
<tr>
<td>Has influenced changes in technology education laboratories.</td>
<td>SD D A SA DK</td>
</tr>
<tr>
<td>Has technology teachers who are involved in professional development.</td>
<td>SD D A SA DK</td>
</tr>
<tr>
<td>Is promoted by the technology teachers in the school.</td>
<td>SD D A SA DK</td>
</tr>
<tr>
<td>Represents the diversity of the school population.</td>
<td>SD D A SA DK</td>
</tr>
</tbody>
</table>
### Section B: Technology Education Goals

**Directions:** For each item, circle one of the following responses:  
Strongly Disagree (SD), Disagree (D), Agree (A), Strongly Agree (SA), Don’t Know (DK)

#### The technology education program in your school prepares students to:

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Response</th>
<th>Circle Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Demonstrate practical understanding of technology systems.</td>
<td>SD</td>
<td>D</td>
</tr>
<tr>
<td>11. Demonstrate knowledge about the characteristics of technology.</td>
<td>SD</td>
<td>D</td>
</tr>
<tr>
<td>12. Demonstrate the ability to solve problems about technology.</td>
<td>SD</td>
<td>D</td>
</tr>
<tr>
<td>13. Demonstrate skilled use of tools and materials to perform industrial operations.</td>
<td>SD</td>
<td>D</td>
</tr>
<tr>
<td>14. Demonstrate skilled use of technology resources to solve practical problems.</td>
<td>SD</td>
<td>D</td>
</tr>
<tr>
<td>15. Apply technical knowledge and tool skills to leisure activities.</td>
<td>SD</td>
<td>D</td>
</tr>
<tr>
<td>16. Apply other subjects with technological concepts to solve practical problems.</td>
<td>SD</td>
<td>D</td>
</tr>
<tr>
<td>17. Apply knowledge and skills of industry.</td>
<td>SD</td>
<td>D</td>
</tr>
<tr>
<td>18. Recognize multicultural contributions in past, present, and future technology.</td>
<td>SD</td>
<td>D</td>
</tr>
<tr>
<td>19. Make ethical decisions about technology issues.</td>
<td>SD</td>
<td>D</td>
</tr>
</tbody>
</table>
**Section C: Technology Education Teaching-Learning Indicators**

*Directions: For each item, circle one of the following responses: Strongly Disagree (SD), Disagree (D), Agree (A), Strongly Agree (SA), Don't Know (DK)*

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Response:</th>
<th>Circle Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>20. Is designed to accommodate all students in your school.</td>
<td>SD D A SA DK</td>
<td></td>
</tr>
<tr>
<td>21. Satisfies the diverse learning styles of students.</td>
<td>SD D A SA DK</td>
<td></td>
</tr>
<tr>
<td>22. Places emphasis on problem solving as an instructional method.</td>
<td>SD D A SA DK</td>
<td></td>
</tr>
<tr>
<td>23. Incorporates cooperative learning and group activities.</td>
<td>SD D A SA DK</td>
<td></td>
</tr>
<tr>
<td>24. Lends itself to interdisciplinary activities.</td>
<td>SD D A SA DK</td>
<td></td>
</tr>
<tr>
<td>25. Involves student use of tools, machines, and processes.</td>
<td>SD D A SA DK</td>
<td></td>
</tr>
<tr>
<td>26. Develops critical and creative thinking.</td>
<td>SD D A SA DK</td>
<td></td>
</tr>
<tr>
<td>27. Promotes technology-related career development.</td>
<td>SD D A SA DK</td>
<td></td>
</tr>
<tr>
<td>28. Involves students in technology student organizations or competitions.</td>
<td>SD D A SA DK</td>
<td></td>
</tr>
</tbody>
</table>
Part II: Barriers Preventing Implementation of Technology Education

Directions: Rank each item according to the extent it prevents implementation of technology education at your school. Ranking order is 1 for the greatest barrier and 9 (or 10) for the least barrier. Use each rank number once.

____ Difficulty in scheduling classes
____ Lack of instructional and equipment resources
____ Lack of certified technology education teachers
____ Inadequate facilities
____ Insufficient budget
____ Conflict with other graduation requirements
____ Parents who are not adequately informed about the program
____ Students who are not adequately informed about the program
____ Conflicts with community or school system priorities
____ Other (Please specify)_________________________________
Part III: Demographic Information

Directions: Check or provide the information that most closely describes you and your school's technology education program.

1. Student Enrollment in Your High School for 1995-96:
   ___________ Number of Students

2. Student Enrollment in Technology Education in Your School for 1995-96:
   ___________ Number of Students

3. Number of Technology Education Teachers in Your School for 1995-96:
   ___________ Number of Technology Education Teachers

4. How long have you been a principal at the present school?
   ___________ Years

5. In what area(s) are you certified?
   ____________________________
   ____________________________

6. What courses at your school meet the technology education graduation credit requirement?
   (✓ Check all that apply)
   __ Advanced Technology Education
   __ Architectural Drawing
   __ Basic/Introductory Technology Education
   __ Business
   __ Communication
   __ Computer Science/Computer Applications
   __ Construction
   __ Drafting/Mechanical Drawing
   __ Engineering/Pre-Engineering
   __ Foundations of Technology
   __ Manufacturing
   __ Science
   __ Transportation
   __ Other (please specify) __________________________________________

Thank you for your participation in this study. Your professional input will contribute to technology education research and implementation in Maryland.
APPENDIX D

SURVEY FEEDBACK FORM
Survey Feedback Form
Maryland Technology Education
High School Principal Survey
Content Validity Review

Instructions:

Please read the survey instrument in its entirety. Read the directions in each section for clarity. Cite errors and unclear statements in the spaces provided on the feedback form. Indicate the number of the statement and explanation in the space provided.

Review all items as if you were a high school principal completing this survey. Review the items in each section for validity. Identify invalid items and unclear statements in the spaces provided on the feedback form. Additional comments and suggestions regarding the content, format, appearance, and length of the survey are appreciated. You may use the space labeled "Additional Comments".

Your professional input into the validity and refinement of this survey instrument is appreciated. Thank you for your time and effort.
Survey Feedback Form

Part I. Section A: Technology Education Program Characteristics

Unclear Directions:


Unclear Statements:


Invalid Statements:


Additional Comments:


Part I. Section B: Technology Education Goals

Unclear Directions:


Unclear Statements:


Part I, Section C: Technology Education Teaching-Learning Indicators

Unclear Directions:

Unclear Statements:

Invalid Statements:

Additional Comments:
Part II: Barriers Preventing Implementation of Technology Education

Unclear Directions:

Invalid Statements:

Additional Comments:

Part III: Demographic Information

Unclear Directions:

Invalid Statements:
Think you for your professional input.

Time needed to complete survey: _____ minutes

Other Comments:

Thank you for your professional input.
April 25, 1996

Title/First Name/Last Name
Position
Institution/Organization
Street Address
City/State/Zip

Dear Title/Last Name:

Your professional input is needed to establish the content validity for a dissertation study. I am conducting this research to determine Maryland high school principal perceptions of technology education.

You were identified as an educator who is acquainted with technology education and who understands the role of technology education in the secondary school curriculum. Your input along with input from other field experts will verify the content validity of this survey instrument.

I would greatly appreciate you taking a few minutes to critique the enclosed survey instrument for clarity, content and format. Detailed instructions for completing this task are provided on the enclosed survey instrument feedback form.

A self-addressed, stamped envelope is enclosed for the return of the validation materials. Your input will be used to establish content validity and revise the instrument for a census mailing. You will receive an abstract of the results of the survey once the research has been completed.

Thank you for your assistance in increasing understanding of technology education in practice.

Sincerely,

Brigitte G. Valsey
Doctoral Candidate

Michael L. Scott, Ph.D.
Associate Professor
Technology Education
APPENDIX F

LETTER TO FIELD TEST PARTICIPANTS
May 5, 1996

Title/First Name/Last Name
Position
Institution/Organization
Street Address
City/State/Zip

Dear Title/Last Name:

Recognizing that this is a busy time in your school calendar, I respectfully request your assistance in field testing a survey instrument for a dissertation study. The study will investigate the perceptions of Maryland high school principals toward technology education. You have been selected to help field test the research instrument for wording, clarity, and format. I am conducting this study in cooperation with The Ohio State University, Department of Educational Studies: Technology Education Program.

Enclosed is the survey instrument and a feedback form for providing input. Your feedback will be used to revise the survey before it is administered to all Maryland high school principals. You may return the feedback form and survey using the enclosed envelope, or you may transmit the materials to me by fax at (614) 292-2662. Your response must be mailed by May 14, 1996.

I enclosed a token of appreciation in return for your assistance. Your input will be used solely for improving the survey instrument. Your name will not be placed on the instrument nor reported in the study results.

If you have questions, do not hesitate to contact me at (614) 292-7471 or contact me by e-mail at valesey.1@osu.edu. Thank you for your assistance in this study.

Sincerely,

Brigitte G. Valesey
Ph.D. Candidate

Dr. Michael L. Scott, Ph.D.
Associate Professor
Technology Education
APPENDIX G

FIELD TEST FEEDBACK FORM
Survey Feedback Form
Maryland Technology Education
High School Principal Survey
Field Test Input

Instructions:

Please read the survey instrument in its entirety. Evaluate the directions and corresponding items in each survey section for wording, clarity, and format. Feel free to place comments and suggested revisions directly on the survey instrument. You are encouraged to provide comments regarding the areas listed below:

WORDING:

ITEM CLARITY:

FORMAT, LENGTH:

BIAS:

TIME NEEDED TO COMPLETE SURVEY:
APPENDIX H

HUMAN SUBJECTS APPROVAL FORM
APPLICATION FOR EXEMPTION FROM HUMAN SUBJECTS COMMITTEE REVIEW

All research activities that will involve human beings as research subjects must be reviewed and approved by the appropriate human subjects review committee, or receive exemption status, prior to implementation of the research.

Principal Investigator: Scott, Michael L.  
Academic Title: Associate Professor  
Department: Educational Studies (Technology Education Program)  
Campus Address: 200 Welding Engineering  
Co-investigator(s): Valsey, Brigitte G.  
Protocol No. 2-7471  
Fax No. 2-2662  

PROTOCOL TITLE: Perceptions of Maryland High School Principals Toward Technology Education

* THE ONLY INVOLVEMENT OF HUMAN SUBJECTS IN THE PROPOSED RESEARCH ACTIVITY WILL BE IN ONE OR MORE OF THE EXEMPTION CATEGORIES LISTED ON THE BACK OF THE APPLICATION.

CATEGORY: (Check one or more)
A. A-3
B. A-4
C. A-5
D. A-6

SOURCE OF FUNDING FOR PROPOSED RESEARCH: (Check A or B)
A. OSURF: Sponsor RF Proposal/Project No. ________________
B. Other (Identify) ________________

EXEMPTION STATUS:  
Mar 21 1996  
Chairperson

IMPORTANT NOTICE TO INVESTIGATORS: Exempting an activity from review DOES NOT absolve the investigators of the activity from ensuring that the welfare of human subjects in the activity is protected and that methods used, and information provided, to human subject consent are appropriate in the activity.
APPENDIX I

LETTER TO PILOT STUDY PARTICIPANTS
May 28, 1996

Dear «Title» «Last_Name»:

Recognizing that this is a busy time in your school, I respectfully request your assistance in pilot testing the research instrument for my dissertation study. The study will describe Maryland high school principals' perceptions of technology education. I am conducting the study in cooperation with The Ohio State University, Department of Educational Studies, Technology Education Program.

Enclosed is a mail survey instrument for collecting data reflecting principals' perceptions. Your responses will be used to determine reliability prior to conducting a census survey. The final survey will be sent to all public high school principals in Maryland. Part II of the survey will be used in a test-retest reliability procedure in which you complete this part on two separate occasions.

The survey will take approximately 10 minutes to complete. You may return the survey using the enclosed priority envelope, or you may fax the survey at (614) 292-2662. Your response is urgently needed by June 7, 1996. In return for your assistance, I enclosed a complimentary pen. Your responses will be used solely for the purpose of improving the instrument. Your name or school name will not be placed on the instrument nor reported in the study findings.

If you have any questions, please call me at (614) 292-7471 or contact me by e-mail at valsey.1@osu.edu. Thank you for your assistance in providing this necessary input.

Sincerely,

Brigitte G. Valsey
Ph.D. Candidate

Michael L. Scott, Ph.D.
Associate Professor
APPENDIX J

LISTSERV INSTRUCTIONS FOR COMPLETING SURVEY
LISTSERV Instructions

As a communication option, the enclosed survey is available on a LISTSERV. To access the LISTSERV from your e-mail software, type the following:

1. At the heading, "TO:”, type listserver@lists.acs.ohio-state.edu.
2. At the heading, "FROM:”, type <your e-mail address>.
3. In the text body type, subscribe TECHSURVEY First Name Last Name (input your first and last names).

You will receive a reply message with an e-mail survey. Instructions are provided for inputting your responses. The response message can be posted to TECHSURVEY@lists.acs.ohio-state.edu. If you have any problems, you can post an e-mail message to me at the TECHSURVEY e-mail address.

Thank you for your professional efforts.—Brigitte Valesey
BIBLIOGRAPHY


