A Study on the Feasibility of Implementing Advanced Placement Courses in the Field of Technology Education

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A STUDY ON THE FEASIBILITY OF IMPLEMENTING ADVANCED PLACEMENT COURSES IN THE FIELD OF TECHNOLOGY EDUCATION

A Research Paper
Presented to the Graduate Faculty of the Department of Occupational and Technical Studies at Old Dominion University

In Partial Fulfillment of the Requirements for the Master of Science in Education Degree

By
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August 1997
This research paper was prepared by Donald S. Luebbecke and Mark A. McGrath under the direction of Dr. John M. Ritz in OTED 636, Problems in Education. It was submitted to the Graduate Program Director as partial fulfillment of the requirements for the Degree of Master of Science of Education.

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Date: 8-5-97
ACKNOWLEDGMENTS

The authors would like to thank Dr. John Ritz for his assistance during the course of this study. His guidance and advice were invaluable in completing this inquiry. The authors would also like to thank the Supervisors/Directors of Technology Education from all the states and the District of Columbia that provided the data used in completing this report.
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CHAPTER I
INTRODUCTION

Technology is essential to human endeavor; it has and continues to have a profound impact on the social, cultural and economic systems which affect the quality of life in our modern global society. Technology involves the application of knowledge, the development of enterprise systems and the exercise of laws and principles of mathematics and physical science which enhance creativity and problem solving abilities. This leads to the overall improvement of the human condition and its capabilities.

As we continue to move from the Industrial Age into the Information Age, we have witnessed an exponential growth in the rate of discovery and the quantity of knowledge. It is now virtually impossible for individuals to function successfully in a dynamic society without an understanding of, or at least an appreciation of, foundations of technology. It is this "technological literacy" that facilitates and expands one's opportunities, improves the understanding of human experiences and allows people to more fully contribute, participate and succeed in a modern world community.

The Technology Education profession, while making notable progress in moving Technology Education from its Industrial Arts roots, has yet to achieve the goal of national implementation and standardization. However, a current project, Technology for All Americans: A Rationale and Structure for the Study of Technology, is working to resolve this issue (ITEA, 1996, p. 6).
The importance of responding to the present and future needs of students is recognized by all levels within the education profession. The following comments by Secretary of Education Riley emphasize the importance of ensuring the students of today are prepared to meet the challenges of tomorrow.

Our economy is characterized by rapidly changing technologies and increasing international economic competition. And, our society is complex, diverse, and mobile. Success as a nation will depend substantially on our students’ ability to acquire the skills and knowledge necessary for high-technology and informed citizenship (Riley, 1996, p. 4).

Secretary Riley’s report, *Getting America’s Students Ready for the 21st Century: Meeting the Technology Literacy Challenge*, proceeds to outline specific goals which challenge the education community to implement technology and to prepare our students to meet the technology literacy challenge. President Clinton, in his *State of the Union Address* (1997, p. 5), outlined ten goals for education. One of his proposals was to make at least two years of college as universal in the next century as high school is today. When the objectives of these policy makers are taken together, the logical conclusion is that the number of students attending at least some level of higher education will significantly increase in the next few years.

The prospect for success of Technology Education lies in a broader acceptance and implementation of Technology Education as a “core” subject area for the general education curriculum. When fully established, Technology Education would incorporate introductory as well as more content specific courses in the three technology contexts of informational systems, physical systems (construction,
manufacturing and transportation) and biological and chemical systems. As a "core" subject, the Technology Education curriculum would include the same range of features that exist in the more traditional core subjects, part of which, includes a program of Advanced Placement or "AP". AP not only provides the opportunity for bright high school students to gain college credit, but AP also provides a validation of standards within the core curricula area. A Technology Education AP program would affirm the broadened nature and general applicability of Technology Education. Additionally, it would communicate and validate Technology Education standards while affording students the opportunity to optimize their post-secondary education experiences.

**STATEMENT OF THE PROBLEM**

The problem of this study was to investigate the feasibility of and implementation procedures for establishing Advanced Placement credit for high school Technology courses.

**RESEARCH GOALS**

With the purpose of determining the feasibility of establishing a national Advanced Placement program in the subject of Technology Education, this study developed with three goals in mind. They were:

1. To determine the opinions of state supervisors/directors of Technology Education concerning the establishment of an AP program for Technology Education;
2. To request recommendations or nominations for AP credit content areas applicable to Technology Education from state supervisors/directors.

3. To determine the procedures to be followed by the Technology Education profession and The College Board to establish and implement a Technology Education AP program.

BACKGROUND AND SIGNIFICANCE

The topic of this study evolves from issues resulting from Technology Education's evolutionary process and has been a matter under discussion by the Executive Director of the International Technology Educational Association (ITEA) and specifically the President of the Council on Technology Teacher Education (CTTE).

Over the last ten years, Technology Education has moved from the process-based Industrial Arts methodology to a program grounded in the general education curriculum which endeavors to describe technologies, their applications and a logical approach to evaluating and employing new technologies (Satchwell and Dugger, 1996, p. 1). The Technology for All Americans Project discusses many of the ideas prevalent today in regard to the integration of technology into the general curriculum for grades K-12 (JTE, 1995, p. 1). Satchwell and Dugger suggest that a century ago the essential curricula included language arts, mathematics, science, foreign language and history. The technological changes in society over the last 100 years have altered the fundamental scope of society. Professional educators, parents and students now question whether these traditional curriculum areas comprise the "core" of subjects
which are responsive to meeting the needs of today's students (Satchwell and Dugger, 1996, p. 1).

As the technological competency requirements of the workforce increase, Technology Education requirements beyond post-secondary education must increase as well. Present programs need to change to meet the dynamic innovations occurring everyday (Huffman, 1995, p. 1). As technological literacy continues to define itself and the workforce struggles to adapt and re-adapt itself to an increasing frequency of change resulting from economic demand and technological advance, the need has become critical to implement Technology Education as a fundamental element of general education. The incorporation of Technology Education as a "core" curricula subject will provide a vehicle to guide students through the challenges of a constantly changing global society.

One factor common among the accepted "core" courses is a recognized set of standards or guidelines. Within these core subjects there exists an array of courses of which the Advanced Placement program is a part. The AP program was established to allow bright students the opportunity to earn college credit through completion of advanced courses and testing while still in high school. In comments made before an open forum on diversity, Keller talked about three critical time frames in the post-secondary education process: between high school and freshman college; between two and four year programs (lower and upper level university or associate and baccalaureate programs); between baccalaureate and graduate programs. In his opinion, Advanced Placement courses in the high school, which teach at the college
level, offer a "taste" of college work and the ability to earn college credit. This combining of the high school experience and early college has significantly aided retention rates among minority students (NSF, 1995, p. 4).

The evolution of the Technology Education program and its future importance to the success of all students, coupled with the established success that Advanced Placement programs offer, significantly benefits and provides opportunity for students including:

1. Facing a more challenging curriculum and higher standards earlier in the education process;
2. Reducing variations in program content as a result of national testing; and
3. Easing the transition from the high school experience to the collegiate environment (CEEB, 1997, p. 1).

The establishment of AP courses in Technology Education, in addition to better preparing students for follow-on education, would encourage further implementation of Technology Education curricula in high schools and potential incorporation of technology studies in university lower division, general education requirements. Additionally, the long term benefit to follow-on institutions would be a better prepared student population. These students would be more capable of pursuing more advanced courses or pertinent elective courses facilitating a greater exploration in depth and breadth of the higher education curriculum. Likewise, graduates will be better prepared and have a greater understanding of their majors and professions. Completion of AP courses at the high school level can relieve some of the financial
burdens students and parents are experiencing in paying tuition and reverse the trend of students taking longer and longer to complete a four year degree.

The concepts behind investigating AP courses for Technology Education are the same as for other academic areas: increased student preparation, increased flexibility and decreased time and costs. While the need for Technology Education is seen as universal by its profession, there are certain areas which have particular significance in view of follow-on studies, for example: Drafting and Design and Computer Aided Drafting and Design are areas required in Engineering, Architecture and numerous applied technology programs. Depending upon the courses implemented, many other areas of Technology could be opened to Advanced Placement.

The authors view AP courses for Technology Education as an evolutionary step in the full implementation of Technology Education as delineated in the *Technology For All Americans Project* and the vision of the CTTE and ITEA. Technology AP courses could provide impetus to improving technological literacy for all students by reaffirming standards and criteria for Technology Education.

**LIMITATIONS**

The following limitations were followed in this study:

1. The population of this study was limited to the District of Columbia and state supervisors/directors in the field of Technology Education.

2. The external examination procedures used in verifying attainment of Advanced Placement goals was limited to those used by The College Board, and
3. The subject matter nominations were limited to subjects considered eligible for Advanced Placement credit.

ASSUMPTIONS

The results of this study were based on the following assumptions:

1. The need for an Advanced Placement program has general application for a large portion of high school students,

2. State supervisors/directors in the Technology Education profession will support establishing a dedicated Advanced Placement program for Technology Education,

3. State supervisors/directors might nominate the following areas as applicable:
   
   A. Introduction to Technology/Fundamentals of Technology (General Curriculum) and
   
   B. Drafting and Design and Computer Aided Drafting and Design (Technical Curriculum),

4. The standards and criteria to be established by Phase II of Technology Education for All Americans will be accepted by the states for course development, and

5. The standards and criteria to be established by Phase II of Technology Education for All Americans will be accepted and used by The College Board for test development.
PROCEDURES

In order to conduct this study appropriately, first the researchers obtained a listing of supervisors/directors of Technology Education in each of the fifty states from ITEA, if the state had no office of Technology Education, then the supervisor/director of Vocational or Industrial Arts programs was contacted. For this study, the District of Columbia was included in the population. The researchers then developed a standardized survey instrument to determine the opinions of state supervisors/directors regarding AP courses and to receive course and course content nominations. After distributing the survey, the data was collected and analyzed to evaluate the information and recommendations made for program implementation, development and for further research. These actions occurred to satisfy the first and second research goals.

The third research goal, that of determining AP implementation procedures, testing requirements and program development guidelines for the Technology Education profession and the Education Testing Service (ETS) to follow, was addressed through interviews with executive personnel from The College Board.

DEFINITION OF TERMS

The terms used in this study are defined as follows:

Advanced Placement (AP) Program - “gives students the opportunity to pursue college-level studies while still in high school and to receive advanced placement and/or credit upon entering college” (ETS, 1987, p. 33).

CADD - Computer Aided Drafting and Design, a course which emphasizes the development of drafting skills and the use of computer software to produce
drawings.

Core subjects - The traditional family of courses taught in public education which include mathematics, science, language arts, history and social studies.

College Level Examination Program (CLEP) - “designed to allow students who have acquired college-level knowledge outside of the college classroom to demonstrate that knowledge and receive college credit for it” (ETS, 1987, p. 36).

Proficiency Examination Program (PEP) - “designed to grant credit to meet specific college degree requirements of the New York Regents External Degree Program and are accepted by many other colleges for credit” (ETS, 1987, p. 34).

CTTE - Council of Technology Teacher Education, an affiliated council of the International Technology Education Association involved with defining the goals, purposes and guidelines involved with technology teacher education (Israel, 1995, p. 30).

Defense Activity for Non-Traditional Educational Support (DANTES) - An organization established to assist military personnel to earn college credit for education gained outside the normal college classroom (ETS, 1987, p. 37).

DANTES Subject Standardized Tests (DSST) - “The DSST’s were originally designed to give military personnel the opportunity to earn college credits for education gained outside the classroom. These tests are now available for use by nonmilitary institutions to grant credit by examination” (ETS, 1987, p. 37).

General Curriculum / Education - The fundamental academic subjects required by all students to complete graduation requirements in high school.
Industrial Arts - A program for teaching mechanical and trade skills with the focus of applying these skills to industrial and technical applications (Israel, 1995, p. 27).

ITEA - International Technology Education Association, an organization within the field of Technology Education which acts as “a facilitator of change, a clearinghouse for information and a perpetrator of ideas” (Starkweather, 1995, p. 543).

“Introduction to Technology Course” - An overview of resources and systems of technology with an emphasis on technological literacy.

Technology - As defined by Wright and Lauda, “A body of knowledge and actions, used by people, to apply resources in designing, producing and using products, structures and systems to extend the human potential for controlling and modifying the natural and human-made (modified) environment” (cited in Bensen, 1995, p. 2).

Technology Education - As defined by Wright and Lauda, “an educational program that assists people [to] develop an understanding and competence in designing, producing and using technology products and systems and in the appropriateness of technological actions” (cited in Bensen, 1995, p. 14).

Test by Examination - A program to allow students to earn college credit and to meet course completion requirements through examination.

USAFI - United States Armed Forces Institute.

Vocational Education - “An educational area that encompasses a variety of programs designed to equip students with work and life skills” (Israel, 1995, p. 35).
SUMMARY AND OVERVIEW

In Chapter I, the problem was defined and research goals, limitations and assumptions were described to inform the reader as to the context of the research conducted. In the Background and Significance section, the motivation for this research and its importance to the evolving implementation of Technology Education was discussed. The sections on Procedures and Definition of Terms explained the processes and instruments that were employed and the meaning of specific terms used in this study.

Chapter II, Review of Literature, provides a summary of pertinent information on the development of Technology Education's roots, background information on the AP program and the future direction of Technology Education. The Methods and Procedures of the study are described in Chapter III and the Findings of the study are contained in Chapter IV. This study concludes with Chapter V, Summary, Conclusions and Recommendations.
CHAPTER II

REVIEW OF LITERATURE

This chapter provides a review of the major methods of earning non-traditional college credit. A survey of information regarding the awarding of non-traditional credit, based on advanced learning and experience, highlights the Advanced Placement Program as one of four primary means available for receiving post-secondary credit. The following sections provide a historical review of non-traditional credit, describe the various non-traditional credit programs including an overview of national testing programs and an in-depth examination of the Advanced Placement Program. This backdrop should provide the perspective necessary to understand the origin, validity and evolution of non-traditional credit programs in general and the Advanced Placement Program specifically.

NON-TRADITIONAL COLLEGE CREDIT

Earning non-traditional college credit has developed into an important means of completing the requirements of a post-secondary education for a large and growing number of traditional and non-traditional students. A more appropriate description for non-traditional credit might be - the assessment of learning, experience and credit for advanced achievement beyond the post-secondary education level (Miller, 1977, p. 1149). Credits earned through non-traditional means may be recognized, and equivalency credit awarded, by a variety of post-secondary institutions including: technical schools, two year community colleges and four year universities.

The status and opportunity afforded individuals based upon solid academic credentials cannot be overstated. The advantages of such achievements include social
recognition, improved professional status and, of course, an increase in earning potential which results in a higher socioeconomic status. The expanded opportunities, responsibilities, professional stature and compensation afforded individuals achieving academic recognition is based upon the experience, collective performance and contributions of similar individuals over time.

Diplomas and certificates provide educational institutions, social organizations and prospective employers with a degree of assurance and satisfaction that certain standards or competencies have been met by the recipient. This suggests that the granting institution must be fundamentally involved in the evaluation and qualification process and understand the standards used as a basis for recommendations. The awarding of non-traditional credit is even more challenging in view of the accelerated rate of change of technology and the career flexibility required in a modern work force (Miller, 1977, p. 1149). Higher educational institutions are being asked to provide instruction and credentialing opportunities to people who are employed and cannot leave the work force but who must respond to changing professional or occupational demands. For higher education institutions to be effective in meeting the needs of this class of learners, it is important to evaluate equivalent competencies and learning experiences outside the traditional classroom.

The role of post-secondary institutions in credentialing is an important and most challenging one. Institutions of higher learning are responsible for the establishment of "in-house" policies, procedures and practices as they pertain to alternative credit based upon such things as work experience, military schools, national testing and completion
of an Advanced Placement Program. Beyond their own “in-house” procedures, institutions must also evaluate the policies, procedures and practices of other institutions including other institutions of higher learning, employers and licensing, registration and certification agencies to determine how well they meld with their own standards.

Credentialing is the end result of evaluation of student achievement and is only meaningful if distinguished in regard to types and levels of competency and learning (Miller, 1977, p. 1150). The assessment in traditional classroom situations may be derived directly from observations and measurements. The instructor is ultimately able to determine a level of objective accomplishment or competency attainment. When considering alternative credit, the justification for awarding credit is usually based upon recommendations made by a group of experts in the specific field considered.

THE HISTORY OF NON-TRADITIONAL CREDIT

Since 1945, institutions of higher learning have formally established policies and standards for crediting of learning which occurs outside the institution. Working in connection with the American Council on Education (ACE) through the Commission on Accreditation of Service Experiences (CASE), returning veterans of World War II were able to receive credit for military training and experience. CASE’s mission was to assist institutions in determining the amount of credit to award for various categories of experience, the alternative credit also applied to completing high school equivalency programs (Miller, 1977, p. 1150).

This early effort evolved and broadened in scope to meet changing needs and
increased emphasis in post-secondary education. In 1974, CASE was expanded and became the Office of Educational Credit. Despite increasing interest in the concept of credit for out of classroom learning, many institutions did not participate in the CASE program. Subsequently, there has been a great interest shown in recognizing non-traditional credit. Miller based the concept of awarding credit for non-traditional learning on the evaluation of the experience meeting three criteria:

1. The competency meets acceptable levels of student performance.

2. The credited competency is equivalent to or exceeds the recognized outcomes of the classroom experience.

3. The proposed credit is applicable to the course of study or credential sought by the learner (1977, p. 1150).

To achieve credit for other than traditional classroom training, three approaches have emerged which include the following:

1. Credit by examination.

2. Credit recommendations of the ACE based upon non-collegiate instruction and occupational assessment programs.

3. Individual assessments performed by institutions of higher learning.

An examination of these approaches will provide a description of the actual programs and the foundation for the validity and application of such programs.
CREDIT BY EXAMINATION PROGRAMS

Between 1945 and 1961, the General Educational Testing Program (GED) measured the high school equivalent knowledge and college level testing of returning World War II veterans. ACE subsequently assumed responsibility for this program and replaced the program with the comprehensive college test. In parallel, the United States Armed Forces Institute (USAFI), beginning in 1944 and until 1974, developed and administered standardized tests and correspondence course examinations for the Department of Defense. These programs marked the beginning of "credit-by-examination" for learners wishing to pursue higher levels of education beyond the secondary level.

In 1965 the College Entrance Examination Board (CEEB), after considerable research in conjunction with the Carnegie Corporation, working with the Committee on Institutional Cooperation and the Educational Testing Service established the College Level Examination Program (CLEP) to serve as a means for adult learners to validate the knowledge they had acquired through other than classroom experience. CEEB had determined, through data acquired by the National Opinion Research Center, that there existed a sizable population of adults who for some reason had not completed high school or who had graduated from high school but dropped-out of college short of attaining a degree (Holloway, 1971, p. 213).

CLEP was intended to provide an opportunity to gain college credit on the basis of competencies demonstrated by examination for learning achieved outside the classroom. These learning experiences typically included correspondence study, on-
the-job training (OJT), occupational courses, distance learning experiences, etc.

CLEP also presented potential employers, professional licensing agencies and colleges and universities a recommendation for college equivalency based upon proficiency demonstrated through strict and controlled examination.

CLEP tests were developed by ETS for CEEB and were initially administered by a very small number of colleges and universities. One of the major administers of CLEP tests was the United States Armed Forces Institute (USAFI) which tested thousands of service personnel. By 1967, CLEP offered general tests in English, mathematics, humanities, natural sciences, history and social sciences, as well as 13 subject matter examinations at sites all across the country. In 1968 over 100 institutions of higher learning agreed to grant credit on the basis of CLEP examination scores. The general tests were intended to assess general knowledge of learners who have one or two years of college or equivalent experience. Tests addressed subject area fundamentals and principles and were composed of multiple choice questions. In addition, the English test has an optional essay portion. General Tests were administered in either 60 or 75 minute blocks and subject examinations were 90 minutes. The subject examinations tested objective assessment of the fundamentals of a specific subject (Holloway, 1971, p. 214).

The objectives of the CLEP program as established in 1967 remain:

1. To provide a national program of examinations that evaluates non-traditional college level education.

2. To provide institutions of higher learning with an awareness of the
possibilities and problems of credit by examination.

3. To allow institutions of higher learning to implement procedures for placement, accreditation and admission of transfer students.

4. To provide institutions of higher learning with programs to evaluate their own programs.

5. To afford adult learners the opportunity to meet licensing requirements and/or qualify for advanced positions in business and industry (Holloway, 1971, p. 214).

ACE and CASE continue to provide recommendations to colleges and universities regarding the granting of credit on the basis of CLEP examination scores.

Currently 35 CLEP examinations are offered at a cost of $30.00 per test. Participating colleges and universities now number over 1800 with passing scores (percentile) established by each institution (ETS, 1987, p. 36).

**COLLEGE PROFICIENCY EXAMINATION PROGRAM (CPEP)**

The College Proficiency Examination Program was established by the State University of New York in 1966 and is administered by the New York Regents External Degree Program (Miller, 1977, p. 1150). This program consists of 50 examinations in the subject areas of arts and sciences, business, criminal justice, education and nursing. The examinations are objective or essay and are three to seven hours in duration. The CPEP is accepted by institutions in New York and other states. CPEP is administered in New York by the Board of Regents; elsewhere in the United States the tests are administered by The American College Testing Program. Costs of examinations range from $40.00 - $235.00 (ETS, 1987, p. 34).
DEFENSE ACTIVITY FOR NON-TRADITIONAL EDUCATION SUPPORT (DANTES)

USAFI began testing for college equivalency in 1965 utilizing not only the CLEP series but also unique examinations. In 1974, USAFI was disestablished and replaced by the Defense Activity for Non-Traditional Education Support (DANTES) which set about to launch a more comprehensive college equivalency testing program known as Subject Standardized Tests (DSST’s) (Miller, 1977, p. 1150). DSST’s were conceived to provide military personnel with the opportunity to gain college credits for education acquired outside the traditional academic classroom. Tests were developed by ETS and are now available for general use by universities and colleges throughout the United States. The examinations are un-timed (work-limited) and are viewed as course achievement tests in a specific area. Raw scores and percentiles are reported back to the individual being tested; the institution then grants credits based on internal policies and recommendations provided by ACE. The cost of DSST’s is $27.00 and are administered by institutions providing credits (ETS, 1987, p. 37).

ADVANCED PLACEMENT (AP) PROGRAM

To this point college credit for non-traditional learning has concerned itself with opportunities available to prospective students who have completed high school and have achieved a level of proficiency based on non-traditional education and life experience. The Advanced Placement (AP) Program is directed exclusively at secondary school students.

The AP Program was established in 1955 by the College Entrance Examination
Board to provide students with the opportunity to complete college level studies while still in high school. In order to encourage participation and recognize achievement, common working definitions and standards were required. The AP Program provided course descriptions and professional consultants to assist schools in establishing courses, administering and grading examinations and forwarding results to designated colleges and universities. Additionally, CEEB, ETS and participating schools and universities organized national conferences in the disciplines, conducted frequent local workshops for practitioners as well as promoted direct and indirect research concerning the program (Hanson, 1971, p. 107).

Initial research in developing an AP Program began in 1952 following a joint study by the Andover, Exeter and Lawrenceville Schools Districts and Harvard, Princeton and Yale Universities. Entitled General Education in School and College, the study recognized the “intentional heterogeneity” of college freshman and recommended that schools needed common standards or achievement targets to work (Hanson, 1971, p. 107).

Simultaneously, the school and college study of admission with advanced standing developed and administered similar examinations to a group of 18 schools and 12 colleges. Both of these studies concerned the identical disciplines of foreign languages, mathematics, biology, chemistry, physics, American history and English. European history was added by CEEB and the testing program was offered nationally to all who applied (Hanson, 1971, p. 107).
In 1956, 1,229 students participated nationally from 104 schools. By 1966, 38,178 students from 2,518 schools took over 50,104 examinations and the scores were presented to 1,076 institutions. The program has subsequently grown at a rate of about 10% annually. While the actual numbers of participants varies from field to field, the relative distribution among the fields remains rather constant.

The AP Program is an activity of the CEEB and is headed by a director who is advised by a National Board of Educators known as The Standing Committee On Advanced Placement. CEEB enlists the services of ETS to develop course descriptions and examinations, organize the administration of examinations, report the grades and provide technical and operational services for the program. ETS also assists the CEEB examination committees in each of the discipline areas to review course descriptions and modes of examination, to set the examination for the following year and to discuss in open forum the issues related to their discipline. It is these examiners which are ultimately responsible for the program in their disciplines including the consolidation or division of examinations.

The examiners' task, in a general sense, is to ascertain the competencies of the first year college student in their discipline and define the form of advanced study in participating high schools which will best prepare students for advanced placement in colleges to which they may matriculate. Such guidance for participating schools is revised every two to three years and published in the Advanced Placement Course Descriptions.
AP Program examinations are administered world wide during the last week of May. Examination times may not exceed three hours in length and are comprised of objective and essay questions. In early June, readers are appointed by ETS from school and college faculty in the proportion of one school to two colleges with each reader responsible for no more than 120 examinations. The chief reader for each committee is a college professor who sits *ex officio* as a consultant to the CEEB examiners to ensure continuity exists between writers and readers of the test. The grading process involves prior agreement and understanding of standards. Then, each reader only reads and assigns raw scores on a single section of a test. Following the reader(s) raw scoring, the combined raw scores from the various sections are consolidated with the objective scores. The raw scores are articulated on a five point system ranging from 1- no recommendation to 5- extremely well qualified. A score of 3 is considered qualified. The reader has no information of the name of the examinee or his school or location. The grades are an assessment of how well the examinee meets the requirements of the course description and not how they compare with each other or a reference group.

Finally, a sample distribution is made of some candidates of regularly participating schools which are identified after initial readings. This distribution is then compared with distributions from the same schools in the recent past. Additionally, the chief reader has available historical distributions in the discipline in order for he/she to compare with the intended cut-off points (Hanson, 1971, p. 108).
Historically, 25 percent of candidates receive honor grades ("4's" or "5's"), 33 percent "3's", 33 percent "2's" and about 10 percent "1's". While the patterns of distribution may vary greatly, from a single institution, the broad base of participation ensures stability.

All examination materials are held by ETS until July, following the senior year of high school, and forwarded to the college or university requested by the student. These materials include the advanced placement course description, essay booklets, grade given, a copy of the publication, *The Interpretation And Use Of Advanced Placement Examination Grades* and a students' school report. The latter report allows a school to describe its advanced placement program and the quality of the student's work and to make a recommendation concerning credit and placement (Hanson, 1971, p. 109).

Increasingly, colleges and universities are not requiring the complete AP package and are relying on grades only. The requirements of higher education institutions in regard to submissions and qualifying grades are contained in CEEB's college advanced placement policies. After colleges and universities complete their review of the AP packages, they are returned to the respective student's high school. These "used" packages provide schools with valuable feedback on their AP Programs.

Since inception, the Advanced Placement Program has grown to 537,428 students taking 843,423 examinations in 1996. Today the CEEB is more commonly recognized as The College Board. Currently, over 21,000 high schools in the United States, Canada and 45 other countries participate in the AP program with an average
of 400 schools joining each year. The average high school administers 72 tests in the 29 program areas (CEEB, 1996, pp. 1, 2, 7). The current cost of an AP examination is $73.00 with financial assistance available for those who require it.

**CREDIT RECOMMENDATIONS**

Following World War II, the American Council on Education (ACE), responding to institutions of higher learning and accrediting associations, set out to establish an equivalency system which would detail college credit for formal military training. ACE asked college professors to evaluate military courses to determine their value in meeting criteria for academic credentials. The results of this effort have been published in the *Guide To The Evaluation of Educational Experiences In The Armed Services*. In 1975 and 1976, under the first edition of the guide, over 2,000 colleges participated in the program awarding 290,391 semesters of credit. The program has continuously grown since inception and has become a valuable benefit to members of the all-volunteer force.

The scope of the ACE equivalency program was expanded in 1973 through a recommendation by the Commission on Non-Traditional Education, which extended credit to non-collegiate organizations including business, government, occupational and professional associations and labor unions. In cooperation with the New York Board of Regents, *A Guide To Educational Programs In Non-collegiate Organizations* was published which included recommendations for 600 course equivalencies. The Consortium of the California State University and Colleges also joined the effort in 1976. Since inception, the original 38 non-collegiate sponsors has
grown and the training programs of these sponsors are reviewed by groups of college professors to determine college equivalency similar to the military equivalency program. The ACE Commission on Educational Credit subsequently studied and incorporated assessments of occupational specialties of enlisted and officer designators (Miller, 1977, p. 1152).

INDIVIDUAL ASSESSMENTS

In 1974, the Cooperative Assessment of Experimental Learning (CAEL) Project, in cooperation with the Educational Testing Service, responded to growing interest from institutions of higher learning regarding assessment of experimental learning. These assessments for collegiate credit involve the review of professional portfolios and assessment of other non-institutional sponsored learning (Miller, 1977, p. 1153).

The previous methods of achieving post-secondary education credit are founded on the premise that valid and meaningful education occurs outside the traditional college classroom and that regardless of the means by which the education is accomplished, if in the judgment of the custodians of collegiate curricula, the academic criteria and competencies are met, then appropriate recognition and credentialing should be awarded. From its origins as a method of establishing collegiate equivalency for military training, the area of non-traditional credit has grown significantly in scope and participation to encompass education and experience gained in the work place. The Advanced Placement program offers yet another aspect to the non-traditional credit program, that of affording advanced study and opportunity for college credit to highly deserving high school students.
SUMMARY

Consistent with the continuing interest and increasing demand in all areas of credit for non-traditional education and Advanced Placement in particular, Chapter III will discuss a survey instrument and method in which state school authorities will be queried regarding interest and recommendations in Advanced Placement programs in Technology Education.
CHAPTER III

METHODS AND PROCEDURES

The information presented in this chapter describes the methods and procedures used in gathering and analyzing the data collected to answer the problem of the study and the research questions defined in Chapter I. The problem of this study was to determine the feasibility of, and implementation procedures for, establishing Advanced Placement credit for high school Technology Education courses. Toward answering this problem, three research goals were developed which asked: did state supervisors/directors of Technology Education feel there was a need for a technology based AP program, for recommendations from state supervisors/directors in the field of Technology Education for technology AP content areas and for the procedures to be followed by the Technology Education profession and ETS in establishing and implementing a technology AP program. In Chapter III will be found information on the following topics: population, instrument design, methods of data collection, methods of data analysis and summary.

POPULATION

The research goals indicate there will be two sources of information used in determining the answer to the problem of the study. The population used to answer the first two research questions consists of all 50 state Technology Education Supervisors/Directors. Additionally, the supervisor/director of the District of Columbia was included. The total population was then fifty-one (51). Further sources of information included The College Board and The Education Testing Service. They provided information concerning Advanced Placement Program development and implementation.
INSTRUMENT DESIGN

Each supervisor or director responsible for technology education was written and responses were solicited to questions regarding the position of their state or territory on the need for technology-based AP courses. A sample of the cover letter used to introduce the topic contained in Appendix A. The instrument was designed to develop information which answered the questions posed by the research goals. With this in mind, the instrument focused on the position of each state as it relates to technology AP courses and recommendations for specific testing content areas. Additionally, state supervisors/directors were asked questions concerning student population and educational trends. This information was needed to determine the economic feasibility of implementing new AP tests and courses. For a copy of the survey instrument, see Appendix B.

METHODS OF DATA COLLECTION

Data collection consisted of four parts. Three involved the survey instrument and one involved The College Board. The survey instrument used three types of questions to collect data. The first section consisted of four (4) open-ended questions about the student population and how many students are involved with technology courses. The second section consisted of four (4) closed-form questions formatted using the Likert scale. The purpose of these questions was to determine educational trends and the desirability of establishing AP technology courses. The final section listed twelve possible technology areas and requested supervisors/directors to rank order the five (5) most desirable AP candidates. A space was provided for the respondents to make
their own course suggestion.

The survey instrument was then mailed along with a cover letter and self-addressed return envelope via the U.S. Postal Service. Approximately one month after the initial mailing, a follow-up letter was sent to those states which had not responded to the first mailing. See Appendix C.

The final method of data collection required direct contact with The College Board. This consisted of letters and phone interviews. These contacts were to determine the criteria used to decide if a technology content area test was economically feasible. Other interview questions concerned statistical data on student populations, percentage of AP participants and program development time frame. The College Board also was asked to provide data satisfying the final research goal which was to outline the procedures to be used by the Technology Education profession in establishing new technology-based AP content areas.

**METHODS OF DATA ANALYSIS**

The variety of information gathered required different analysis methods. Data from the survey was gathered in three (3) sections. Data from section one (1) of the survey on student population and educational trends was formatted into a matrix and the results totaled for reporting. The data from section one (1) is reported for each survey as the total number of high schools, high school student population, the estimated number of students participating in technology related courses and whether technology is required at the high school or middle/junior high school levels. For the data from section one (1) see Appendix D.
The data from section two (2), was tabulated and analyzed to determine the overall opinion of state supervisors/directors and the state's position on technology-based AP courses. The information is reported as the total number of responses for each selection within each question. These summed selections were then divided by the total number of responses for each query to provide the percentage of response for each question.

Data from section three (3) indicated the priority for AP content obtained from each state and the District of Columbia. The highest priority was ranked number one (1), the second highest priority was ranked number two (2), etc. The responses from each survey were tabulated and formatted to show a rank ordered listing of possible priority technology AP courses.

SUMMARY

This chapter outlined the methods and procedures used to collect the data required to answer the research goals and solve the overall problem. In order to answer the research goals, the types of data and information required had to be determined and a survey instrument developed. The survey instrument only met part of the requirements and parameters established to conduct interviews with The College Board personnel to complete the data collection process. In Chapter IV the results from the methods and procedures established in this chapter will be reported.
CHAPTER IV

FINDINGS

Chapter IV will present to the reader the information gathered during the data collection portion of this research project. The problem of this study was to investigate the feasibility of and implementation procedures for establishing technology Advanced Placement courses. Data was gathered in two distinct phases. During Phase I, information was solicited from state Supervisors/Directors of Technology Education concerning the number of high schools, student populations and whether Technology Education was a requirement in that state for the 1995-1996 school year. Supervisors were also asked their opinion in regards to the general success of AP courses and its applicability within the Technology Education curricula. They were then asked to provide five (5) rank ordered selections for possible subject areas for technology AP courses. Phase II consisted of direct contact with The College Board to determine development criteria and procedures.

PHASE I - STATE SURVEY

The survey instrument developed by the researchers was distributed to 50 state Supervisors/Directors of Technology Education and to the District of Columbia for a total population of 51. Approximately four (4) weeks after the initial mailing, follow-up letters and duplicate copies of the survey were mailed to those individuals who had not responded. A total of 43 responses were received which represented 84.3% of the population.
RESPONSE FOR QUESTIONS 1 THROUGH 4

Questions 1 through 4 provided basic background which is summarized in Table 1. The individual state responses are provided in Appendix D. Question 1 asked for the number of high schools in the state during the 1995-1996 school year. A total of 14,484 were reported by the 43 responding states and is shown in Table 1. Some of those unable to report the number of students in technology related courses indicated that this data was not tracked within their systems.

<table>
<thead>
<tr>
<th>TABLE 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>BACKGROUND DATA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of High Schools</th>
<th>Number of High School Students</th>
<th>Number of Technology Students</th>
<th>Technology Education Required at the High School Level</th>
<th>Technology Education Required at the Middle/Junior High School Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL</td>
<td>14,848</td>
<td>10,127,143</td>
<td>1,296,865</td>
<td>2</td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>10</td>
<td>33</td>
</tr>
</tbody>
</table>

Note: Of the 43 respondents, one did not report the number of high schools. Three did not report the number of high school students and nine did not report the number of students enrolled in technology related courses.

Question 2 asked for the total number of high school students in the state during the 1995-1996 school year. Forty of the responding states answered the question for a total high school student population of 10,127,143. Question 3 asked for the total number of high school students attending technology related courses during the 1995-1996 school year. This question was answered by 34 of the responding states for a total of 1,296,865 students. Question 4 asked the respondents to indicate whether technology related courses were required at the high school and/or middle/junior high
school level during the 1995-1996 school year. Of the 43 responding states, 42 answered the question and only two (2) required a technology related course as part of the high school curricula. All 43 states answered the second part of Question 4, ten (10) states indicated “Yes” that they required technology as a subject area and 33 indicated “No”, to a requirement for technology related courses in middle/junior high schools.

RESPONSE TO QUESTIONS 5 THROUGH 8

Questions 5 though 8 requested information as to the opinions of various state Supervisors/Directors regarding program growth, participation and usefulness of AP courses. The individual state responses are provided in Appendix E. Question 5 asked whether student populations participating in high school technology education/industrial arts courses had increased over the last ten (10) years. Over 58% of the respondents indicated that participation in technology education/industrial arts courses increased over the last ten (10) years. See Table 2. Question 6 inquired as to the perceived growth as a percentage of student population over the last ten (10) years. Thirty-nine of the 43 responding states answered this question. The majority of respondents (53.8%) indicated that there had been at least a 10% growth, with 30.8% indicating a growth of over 20% in student population. Question 7 asked the Supervisor/Director's opinion concerning AP course establishment to meet the needs of those students taking technology subject areas. The majority of respondents (62.8%) indicated that they either agreed or strongly agreed with the addition of AP courses to the technology education curricula. Question 8 asked if AP courses were
helpful in preparing college bound students for success. A significant majority (74.4%) of those surveyed either agreed or strongly agreed with the concept of AP courses being helpful for college bound students.

**TABLE 2**

**NUMBER OF RESPONSES FOR PROGRAM OPINIONS**

<table>
<thead>
<tr>
<th>Response</th>
<th>Participation and % Selecting</th>
<th>Program Increase &amp; % Selecting</th>
<th>Adding AP &amp; % Selecting</th>
<th>Prepares Students &amp; % Selecting</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Response</strong></td>
<td>Q 5 %</td>
<td>Q 6 %</td>
<td>Q 7 %</td>
<td>Q 8 %</td>
</tr>
<tr>
<td>Strongly Agree / 30%</td>
<td>13 30.2%</td>
<td>6 15.4%</td>
<td>12 27.9%</td>
<td>11 25.6%</td>
</tr>
<tr>
<td>Agree / 20%</td>
<td>12 27.9%</td>
<td>6 15.4%</td>
<td>15 34.9%</td>
<td>21 48.8%</td>
</tr>
<tr>
<td>Uncertain / 10%</td>
<td>6 14.0%</td>
<td>9 23.1%</td>
<td>13 30.2%</td>
<td>10 23.3%</td>
</tr>
<tr>
<td>Disagree / 0%</td>
<td>9 20.9%</td>
<td>9 23.1%</td>
<td>2 4.7%</td>
<td>0 0.0%</td>
</tr>
<tr>
<td>Strongly Disagree / 10%</td>
<td>3 7.0%</td>
<td>9 23.1%</td>
<td>1 2.3%</td>
<td>1 2.3%</td>
</tr>
<tr>
<td><strong>Total Responding</strong></td>
<td>43</td>
<td>39</td>
<td>43</td>
<td>43</td>
</tr>
</tbody>
</table>

**NOTE:**

1. Response indicates level of agreement (Strongly Agree, Agree, etc.) for Questions 5, 7 and 8. Response for Question 6 indicates program growth equal to or greater than the percentage indicated in column 1.
2. The percentages indicated in columns 3, 5, 7 and 9 are an indication of the number of responses in a category compared to the entire number of respondents.

**RESPONSE TO QUESTION 9**

The focus of Question 9 was to have the respondent select and prioritize five (5) technology education courses from a list of 12 titles provided. The response was to be in rank order from highest priority to lowest priority. Of the states that responded, one (1) did not answer the question, one ranked only one (1) choices, one ranked only three (3) choices and two (2) ranked only four (4) choices. The remaining 39
respondents ranked all five choices. The responses were tabulated and preference values were assigned to the rankings of the respondents. A first priority response was assigned a value of five (5), second priority was assigned a four (4), third priority a three (3), second priority response a two (2) and the fifth priority response a one (1).

For each course the total number of a specific ranking was multiplied by the value for that ranking. The total calculated values for each course was then summed to achieve an overall ranked order. Table 3 shows the results of this process and lists the courses in order of final ranking under the column heading "Selection Points."
Table 3
Possible Course Selections by Rank Order

<table>
<thead>
<tr>
<th>Subject</th>
<th>Response 1</th>
<th>Response 2</th>
<th>Response 3</th>
<th>Response 4</th>
<th>Response 5</th>
<th>Selection Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering Technology</td>
<td>8</td>
<td>40</td>
<td>5</td>
<td>20</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Computer Aided Drafting (CADD)</td>
<td>8</td>
<td>40</td>
<td>6</td>
<td>24</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Intro. to Tech. or Foundations of Technology</td>
<td>12</td>
<td>60</td>
<td>4</td>
<td>16</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Communication Technology</td>
<td>3</td>
<td>15</td>
<td>5</td>
<td>20</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>Principles of Technology</td>
<td>7</td>
<td>35</td>
<td>4</td>
<td>16</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>Electricity and Electronics</td>
<td>1</td>
<td>5</td>
<td>2</td>
<td>8</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Technology and Society</td>
<td>1</td>
<td>5</td>
<td>4</td>
<td>16</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Architectural Drafting &amp; Design</td>
<td>1</td>
<td>5</td>
<td>2</td>
<td>8</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Biological/Chemical Tech.</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>12</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Production Technology</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Drafting and Design</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td>12</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>8</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Technology Assessment</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Possible Points</td>
<td>42</td>
<td>210</td>
<td>41</td>
<td>164</td>
<td>41</td>
<td>123</td>
</tr>
</tbody>
</table>

1. Totals for columns B, D, F, H, & J would equal 38 if each state had responded by ranking 5 choices. Maryland ranked only 1. Delaware only ranked 3. Colorado and West Virginia only ranked 4. Oregon did not rank any.
2. Courses suggested under response "M" for other included Problem Solving, Energy/Power/Transportation, Control Technology, Principles of Engineering and 1 Undecided.
3. Rankings from the survey were converted using the following survey response to point scale: 1=5, 2=4, 3=3, 4=2 and 5=1.
PHASE II - THE COLLEGE BOARD

The College Board was asked to describe the criteria for the establishment of AP courses (Appendix G). Dr. Wade Curry, Director, Advanced Placement Program at The College Board, provided the following eight criteria:

Advanced Placement Program
Criteria for Establishing a New Course

1. Is the course within the liberal arts and sciences?
2. Is the course normally offered by universities both for majors and to meet graduation requirements for non-majors?
3. Is there sufficient agreement among college faculty in the discipline on purpose, content, and standards?
4. Do the national associations in the discipline support the development of this AP course?
5. Will colleges and universities grant credit and/or placement?
6. Do high schools have or can they develop the teachers and resources to offer the course?
7. Can the College Board break even on this course?
8. Are we relatively certain that the course:
   a) will have sufficient rigor to enhance the reputation of AP?
   b) will not unduly harm other AP courses?
   c) will not draw students away from courses that would develop skills or knowledge that are more crucial to success in college?
   d) is the best addition to the discipline? (Appendix H)

According to Dr. Curry, most new course proposals do not immediately meet all of the above criteria. He indicated that establishing courses in support of Technology Education may be even more challenging since they are neither a liberal studies course, nor are there generally accepted content standards for such courses in colleges and universities (Appendix H).

A follow-up query was sent to The College Board to seek clarification and detail on the aforementioned criteria. Additional questions were asked concerning the
mechanics of AP course establishment, see Appendix I. Additional information was desired concerning the establishment process, cost and financing, time-lines and developmental responsibilities.

Appendix J provides a detailed response from Dr. Curry regarding the questions which were asked in the second letter. To summarize, he indicated:

1. The cost would be between $850,000 - $1,100,000.

2. Break even will normally occur after 10,000 to 12,000 examinations.

3. There needed to be a general consensus by college and universities as to the acceptability of the course, their willingness to award credit or placement and an agreed upon content standard.

4. The College Board develops new courses based on a determination by the staff that the proposed subject was the most promising based on criteria outlined in paragraph 1 of Appendix J.

SUMMARY

The questions asked of the state Supervisors/Directors of Technology Education were used to establish a measure of the interest concerning implementation of AP courses in support of a technology based curriculum. Data was also gathered to define an approximate student base and levels of participation in technology related courses. The College Board provided general information and criteria used to select subjects for AP course development and implementation. In Chapter V, the data gathered and analyzed in Chapter IV will be used to provide a summary, draw conclusions and make recommendations for future courses of action.
CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter summarizes the previous chapters and draws conclusions based upon
the data and information collected. A summary will first be presented to provide the
reader with a description of the problem, desired goals and methods and procedures
used in the study. The data and information collected will then be used to answer the
original problem statement and research goals and then to draw conclusions.
Recommendations will then be made based on the data collected and the authors'
conclusions. These recommendations will identify areas for future study and courses
of action which might expand upon the authors’ initial work.

SUMMARY

The problem of this study was to investigate the feasibility of and implementation
procedures for establishing Advanced Placement credit for high school Technology
Education courses. During the initial phase, research conducted as part of this study
included a review of current professional literature to determine if there was a
significant need to warrant further investigation. Early research indicated a need for a
more technologically literate workforce within our society and that present educational
systems would need to evolve to meet this demand. Further research was conducted
to determine the historical development of alternative credit, credit for experience,
credit by examination and Advanced Placement course credit as a framework for
potential implementation of technology AP.

A two phase research process was employed to achieve the research goals
outlined in this study. Phase I consisted of a survey and Phase II consisted of direct
correspondence with The College Board. The goals consisted of three items. The first goal was to determine the opinions of state Supervisors/Directors in the field of Technology Education regarding the establishment of an AP program for Technology Education. The second goal was to request recommendations or nominations for AP credit content areas applicable to Technology Education from state Supervisors/Directors. The final goal was to determine the procedures to be followed by the Technology Education profession and The College Board to establish and implement a Technology Education AP program.

To achieve the first two goals, a survey instrument was developed and mailed to each state and the District of Columbia's Supervisor/Director of Technology Education. This provided a population for the study of 51. The first part of the survey determined the number of high schools, high school students, participation and technology requirements for each responding state. The second section asked for the opinion of the respondent as it pertained to program growth and AP applicability. The final section provided a list of 12 subject areas relevant to the technology curricula and asked the respondent to select five (5) courses and rank them according to instructions provided. Of the original population of 51, 43 responses were received, 84.3 percent.

The final goal was achieved by contacting The College Board to determine the process and procedures to establish a new AP course. This information was queried through two letters from the President, Council on Technology Teacher Education to the Director, Advanced Placement Programs at The College Board.

The survey results were tabulated and summarized. The guidelines provided by
the AP program director were also summarized. Based on this data, conclusions and recommendations regarding the establishment and implementation of AP courses were made.

**CONCLUSIONS**

The first goal was to determine the opinions of state Supervisors/Directors concerning the establishment of an AP program for Technology Education. A majority of the respondents indicated that student populations in technology related courses has been increasing over the last ten (10) years and over half of the respondents reported this increase has exceeded 10%. Additionally, the state Supervisors/Directors generally agreed that AP was helpful in preparing high school students for college (74.4%) and was appropriate for those students taking technology related subjects in high school (62.8%). This supports the authors' original assumption that state Supervisors/Directors would support the development of technology AP courses.

The second goal was to request recommendations or nominations for AP courses from state Supervisors/Directors. The results of the survey indicate that the four (4) most likely candidates for technology AP courses to be Engineering Technology, Introduction to Technology/Foundations of Technology, Computer Aided Drafting and Design (CADD) and Principles of Technology. Not withstanding these results, the authors, based upon telephone follow-up calls to state Supervisors/Directors, feel there is possibly a lack of universal understanding of the fine differences between many of the suggested study areas. This may be the result of a lack of nationally recognized
course descriptions and definitions, particularly with regards to the fundamental courses of technology (Introduction, Foundations, Principles of Technology and Technology and Society).

The final goal was to determine the procedures to be followed by the Technology Education profession and The College Board to establish and implement a Technology Education AP Program. The responses by Wade Curry, Director Advanced Placement Programs for The College Board, outlines the criteria used to establishing a new AP course. The criteria established by The College Board presents many challenges, however, the researchers conclude that these challenges will result in a stronger profession. With 84.3% of the population responding and the estimated number of students in technology related curricula at almost 1.3 million, there appears to be a large potential student base. The College Board indicated a minimum break even point for program development occurred when 10,000-12,000 examinations were administered. With the large number of students presently enrolled in technology related courses and the expected future growth, based on historical trends, there is a sufficient population in today's high schools to make selected examination development and testing cost effective. The proper selection of subject matter should be able to meet this requirement.

The second challenge concerns the evolution of Technology Education. Dr. Curry indicates that technology courses are not currently required as part of the liberal studies program of most universities, nor is there general agreement on course content. The researchers concluded, based on the student population growth data and
on the social changes that have occurred in our technological society, that business leaders, parents and students will compel post-secondary institutions to produce more technologically literate graduates. As this process occurs, it is likely that technology requirements will be included in the liberal studies programs of most secondary school districts and universities. Additionally, it will improve content clarity and provide nationally accepted course descriptions and content.

**RECOMMENDATIONS**

Based on the research conducted and information supplied by The College Board, the authors recommend the following actions. These recommendations are presented in two areas: academic study and professional support.

**ACADEMIC STUDY**

The process of conducting this study highlighted areas which would be valuable in further analysis of the technology AP question.

1. A study is recommended to determine what technological areas would be acceptable as AP courses. This study should be addressed to institutions of higher learning in order to determine what credits might be acceptable. It is suggested that this study provide a smaller list of course selections than used during this study and contain detailed course descriptions for each item. The course descriptions are needed to provide a standard basis for comparison.

2. A study is recommended to determine what technology requirements exist within the liberal studies program of a significant number of universities and colleges. The problem of this study is to identify appropriate course title, content and general studies applicability. This study should provide the
opportunity for universities and colleges which have not implemented
requirements, but which have them under development, to indicate this in
their response.

3. A study should be implemented to determine the impact of selected AP
technology courses on course requirements for non-liberal studies programs.
For example, while Engineering Technology had the highest selection value in
this study, Computer Aided Drafting and Design may be a more logical
choice since this may have a greater impact on a broader base of
undergraduate programs in many technical fields. The problem of the study
would be to show what technology requirements exist and how they relate to
technical majors.

PROFESSIONAL SUPPORT

As a unifying force to the Technology Education profession, the ITEA and CTTE
should act as the focal point for the various technical and industrial professions and
provide representation to The College Board in matters of AP development and
support. Towards this end, it is recommended that the ITEA/CTTE:

1. Investigate expanding the role of the current *Technology for All Americans: A Rationale and Structure for the Study of Technology* project to include
   standards which would be recommended for liberal studies programs at post-
   secondary institutions.

2. Sponsor the development and promulgation of a universal listing of
   standardized titles, descriptions and content for secondary and university
   technology education courses.
BIBLIOGRAPHY


APPENDICES

Appendix A: Cover Letter
Appendix B: Survey Instrument
Appendix C: Follow-up Letter
Appendix D: Survey Results Q1 through Q4
Appendix E: Survey Results Q5 through Q8
Appendix F: Survey Results Q9
Appendix G: Letter from CTTE to The College Board of February 24, 1997
Appendix H: Letter from The College Board to CTTE of June 13, 1997
Appendix I: Letter from CTTE to The College Board of June 26, 1997
Appendix J: Letter from The College Board to CTTE of July 18, 1997
Appendix A

Cover Letter

Date

Supervisor/Director Address

Dear ____________:

The International Technology Education Association (ITEA) and its affiliate, The Council on Technology Teacher Education (CTTE), is working on a project which is assessing the applicability of Advanced Placement (AP) course(s) that support a technology-based curricula. Your assistance is requested by completing the attached questionnaire and returning it in the enclosed envelope. Please respond to these questions as an indication of the state’s objectives and goals regarding the future of Technology Education.

Your unique position as a Supervisor/Director in the field of Technology Education means you can provide a valuable insight concerning the needs of your students. Your responses are needed so that a true picture of the applicability of AP to technological studies can be created.

The purpose of our study is to investigate the feasibility of, and implementation procedures for, establishing AP credit courses for high school technology courses. The study consists of determining the focus of United States state and territory, as well as Canadian province, programs relating to Technology Education and the desirability of AP course implementation. Your opinion, based on experience, regarding the most beneficial areas of study would be most valuable.

Today, hundreds of thousands of students are using Technology courses as a foundation for further study in engineering, architecture, and many technical careers. Our research so far indicates that AP courses are becoming critically important in assisting students in the transition from high school to college and as a valuable means of earning college credit.

Your help is needed in collecting information so a report can be sent to the ITEA and The College Board/The Educational Testing Service about the statistics to support the creation of AP courses in Technology Education. Included will be a matrix of the responses from each state, territory and province. Please help us achieve a 100 percent response rate. Your response is requested by June 30, 1997. If you would like to receive a copy of our results, simply fill out the information on the survey and we will forward it to you when completed.

Thank you for your time in this matter and I hope to hear from you soon. You can contact me, or my research assistant Donald Luebbecke, at (757) 683-4305 or FAX (757)683-5227 to further discuss this research.

Sincerely,

John M. Ritz
CTTE President
Occupational and Technical Studies
Old Dominion University
Norfolk, VA 23529

JMR/dl
APPENDIX B

Committee on Technology Teacher Education
Advanced Placement Program Assessment

Name: 
Representing: 

Purpose:
The Council on Technology Teacher Education and the International Technology Education Association is investigating the feasibility of and implementation procedures for establishing Advanced Placement (AP) credit for high school Technology courses. The data gathered in this survey will define present high school student populations, participation in technology related courses, the applicability of AP courses, and determine recommendations for future AP technology course considerations. This data will be combined with implementation requirements and procedures defined by The College Board and The Education Testing Service to make recommendations on the feasibility of future implementation of AP courses for Technology Education.

Section 1 - Background Data

Please indicate the approximate numbers as requested below as they apply to the 1995-1996 school year.

1. How many high schools were there in your state, territory, or province?

2. How many high school students were there in your state, territory, or province?

3. How many enrollments in high school technology related courses were there in your school systems?

4. Is technology a required subject area in your state, territory, or province? (Please darken the appropriate circle.)

   High School   ○ Yes   ○ No
   Middle/JR High School   ○ Yes   ○ No
Section 2 - Applicability of Advanced Placement (AP) courses

Please indicate your position regarding the following statements. Simply darken in the appropriate circle to indicate your response.

5. The number of students participating in high school technology education/industrial arts courses has been increasing over the last ten (10) years.
   - Strongly agree
   - Agree
   - Uncertain
   - Disagree
   - Strongly disagree

6. Over the past ten (10) years, the percentage of students participating in high school Technology curricula, in proportion to overall student population has:
   - Increased more than 30 percent.
   - Increased more than 20 percent, but less than 30 percent.
   - Increased more that 10 percent, but less than 20 percent.
   - Undergone negligible change.
   - Decreased by 10 percent or more

7. In my opinion, Advanced Placement credit courses should be established to meet the needs of those students taking technology subject areas in high school.
   - Strongly agree
   - Agree
   - Uncertain
   - Disagree
   - Strongly disagree

8. Advanced Placement credit courses are helpful in preparing college bound students for success.
   - Strongly agree
   - Agree
   - Uncertain
   - Disagree
   - Strongly disagree

(Please continue to the last section on the next page.)
Section 3 - Nominations for AP content areas

9. Please first review the following list of potential AP Courses in the right hand column. Then select five (5) courses you recommend for AP credit and place the assigned letter in the space provided in rank order. The most important course would be listed in the space marked number 1, the next most important in space number 2, etc. Only rank your top five (5) priorities.

For example:

1. ______  2. ______  3. ______  4. ______  5. ______

1st Priority  2nd Priority  3rd Priority  4th Priority  5th Priority

Rank selections:  Proposed subject areas:

1. ______  A. Architectural Drafting and Design
2. ______  B. Biological/Chemical Technology
3. ______  C. Communication Technology
4. ______  D. Computer Aided Drafting and Design (CADD)
5. ______  E. Drafting and Design
     F. Electricity/Electronics
     G. Engineering Technology
     H. Introduction to Technology or Foundations of Technology
     I. Principles of Technology
     J. Production Technology (Construction and Manufacturing)
     K. Technology and Society
     L. Technology Assessment
     M. Other: ____________________________

(Thank you for taking the time to complete these questions.)
APPENDIX C

FOLLOW-UP LETTER

Date

Supervisor/Director Address

Dear ____________:

Several weeks ago you should have received a survey asking for information about Technology Education programs within your State and the desirability of implementing technology oriented Advanced Placement (AP) credit courses in high schools. If you have already completed and returned it, thank you very much. Your input will be of great assistance to us as we move forward on making recommendations for AP courses for technology education. If you never received the survey, or have not returned it, please do so within the next few days. Enclosed you will find another copy of the survey and a self addressed stamped envelope.

The International Technology Education Association (ITEA) and its affiliate, The Council on Technology Teacher Education (CTTE) is working with The College Board/The Educational Testing Service to determine the feasibility of establishing such courses within the technology-based curricula. As a leader in the field of Technology Education your input is vital in determining the future course of our profession. So far the level of response has been quite good, please help us achieve a 100 percent response rate.

Thank you for your time in this matter and I hope to hear from you soon. You can contact me, or my research assistant Don Luebbecke, at (757) 683-4305 or FAX (757) 683-5227 to further discuss this research.

Sincerely,

John M. Ritz
CTTE President
Occupational and Technical Studies
Old Dominion University
Norfolk, VA 23529

JMR/mam

Enclosures
## APPENDIX D

Survey Results Q1 through Q4

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# APPENDIX F

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APPENDIX F

COURSE LISTING

A. Architectural Drafting and Design
B. Biological/Chemical Technology
C. Communication Technology
D. Computer Aided Drafting and Design (CADD)
E. Drafting and Design
F. Electricity/Electronics
G. Engineering Technology
H. Introduction to Technology or Foundations of Technology
I. Principles of Technology
J. Production Technology (Construction and Manufacturing)
K. Technology and Society
L. Technology Assessment

Listed as other on the Survey Instrument
M. Problem Solving
N. Energy/Power/Transportation
O. Control Technology
P. Undecided
Q. Principles of Engineering
APPENDIX G

LETTER FROM CTTE TO THE COLLEGE BOARD
OF FEBRUARY 24, 1997

Dr. Wade Curry, Director
Advanced Placement Program
College Board
45 Columbus Avenue
New York, New York 10023

Dear Dr. Curry:

I was referred to you by Walter McDonald of the Educational Testing Service while querying him regarding the possibility of establishing an Advanced Placement Program in Technology Education. By way of introduction, I am the President of the Council on Technology Teacher Education, an affiliate of the International Technology Education Association and the Chairman of the Department of Occupational and Technical Studies in the Darden College of Education at Old Dominion University.

I would like to phone you to discuss the above matter and outline a research project being undertaken by two Old Dominion University graduate students to determine the feasibility of establishing, and the process for implementing, Advanced Placement course(s) for the technology curricula areas such as Drafting and Design and Computer Aided Drafting and Design (CADD) which are foundation courses for many college and university programs in Engineering, Architecture and certain Education curricula. Hundreds of thousands of students enroll in technology courses annually in our nations schools and would benefit from receiving college credit for their work.

Additionally, I would like to request a point of contact at the College Board for these researchers while they pursue this most worthwhile project.

Thank you for your time in this matter and I hope to hear from you soon. I can be contacted at (757)683-4305.

Sincerely,

John M. Ritz
CTTE President
Occupational and Technical Studies
Old Dominion University
Norfolk, VA 23529

JMR/dl
APPENDIX H

LETTER FROM THE COLLEGE BOARD TO CTTE
OF JUNE 13, 1997

John M. Ritz
Occupational and Technical Studies
CTTE President
Old Dominion University
Norfolk, VA 23529

Dear Professor Ritz:

Thank you for your letter proposing AP Technology. I did not respond quickly because we have many proposed courses before us and wanted to discuss them at our recent staff meeting.

There are now three courses “in the pipeline”: Environmental Science (which we will initiate in 1997-98), Geography (approved by the Trustees, but on hold with a probable target date of 2000-2001), and World History (recommended by our councils and awaiting Trustees action but unlikely to be initiated until at least 2000-2001).

Enclosed are the eight criteria for establishing a new course. Most proposed courses do not meet all of them, and AP Technology is problematic in a number of areas. It would be a major departure from AP’s traditions in that it is neither a liberal studies course commonly offered for college freshmen nor a course in which there is general agreement as to content. We are not opposed to its addition to the college distribution requirements; and, when such an offering is common, we would be happy to consider it. A quick check of the catalogs of our major receivers of AP exams, however, would indicate that such a freshman course is not now very common.

Therefore, its consideration now would be premature.

Sincerely,

Wade Curry
Director
Advanced Placement Program
Criteria for Establishing a New Course

1. Is the course within the liberal arts and sciences?
2. Is the course normally offered by universities both for majors and to meet graduation requirements for non-majors?
3. Is there sufficient agreement among college faculty in the discipline on purpose, content, and standards?
4. Do the national associations in the discipline support the development of this AP course?
5. Will colleges and universities grant credit and/or placement?
6. Do high schools have or can they develop the teachers and resources to offer the course?
7. Can the College Board break even on this course?
8. Are we relatively certain that the course:
   a) will have sufficient rigor to enhance the reputation of AP?
   b) will not unduly harm other AP courses?
   c) will not draw students away from courses that would develop skills or knowledge that are more crucial to success in college?
   d) is the best addition to the discipline?
APPENDIX I

LETTER FROM CTTE TO THE COLLEGE BOARD OF JUNE 26, 1997

Dr. Wade Curry, Director
Advanced Placement Program
College Board
45 Columbus Avenue
New York, New York 10023

Dear Dr. Curry:

Thank you for your response to our initial letter in inquiry. While your letter suggests some skepticism regarding the demand for Technology Advanced Placement (AP) courses, the enclosed criteria for AP courses establishment are most helpful.

Enclosed is a copy of the survey instrument which we have forwarded to 65 states, territories and Canadian Province Education Offices soliciting interest in the establishment of Technology AP courses such as “Computer Aided Drafting and Design”, “Introduction to Technology” or “Technology and Society”. Although responses to this survey should satisfy certain of the stated criteria, there are several questions and issues which remain outstanding or need additional clarification.

At your earliest convenience please provide follow-up information regarding these issues:

1. What is the process for establishing a new AP course in technology?
2. What is the time line for development and implementation of a new AP course?
3. What is required to initiate the establishment of an AP course? (i.e. population size, commitment of post secondary institution participation and endorsement/participation of professional organizations)
4. What is the cost of establishing an AP course and who pays?
5. What is the method of determining break even?
6. What national professional technology association would be considered appropriate for support of technology AP course establishment?
7. What would be the source of Technology AP course objectives, content and criteria?
8. Who would actually conduct Technology AP course development and implementation tasks?

Sincerely,

John M. Ritz
CTTE President
Occupational and Technical Studies
Old Dominion University
Norfolk, VA 23529

Enclosures
APPENDIX J

LETTER FROM THE COLLEGE BOARD TO CTTE OF JULY 18, 1997

John M. Ritz
Occupational and Technical Studies
CTTE President
Old Dominion University
Norfolk, VA 23529

Dear Professor Ritz:

Thank you for your letter of June 26. In answer to the questions:

1. The process for a new AP course is selection by staff of the most promising proposal, approval to investigate, funding to investigate, survey of colleges and high schools, naming of a task force, report from task force after two meetings, consideration by our Academic Council, consideration by our Trustees, funding for development, naming of a development committee, three years of development (course guides and publications, exam development), training of workshop leaders, then workshops and institutes.

2. The process usually takes five years, sometimes less if little professional development of teachers is required.

3. The break-even point for most single exams is probably just a bit less than 10,000 exams. When one committee does two or three examinations, the break-even point is probably about 12,000 exams. We will usually not proceed if the relevant professional organizations are opposed or if there is not general agreement among university faculty as to course content.

4. The cost of a new course and exam is about $850,000 to $1,100,000 - $50,000 to $100,000 at the task force stage, then about $300,000 per year for three years.

5. Test development expenses are assigned to project jobs for examination; the portion of other costs (program direction, computing and systems, publications) to be assigned are estimated rather assigned by formula. Revenues to meet these expenses are then calculated.
6. When and if Technology becomes more widely accepted as a distribution option, we would need the support of the professional association(s) for faculty teaching such as a university course before proceeding. As with Environmental Science, these faculty might reside in several different university department.

7. We could survey our top receiving universities. The task force and later development committee would use by not slavishly follow that information as they develop the AP course.

8. Our development committee would build the course and examination.

Sincerely,

Wade Curry  
Director of Advanced Placement

cc: Phil Arbolino

Howard Everson