1997

A Study Comparing Fundamental Skills Development of Technology Education Students at Larkspur Middle School in Virginia Beach, Virginia

Steven W. O'Green
Old Dominion University

A STUDY COMPARING FUNDAMENTAL SKILLS DEVELOPMENT OF TECHNOLOGY EDUCATION STUDENTS AT LARKSPUR MIDDLE SCHOOL IN VIRGINIA BEACH, VIRGINIA

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
Steven W. O'Green
July 1997

APPROVAL PAGE

This research paper was prepared by Steven W. O'Green 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 in Education.

APPROVAL BY: John M. Ritz 7-11-97

Dr. John M. Ritz
Advisor and Graduate
Program Director

Date

TABLE OF CONTENTS

TABLE OF TABLES

TABLE OF FIGURES

CHAPTER I

INTRODUCTION

Technology Education is the latest evolution in education, finding its roots in the post-World War II industrial education era, and its future in a more competitive and technologically-based society. (CBE Guide, 1988) The present emphasis on a technology-literate society, with a strong base in the basics, or fundamental skills, is becoming more important to the growth of technology and the economy in the United States. The skills required of the future workforce and of the general population in a technologically sophisticated society are increasing at an exponential rate. The society that fails to adapt to these changes risks a decline in their international competitiveness and their standard of living. (Stern, 1991, p. 3)

Technology Education is touted to be "the new basic" in education. James Johnson, in a perspective statement on Technology Education as A National Imperative says that "technological literacy is basic to our education just as are literacies in language, humanities, arts, math and science." (Johnson, 1992, p. 3) A purpose of this study is to determine how well technology education is meeting this goal.

Statement of the Problem

The problem of this study was to compare the development of fundamental skills (vocabulary, reading comprehension, language skills, work-study skills, mathematics skills, social studies and science), as defined by the Iowa Test, of eighth-grade technology education students at Larkspur Middle School. This study will involve a comparison between students with and without prior exposure to technology education.

Research Goals

The following goals were established to direct the conduct of this fundamental skills study:

1. Determine students' level of fundamental skills.
2. Determine the effect Technology Education has on the development of fundamental skills for middle-school students.

Background and Significance

In 1986, Waldo Meeks, a professor at Georgia Southern College, wrote describing Technology Education as "the fourth "R" and a well-kept secret." (Meeks, 1986, p. 13) There was a great deal of controversy in 1986 over the quality of education in the public schools. Even after 12 years of school, students continued to have problems reading, writing, and working with mathematics. One solution was to increase the quantity of study in English, science and mathematics. A second solution to the problem was to raise the issue of adding "relevance" to "reading, writing, and arithmetic" -- working with problems that apply to everyday situations. The first solution of increasing the quantity of instruction became the most widely adopted.

With the push for "quality in education," a new emphasis has been placed on interdisciplinary study and the development of skills -- defined as "the ability to use knowledge." (Glasser, 1992, p. 227) The field of technology education (industrial arts) has, over the last 20 years, reflected its contribution to providing fundamental skill development in the areas of reading, writing, science, mathematics, and problem-solving. Donald Maley, a well-known technology professor at the University of Maryland, stated that "the practical reality is that the content of technology education (industrial arts) is integrally tied in with essentially all of the disciplines of the secondary school." (Maley, 1984, p. 3) However, after all these years, technology education is still considered an elective course of instruction.

The significance of this study in determining the effect Technology Education has on the development of fundamental skills is also noted by Walter Waetjen, President Emeritus of Cleveland State University. In a perspective statement on "A Research Agenda for Technology Education," Waetjen writes that technology education finds itself "in an environment in which education decision makers seem at best to be unaware of the importance of technology . . ." (Waetjen, 1991, p. 4). Waetjen emphasizes that a research agenda "should focus on student outcomes; teacher competencies, methods and characteristics; and the attitudes of decision makers." (Waetjen, 1991, p. 4) The problem of this study was the comparison of fundamental skills among technology students, to determine the effect exposure to technology education had on their skills development. This was considered by the researcher to be a "student outcome."

Limitations

This study was limited by the following factors and conditions, which include:

1. The study was limited to eight-grade students at Larkspur Middle School attending technology education courses during school year 1995-1996.

2. This study reflected the Technology program at Larkspur Middle School, and its findings may not be applicable to schools using a different curriculum style.

3. Larkspur Middle School uses the Synergistics System for teaching technology education. This study may not be applicable to schools using a different teaching system.

Assumptions

The following assumptions have been made in the conduct of this study:

1. The student participants in this study were all eighth-graders, and it was assumed that their level of maturity was similar.

2. The assessment instrument used in this study was the Iowa Tests of Basic Skills, Form G, whose norms were established in 1983. Form G is considered a parallel form to the newer Form J, and it is assumed to be a valid test of fundamental skills.

3. The diverse nature of the communities supported by Larkspur Middle School, ranging from affluent to lower middle class, requires the assumption that participating students have equal access to the technology program available at Larkspur.

Procedures

This research study was undertaken to compare the fundamental skills of eighth-grade students in the Technology Education program at Larkspur Middle School, with varying durations of exposure to technology education. Using the Iowa Test, each of the eighth-grade students in the Technology Education program were tested. The scores were then divided into three groupings: students with first exposure to technology education at the eighth-grade level, and students with experience in technology education at the previous sixth and seventh-grade levels. A comparison was then made to determine whether there was a difference in the level of fundamental skills which may be attributed to long-term exposure in a technology education curriculum.

Definition of Terms

The following terms have been operationally defined for this study to aid the reader in understanding:

1. **Technology Education** -- "involves the application of knowledge, resources, materials, tools, and information in designing, producing, and using products, structures (physical and social), and systems to extend human

capability to control and modify natural and human-made environments." (Raizen, et al, 1995, p. 1) The Technology Education program at Larkspur Middle School explores the areas of technical literacy, decision-making skills, communication skills, reading, writing and speaking skills, logical thinking and problem-solving skills, research skills, ability to follow directions, senses of self-esteem and pride, and the ability to cooperate with peers. (Larkspur Middle School Program Introduction Letter, 1995)

2. **Fundamental Skills --** "vocabulary, reading comprehension, language skills, work-study skills, mathematics skills, social studies and science." (Iowa Tests of Basic Skills, 1986)

3. **Iowa Tests of Basic Skills, Form G --** A standardized test to "provide for comprehensive and continuous measurement of growth in the fundamental skills." (Teacher's Guide, Iowa Tests of Basic Skills, 1986, p. 5)

4. **Synergistics System --** a teaching system where students are paired and rotate through different work stations to study various technologies using computers, videos, hands-on activities, and other educational materials.

Overview of Chapters

Chapter I presented the problem statement of this study and introduced the reader to the background, significance, limitations and assumptions concerning the problem under study. Chapter I also set the framework for the assessment and comparison of fundamental skills among the targeted middle school students.

The following chapters describe how this study was conducted and present conclusions and recommendations on the affect exposure to Technology Education had on the development of fundamental skills in middle school students. Chapter II contains a review of existing literature. Chapter III presents the methods and procedures used to conduct this research study. Chapter IV presents the findings of the study. Chapter V summarizes the study and makes recommendations on the future of Technology Education as a course of study in the middle school.

CHAPTER II

REVIEW OF LITERATURE

The purpose of this chapter was to survey other research studies and writings relevant to Technology Education and its affect on the development of fundamental skills. This review of literature also creates a knowledge base for this study, distinguishing what has already been discovered from what needs to be further explored.

History

A "Citizen Challenge Education Project" was recently concluded in the Hampton Roads area of Virginia, which includes Norfolk, Chesapeake, Virginia Beach, and other neighboring cities. This project was initiated in the fall of 1995 with the mission of searching for public consensus on how to improve education. More than 200 parents, educators, business people and retirees met to discuss what was happening in our regional public schools. A conclusion of the study was that schools are producing a generation of children who do not have a grasp of "the basics." (Citizen Challenge, 1996)

This was not the first call for action with an emphasis on teaching the basics in the public schools. W.J. Haynie, Assistant Professor of Education at George Mason University, conducted a study in the early 1980's concerning the teaching of "the basics" in our public schools. Reference after reference cited in his study pointed in one direction -- the low level of proficiency in basic skills of the graduates of our schools. (Haynie, 1985, p. 6) To set a framework and history, the references cited in Haynie's study discussed conditions that existed all the way back into the 1960s. Quoting his article in *The Technology Teacher*, "The students of the 1960's read, wrote, and solved problems poorly; those of the 1970s were less competent; and those of today are even worse." (Haynie, 1985, p. 6)

The Secretary of the U.S. Department of Labor generated a report in 1991 titled "What Work Requires of Schools -- A SCANS Report for America 2000." (Whetzel, 1992, p. 1) The report "challenged schools, parents, and businesses to help all students develop competencies in the basic skills, thinking skills, and personal qualities required for work in the current and future workplace." Five broad categories of competencies were identified which would lead to a student's successful transition from school to work:

Resources, Interpersonal, Information, Systems, and Technology. (Lankard, 1995, p. 1)

Technology as a "Basic"

Technological literacy is the new buzz word of the 1990s. As noted in the introduction to this research study, technological literacy is seen to be as much a basic in our education as are the former "established basics": language, humanities, arts, mathematics, and science. (Johnson, 1992, p. 3) Richard H. Hesh, in the summer of 1982, as quoted by Waldo Meeks in *The Technology Teacher*, stated that "an emphasis on science, math and technological education is not enough for a high technology future. Instead, to be technologically literate requires high quality instruction not only in mathematics and science but also in history, literature, and all the humanities. (Meeks, 1986, p. 15)

Barry E. Stern, Deputy Assistant Secretary of Vocational and Adult Education at the U.S. Department of Education, opens his 1991 *National Perspective on Technology Education as a Component of Fundamental Education* with this statement: "Technology education is a bright new hope in curriculum reform. It provides school children with important content and contextual information about technology, while using successful teaching methods which emphasize integrated, holistic, multi-disciplinary, multi-sensory, hands-on learning." (Stern, 1991, p. 3) Technology education is seen as one way of reaching the goal of technological literacy in the United States. Following on the established reputation of industrial arts instruction, it is a new discipline in the elementary and secondary schools. As some disciplines are more dominantly "theory / thinking" or "pure hands-on / practical," technology education is seen to bring both together as a "hands-on / mind's on" discipline focusing on process and application.

As a new discipline, technology education has a short history, yet its potential contribution to education and society is limitless. This research study has as one of its goals the determination of whether exposure to technology education affects the development of fundamental skills for middle-school students. As this review of literature illustrates, fundamental skills are of prime importance to the future of our school children and to our society. Considering technology education as an "equal" with the other "basics" may be the next step toward achieving technological literacy.

Assessment Instrument Selection

The determination of a viable assessment and data-gathering instrument to use for this study was constrained somewhat by the school environment. The researcher chose to conduct the testing with as little disruption to the normal school conduct as physically possible. It was determined that the instrument used should be one organic to the school system. The instrument first considered was the Iowa Test of Basic Skills. (1988, University of Iowa) A review of *Tests in Print IV* (1994, The University of Nebraska Press) and *The Eleventh Mental Measurements Yearbook* (1992, The University of Nebraska Press) revealed that this instrument would be the instrument-of-choice, and that the latest version available was Form J, developed in 1988. The text also noted that parallel versions, Form G and Form H are available and in use in some school systems. After consulting with the Virginia Beach School Administration Testing Coordinator, it was determined that the school system was still using a parallel Form G, developed in 1983. The school system advised the researcher that they considered Form G to be valid for their purposes, and they also advised the researcher that city-wide testing would be conducted the last week of March, 1996. Considering the validity of the test, and the timing of its administration, the Iowa Test was chosen as the data-collection instrument for this study.

The basic skills tested by the Iowa Test, as noted earlier, are Vocabulary, Reading, Language, Work-Study Skills, and Mathematics. The optional skills tested are in Social Studies and Science. The following is a more in-depth description of these skill areas, as defined by the Iowa Test (1988, University of Iowa):

Vocabulary--reading and knowing the meanings of words.

Reading--understanding what you read.

Language--spelling; capitalization; punctuation; use of words.

Work-Study Skills--reading maps, graphs, and tables, alphabetizing, using an index, the dictionary, and similar materials, and finding information in the library.

Mathematics--understanding the number system, mathematical terms and operations; solving problems; computation.

Social Studies--knowledge and understanding of history, geography, government, and citizenship.

Science--life science, earth and space science, mechanics and energy, health and safety.

Overview

A Review of Literature provided information relevant to the study of technology education. The section on history gave a past and present perspective on our educational system and illustrated the importance of acquiring and enhancing fundamental skills. Technology as a "basic" presented the importance of technological literacy as an imperative to our growth as a nation and technology education as a prime component in the attainment of that literacy.

A Review of Literature also set the groundwork for the following chapters concerning the conduct of the research study. Chapter III follows and presents the Methods and Procedures used in the study.

CHAPTER III

METHODS AND PROCEDURES

Chapter III, Methods and Procedures, has been included in this research to introduce the reader to the mechanics of this study. This chapter will discuss the target population, the data collection instrument, the method of data collection, statistical analysis, and provide a summary of the chapter.

Population

The population used in this study consisted of the ninety eighth-grade students currently enrolled in Technology Education classes at Larkspur Middle School, a public middle school in Virginia Beach. This population was then sub-divided into three groupings. Group A, consisting of 22 students, had exposure to Technology Education only at the eighth-grade level. Group B, consisting of 32 students, had two years of Technology Education exposure. Group C, consisting of 36 students, had three years of Technology Education exposure.

Instrument Design

The data collection instrument used in this study was the Iowa Tests of Basic Skills. The basic skills tested by the Iowa Test, as noted earlier, are Vocabulary, Reading, Language, Work-Study Skills, and Mathematics. The optional skills tested are in Social Studies and Science.

Method for Collecting Data

The Iowa Test was administered to all eighth-grade students at Larkspur Middle School during the last week of March, 1996, as part of the school system's established skills development assessment program. The researcher was given access to the examination scores of the target population for analysis. The requirement of keeping any reference to any individual student confidential was strictly adhered to.

Statistical Analysis

The data collected in this study was divided into three groups, reflecting students with and without prior exposure to Technology Education. These groups were then statistically compared using the t-test for statistical differences. The three sub-groupings selected for analysis were: 1 year exposure, 2 years exposure, and 3 years exposure.

Summary

This chapter presented the methods and procedures used to collect the data for this research study. Ninety eighth-grade Technology Education students were administered the Iowa Tests, and their test scores were collected for statistical analysis. Findings of the statistical analysis will be discussed in Chapter IV.

CHAPTER IV

FINDINGS

The purpose of this chapter was to present the findings from data collected during the study. The data described was a result of a collection of Iowa Test scores achieved by ninety Larkspur Middle School eighth-grade students making up the target population of the study.

Test Results

The following data represents the Iowa Test scores of the ninety eighth-grade Technology Education students at Larkspur Middle School in Virginia Beach serving as the target population for this study. The test was administered the last week of March, 1996. Table 1 lists the cumulative averages of the scores the students achieved by Group and in Specific Areas of the Iowa Test. Figure 1 displays the cumulative scores in Bar-Chart form. Group A represents the 22 students with only one year of Technology Education exposure; Group B represents the 32 students with two years of Technology Education exposure; and Group C represents the 36 students with three years of Technology Education exposure.

TABLE 1

Student Cumulative Averages by Group and Skill Areas

Code	V-NPct	R-NPct	L-NPct	W-NPct	M-NPct	Cm-NPct	Ss-NPct	Sc-NPct
Avgs-A	42.0	41.8	46.4	38.7	36.2	39.4	47.5	44.8
Avgs-B	40.0	30.2	38.7	37.0	39.0	34.0	35.8	46.3
Avgs-C	46.6	45.1	43.5	44.9	47.8	44.6	46.2	55.0

Legend for Skill Areas:

V-NPct - Vocabulary National Percentile Rank

R-NPct - Reading Comprehension National Percentile Rank

L-NPct - Language Skills National Percentile Rank

W-NPct - Work Study Skills National Percentile Rank

M-NPct - Mathematics Skills National Percentile Rank

Cm - NPct - Complete Composite National Percentile Rank. This score combines the scores for Tests V, R, L, W, and M. (Optional Social Studies or Science scores are not included)

Ss-NPct - Social Studies National Percentile Rank

Sc-NPct - Science National Percentile Rank

Table 1 presents the average National Percentile Ranking of each student group by skill area. This ranking shows how the average pupil in each group ranks among pupils in the nation. This percentile ranking is considered by the Iowa Tests to be a useful index for determining relative strengths and weaknesses among tests.

FIGURE 1

Student Cumulative Averages by Group and Skill Areas

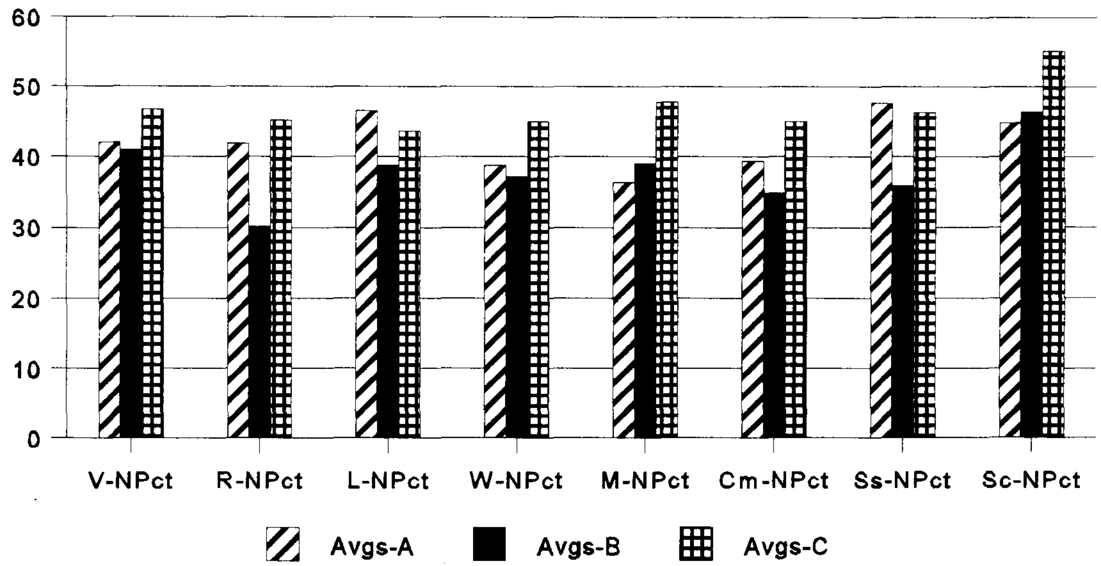

Figure 1 presents the National Percentile Rankings of each student group by skill areas, in Bar Graph format. This format was chosen for its clarity in presenting relations and comparisons between groups and test averages.

Statistical Analysis of Findings

In order to determine if a significant difference existed between the scores from the three selected groups of students (Groups A, B, and C), the one-tailed statistical *t*-test method was applied to the data. Additional data required for the *t*-test calculations will be found in the following tables. Table

2 lists the summative data for each student group and skill area. Table 3 lists the means and squared differences for each student group and skill area. Table 4 lists the *t*-ratios and significance levels for each student skill area and comparison group. This data will be used to calculate the *t*-test ratio.

TABLE 2

Summative Data for Each Student Group and Skill Area

Code	V-NPct	R-NPct	L-NPct	W-NPct	M-NPct	Cm-NPct	Ss-NPct	Sc-NPct
Sum-A	924	919	1021	851	797	867	1045	985
Sum-B	1308	966	1239	1188	1249	1113	1145	1480
Sum-C	1679	1622	1567	1617	1720	1616	1663	1980

Table 2 lists the sum of the individual student test averages by group and skill area. This information is required for calculating the mean and squared difference data used in computing the *t*-test ratio.

Table 3 lists the mathematical mean of the individual student test averages by group and skill area. Individual student test averages were then compared against the mean for that respective group and skill area, and their differences were squared and summed to achieve the "Squared Difference" factor. This data was required for calculation of the *t*-test ratio.

TABLE 3

Mean and Squared Difference
for Each Student Group and Skill Area

Area	Mean - A	Sq Dif - A	Mean - B	Sq Dif - B	Mean - C	Sq Dif - C
V-NPct	42.0	15088.0	40.0	16820.0	46.6	26937.8
R-NPct	41.8	11381.0	30.2	11417.1	45.1	21941.6
L-NPct	46.4	12884.2	38.7	14398.8	43.5	14386.8
W-NPct	38.7	10813.0	37.0	14956.0	44.9	17206.4
M-NPct	36.2	14455.0	39.0	18607.0	47.8	10942.4
Cm-NPct	39.4	13268.2	34.0	10667.0	44.6	17154.0
Ss-NPct	47.5	16360.6	35.8	10874.2	46.2	20188.2
Sc-NPct	44.8	21738.8	46.3	17352.4	55.0	25094.0

The resulting calculations from performing the one-tailed *t*-test and their respective significance levels are listed in Table 4. For this study, data was considered good when statistically significant at the 0.05 or 0.01 levels. Data statistically exceeding these levels was labeled Nss or Not Statistically Significant.

TABLE 4

t-test Ratios and Significance Levels
by Comparison Test Groups

Area	Groups A & B		Groups B & C		Groups A & C	
	t	Signif.	*t*	Signif.	*t*	Signif.
V-NPct	0.31	Nss	-1.15	Nss	-0.63	Nss
R-NPct	2.09	Bt 0.05	-2.96	Bt 0.01	-0.51	Nss
L-NPct	1.27	Nss	-1.03	Nss	0.50	Nss
W-NPct	0.29	Nss	-1.60	Nss	-1.05	Nss
M-NPct	-0.42	Nss	-1.86	Bt 0.05	-2.06	Bt 0.05
Cm-NPct	0.95	Nss	-2.31	Bt 0.05	-0.84	Nss
Ss-NPct	1.93	Bt 0.05	-2.14	Bt 0.05	0.19	Nss
Sc-NPct	-0.21	Nss	-1.53	Nss	-1.33	Nss

Legend for Table 4:

t - Value of *t* ratio

Signif - Significance level

Bt - Significance level Better Than . . .

Nss - Not Statistically Significant. Significance level exceeds 0.05

Overview

This chapter reported the results of the data collection of Iowa Test scores for ninety Technology Education students. Statistical analysis of the findings were also reported. A summary of the study, with conclusions and recommendations, will be made in Chapter V.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The purpose of this chapter was to summarize this research study on the comparison of fundamental skills among students with and without prior exposure to Technology Education at the middle school level. Within this chapter are sections on summary, conclusions, and recommendations.

Summary

The problem of this study was to compare the fundamental skills (vocabulary, reading comprehension, language skills, work-study skills, mathematics skills, social studies and science), as defined by the Iowa Test, of eighth-grade technology education students at Larkspur Middle School. This study involved a comparison between students with and without prior exposure to technology education.

Ninety eighth-grade Technology Education students at Larkspur Middle School in Virginia Beach served as the target population for this study. Their Iowa Test scores were collected and the statistical *t*-test method was applied to the data to determine if a significant difference existed between the scores from the three selected groups of students (Groups A, B, and C) representing 1, 2, or 3 years of exposure to Technology Education. The Iowa Test was administered the last week of March, 1996. Data collection was performed the first week of August, 1996, at the Virginia Beach Public School Administration Building.

Conclusions

Conclusions can be made from the data collection and interpretation of the statistical findings in relation to the following research goals:

1. Determine students' level of fundamental skills. According to the Iowa Tests, the composite score is the best indicator of overall achievement on the test. The average Complete Composite National Percentile Rank for each group was: Group A -- 39.4; Group B -- 34.0, and Group C -- 44.6. This ranking reflects the percentage that the student group scored better than when compared with eighth graders nationally. Group A scored better than 39.4 percent of eighth graders nationally; Group B scored better than 34.0 percent, and Group C scored better than 44.6 percent. These ranking scores also reflect that 60.6 percent of eighth graders nationally scored as well or better than Group A; 66 percent scored as well or better than Group B, and 55.4

percent scored as well or better than Group C. Overall, all these groups scored below the national average.

2. Determine the effect Technology Education has on the development of fundamental skills for middle-school students. Analysis of the data showed a significant positive effect on test score averages in almost all areas, which may be attributed to the long-term exposure to the study of Technology Education. Test score averages of the Group C students (representing 3 years of exposure to Technology Education) showed an increase in the areas of Vocabulary, Reading, Work-Study Skills, Mathematics, and Science, when compared with Group A and B students (those with 1 or 2 years of exposure to Technology Education, respectively). According to the data, no appreciable increase was noted in the cumulative averages in the areas of Language or Social Studies.

Statistically, the most significant effects were noted to occur in the comparison of the Group with 2 years exposure (Group B) and the Group with 3 years exposure (Group C). This comparison group reflected significance levels ranging from better than 0.05 in Mathematics, Social Studies, and Complete Composite to better than 0.01 in Reading. This level shows a very significant difference exists between the two sample means.

Recommendations

Based on the results and conclusions of this study, the researcher suggests the following recommendations:

1. Students should be encouraged to enroll in Technology Education courses as early as possible, preferably prior to or at the beginning of the Sixth Grade.

2. School counselors should be informed of the significance exposure to Technology Education can have on the development of fundamental skills -- those skills most in-demand by employers today and in the foreseeable future.

3. Parents should be informed of the advantages exposure to Technology Education can have on the development of their children as "technology-literate" members of society.

4. In conclusion, it is recommended that further studies be performed on High School Technology Education students, to see if the "gains" achieved in the Middle School are further developed by the High School programs.

References

Buros Institute of Mental Measurements. (1994). Tests in Print IV. The University of Nebraska Press.

Buros Institute of Mental Measurements. (1992). The Eleventh Mental Measurements Yearbook. The University of Nebraska Press.

Community Networking Association. (1996). Citizen Challenge: How Can We Improve Education? A Hampton Roads Study. (Available from the Community Networking Association, P.O. Box 62078, Virginia Beach, VA 23466-2078)

Glasser, W. (1993). The Quality School. New York, NY: HarperCollins.

Haynie, W. (1985). The Basics: Is your Laboratory a Battleground in the Fight against Ignorance? The Technology Teacher, May/June 1985.

Johnson, J. (1992). Technology Education An Imperative. The Technology Teacher, November 1992.

Lankard, B. (1995). SCANS and the New Vocationalism. [On-Line]. ERIC Digest 165, ED389879 95.

Larkspur Middle School Program Introduction Letter, 1995, Larkspur Middle School, Virginia Beach, VA.

Maley, D. (1984). The Role of Industrial Arts/Technology Education for Student Development in Mathematics, Science, and Other School Subjects. The Technology Teacher, November 1984.

Meeks, W. (1986). Technology Education: The Fourth "R" and a Well-Kept Secret. The Technology Teacher, February 1986.

Raizen, S., Sellwood, P., Todd, R., & Vickers, M. (1995). Technology Education in the Classroom: Understanding the Designed World. San Francisco, CA: Jossey-Bass.

Stern, B. (1991). Technology Education as a Component of Fundamental Education -- A National Perspective, Part One. The Technology Teacher, January 1991.

University of Iowa. (1986). Teacher's Guide, Iowa Tests of Basic Skills, ITBS Forms G/H. Riverside Publishing Company: The University of Iowa.

Virginia Department of Education. (1988). Technology Education Guide to CBE Implementation. Virginia Department of Education.

Waetjen, W. (1991). A Research Agenda for Technology Education. The Technology Teacher, November 1991.

Whetzel, D. (1992). The Secretary of Labor's Commission on Achieving Necessary Skills. [On-Line]. ERIC Digest, ED339749 Mar 92.