AN ANALYSIS OF BASIC ACADEMIC SKILLS ASSOCIATED WITH SUCCESS IN VARIOUS AREAS OF VOCATIONAL EDUCATION: A TECHNIQUE FOR PLANNING ACADEMIC PROGRAMS

by Julius Ayo Akinwumiju

The thesis/dissertation document has been electronically approved by the following individuals:

James Dunn (Chairperson)

John Sipple (Minor Member)

Mark Constas (Minor Member)

AN ANALYSIS OF BASIC ACADEMIC SKILLS ASSOCIATED WITH SUCCESS IN VARIOUS AREAS OF VOCATIONAL EDUCATION: A TECHNIQUE FOR PLANNING ACADEMIC PROGRAMS

A Dissertation

Presented to the Faculty of the Graduate School

of Cornell University

In Partial Fulfillment of the Requirements for the Degree of

Doctor of Philosophy

By

Julius Ayo Akinwumiju

August 2010

AN ANALYSIS OF BASIC ACADEMIC SKILLS ASSOCIATED WITH SUCCESS IN VARIOUS AREAS OF VOCATIONAL EDUCATION: A TECHNIQUE FOR PLANNING ACADEMIC PROGRAMS

Julius Ayo Akinwumiju, Ph. D.

Cornell University 2010.

This research work was directed towards analyzing and interpreting the basic academic skills of reading, writing and computation associated with success in each of the various areas of vocational and technical activities, and to suggest ways in which administrators and decision-makers might use the information in planning and operating programs designed to (1) prepare youth for employment; (2) help them maintain their employability; and (3) help them advance within their occupations. Nine research questions were raised to guide the study.

The research used a longitudinal approach. The data for the research came from three major sources: (1) the 1981 Basic Skills Survey; (2) the 1982 Employer’s Survey; and (3) the 1982 Graduate Follow-Up Survey. A participatory approach was used in assessing the need for basic academic skills in vocational activities. Both descriptive and inferential statistical procedures were used in analyzing the data for the research.

The study found, among other things, that (1) employers and employees differ in their perceptions of the basic academic skills needed for success on the job; (2) employees across various program areas perceived the importance of the basic academic skills differently; (3) employers in the seven program areas differ in their beliefs about the significance of the various basic academic skills for effective job performance; and (4) most employers reported that their new entry-level

employees were deficient in basic enabling skills. In most cases the specific reading, mathematics and writing skills required for success in each program area do not differ significantly from program to program.

The higher you go on the aggregate of a specific skill into a family of skills, the less variability there is in the demand for such a skill across vocational program areas. For instance, there were variations in the perceptions of employers and employees on the importance of some specific skills for success in their jobs. But, when the specific skills were regrouped into a family of skills, there appeared to be no significant difference in the perceptions of employers and employees of the significance of such skills for effective job performance. All these findings bear implications for policy and planning in general.

BIOGRAPHICAL SKETCH

Julius Ayo Akinwumiju was born in 1948 in Ondo, Ondo State, Nigeria. After completing his high school education in 1965, he entered into Adeyemi College of Education, Ondo (1966–1968) to train as a high school mathematics and physics teacher. He graduated from the College in 1968 with distinction in Practical Teaching. After receiving the Nigerian Certificate in Education (NCE), Julius taught mathematics and physics at Ibadan Boys' High School, Ibadan (1969–1971).

Julius served as the head of the Physical Sciences Department of the school (1970–1971). In September 1971, Julius entered the University of Ibadan to study pure mathematics, applied mathematics, and education. He graduated with a Bachelor of Education degree (B.Ed.) with honors in mathematics in June 1974. He served in the National Youth Service Corps from August 1974 to July 1975. During the service year (1974-1975), he was the head of the Mathematics Department at the Government Secondary School, Kazaure, Kano State, Nigeria.

In August 1975, Julius returned to Ibadan to join the staff of the Institute of Education, University of Ibadan, and was attached to The International School, University of Ibadan, which is a practicing school for the Institute of Education. There he functioned as a mathematics tutor from 1975–1978. While at the International School, Julius served in various capacities as an assistant house master, head of the Mathematics Department, coordinator of examinations, and evaluator of diplomas for applicants for teaching posts. During this period, Julius also served as a part-time mathematics tutor in the Extra Mural Division of the Department of Adult Education, University of Ibadan.

During the academic year 1977-1978, Julius enrolled for a master's degree program in Educational Evaluation at the International Center for Educational Evaluation, Institute of Education, University of Ibadan. Based on his performance in the masters degree program, Julius was nominated for a UNESCO/UNDP fellowship by the Department of Educational Management, University of Ibadan, to do Ph.D. work in educational research methodology and statistics in a reputable institution in the United States, which brought him to Cornell University in Ithaca, New York.

Over the years, Julius has been heavily involved in the design and development of test items. He served as chief examiner in mathematics for the Primary School Living Certificate examination, the Secondary Modern School Living Certificate examination, and the Teachers Grade II Certificate examination in Oyo State, Nigeria, from 1975–1979. He also served as an examiner in general mathematics for the West African Examination Council from 1972–1979. Julius is a member of several educational associations. Among them: the National Council on Measurement in Education (NMCE), the Science Teachers Association of Nigeria (STAN), the Mathematics Teachers Association of Nigeria, and the Institute of Actuaries.

Julius hopes that, upon completion of his Ph.D. program at Cornell University, he will return to Nigeria to take up an appointment at the University of Ibadan.

Dedicated to the Almighty God, the one who gives Wisdom, Knowledge, and Understanding

And

To those men and women all over the world whose hearts are crying out to see in their lives the working of the miracle power of God.

ACKNOWLEDGMENTS

I would like to begin by thanking Professor James Alan Dunn, my major doctoral program advisor and supervisor. Jim, your warmth, wisdom and insight are embedded in every page of this dissertation. I cannot thank you enough for your belief in both myself and the project on Basic Skills, which you helped to conceive at the Cornell Institute for Occupational Education (CIOE). Jim, you are the best. You have an almost uncanny knack for intuiting how a project and a doctoral dissertation's structure should flow, knowing exactly what needs to be cut, and precisely what needs to be added. At each stage of the study, you knew exactly what I wanted to say, and you knew exactly how best I should say it. Of course, my greatest appreciation goes to you, Jim, without whom this research study would never have been conceived, nurtured and born. Indeed, the double job of evoking and extrapolating the thoughts of this dissertation fell on you, Jim, whose experience, persistence and dedication have made this endeavor a positive experience of success. I thank you immensely for these contributions.

I would like to express my sincere gratitude to Professors Jason Millman, Lin Compton, Marvin Glock, John W. Sipple, and Mark A. Constas (my minor advisors and supervisors), and Professor Bob Gowin, for their unwavering enthusiasm, feedback and good support, and for their love over the years, as well as their belief in my ability and my doctoral work. Very special thanks go to Professor Glock, whose support of my project mission has been instrumental in giving me the time and motivation to create the chasm between Basic Academic Skills and Vocational Education.

To all the respondents to questionnaires and opinionnaires who contributed valuable insights and recollections in this work, I give my thanks, especially in light of their compelling schedules.

To Pattie Place, the Thesis Advisor at the graduate school, without whom the organization necessary to assemble this effort, and without whom many facts necessary to assure accuracy would not have been ascertainable, I owe the greatest of debts. She has made my doctoral program during the last few weeks a big success.

To Dean Terry D. Plater; Janine Brace, Graduate Student Service Representative; and Rosemary Hulslander, Graduate Field Assistant to show my appreciation and to express my gratitude to all of them for brightening my world.

Very special thanks go to Woody Evans of Tarrant County College (Southeast Campus) Library. I cannot thank you enough for your guidance in the use of computer. You made me develop more interest in the use of computer now more than ever before. Your efficient guidance coupled with your genuine interest in helping others to learn will always be remembered. I must confess that I have learned and gained a lot from your wealth of experience.

To Dr. William Barnett of WordCraft Services and Pastor Adewumi Bill Adegbenro of the University of Texas at Arlington for assistance in formatting the document to fully conform with Cornell University (Postgraduate School) current standard. You are indeed God sent agents.

As a UNESCO/UNDP fellow, I thank the UNDP Mission in Lagos, the Federal Government of Nigeria, and the Governing Council of the University of Ibadan for giving me the opportunity to study at an Ivy League school like Cornell University. I am also grateful to those whom God used to make my fellowship award possible. I would like to express my profound gratitude to Professor Tekena Tamuno, Vice Chancellor of the University of Ibadan, for his support. I am particularly grateful to Professor Ayotunde Yoloye, the director, Institute of Education, University of Ibadan; Professor W. M. Zaki, UNESCO representative on Project NIR/75/103; and Dr. T. A. Ohikena, the Acting Head, Department of Educational Management, University of Ibadan. Many thanks to Professor Wole Falayajo, the one who gave me my initial orientation in Research Methodology and Statistics at the International Centre for Educational Evaluation. I am also greatly indebted to Professor Samuel Tunde Bajah, my master's degree project supervisor, for his interest and belief in my research acumen.

My wife Clara deserves credit for her patience, valued advice and counsel. I also appreciate the much valued support of my son, Pius, and my daughters; Wumi, Laolu, Bisi and Ayodele. Many thanks to you all.

I could not imagine ending my acknowledgments without thanking Professor Joe Bail, chairperson of the Department of Education, and all the staff of the School of Agriculture and Life Sciences (in Stone Hall), where a goodly number of these pages were created.

To acknowledge completely an author's indebtedness is clearly an impossible task. For most of what I know in Research Methodology and Statistics has been borrowed from others. My greatest and sincerest hope is that I have used reasonably good judgment in selecting from their wealth of experience plus the diverse pieces of information they provided, and that I have not bungled the opportunity of integrating these pieces into a coherent and dependable structure of knowledge.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ABBREVIATIONS

BAS: Basic Academic Skills

BOCES: Board of Cooperative Extension Services

CB: College Board

CEEB: College Entrance Examination Board

CIOE: Cornell Institute for Occupational Education

GATB: General Aptitude Test Battery

ICEE: International Centre for Educational Evaluation

IQ: Intelligence Quotient

MDTA: Manpower Development and Training Act

NAEP: National Assessement of Education Progress

NCES: National Center for Educational Statistics

NIE: National Institute of Education

RGL: Reading Grade Level

SAT: Scholastic Aptitude Test

US: United States

USA: United States of America

VEA: Vocational Education Act

LIST OF SYMBOLS

ca: Latin for *circa*, which means “stand” and is commonly used with approximate dates

©: Copyright ownership

Cf: Abbreviation of Latin *confer*, meaning “compare”

DF: Degrees of freedom

e.g.: Abbreviation of Latin *exempli gratia*, meaning “for example”

et al.: Abbreviation of Latin *et alii/alia*, meaning “and others”

F-ratio: Test for significant differences among means

Ibid: Abbreviation of Latin *ibidem*, meaning “in the same place”

i.e., Abbreviation of Latin *id est*, meaning “that is”

N.B. Abbreviation of Latin *nota bene*, meaning “take notice, mark well”

Op. cit.: Abbreviation of Latin *opera citare*, meaning “in the work cited”

Passim: Latin meaning “throughout the work, here and there”

p-value: Level of Significance

sd: Sample standard deviation

sic: Latin meaning “thus so”

t-test: test for significance of difference between means

viz.: Abbreviation of Latin *vidlicet*, meaning “namely”

X: Sample mean

3R’s: “Reading, writing, and arithmetic”

PREFACE

Research done in different countries and under diverse settings has shown that academic pre-occupational training has proceeded as if every occupation had the same basic academic requirements. But, it is generally assumed (without any substantial research support) that the general emphasis on one area of skill or another varies considerably among occupations; that the specific reading materials, mathematical problems, writing assignments, and oral communication tasks faced by students differ from occupation to occupation; that certain occupations rely heavily on listening and speaking to communicate information whereas others use reading and writing; and also that the use of mathematical skills shows marked differences in emphases.

Significantly, students who choose to enter vocational preparatory programs may be lacking information. They do not know which basic skills are relevant to their “callings.” It seems, then, that the chasm between related studies in the basics and vocational specialty training is not effectively bridged.

Considering the need for appropriate guidance in curricular relevance in vocational and technical activities, this study sets out to analyze and interpret the basic academic skills of communication and computation—of reading, writing and arithmetic—that are associated with success in various areas of vocational and technical activities.

The findings of the research will have various implications for federal, state and local policymakers on vocational and technical activities in the U.S., since vocational programs receive federal funding under the Vocational Education Act (VEA). The research also has implications for vocational and basic academic skill development in developed, developing, and underdeveloped economies of the world. The findings of the research will be of immense value to researchers attempting to find solutions to the problems of pervasive sex segregation in vocational preparation.

A number of theories attempt to explain the process of choice, but each rests on remarkably little empirical data. The demand for school counselors, government subsidies for the training of counselors, and the introduction of counseling into almost every manpower program illustrate the widespread assumptions that counseling and guidance are the key to sound occupational preparation and occupational choice. But, all too often, counselors appear to be less available to vocational than to other students.

They appear to be better informed about, and overly oriented toward, college preparatory work, and prone to direct minority group members toward traditional minority occupations. The finding of the research has implications for school counselors in focusing on vocational education. Guidance counselors have been less interested in vocational students in recent years, being rather more interested in college-bound students. This work provides the counselors with adequate information on what to advise and counsel.

Guidance counselors will find this a working tool in advising students on which program to follow, which areas of skills need remediation, and which areas to stress and emphasize. The implications of this work for students are innumerable. It helps them to identify the range, scope and level of basic academic skills associated with their "callings."

The findings of the research have implications for employers of laborers. The work points out that planning geared toward identifying the variability between and within variables should be directed toward specifics rather than families of variables.

For example, there are no significant differences in the perceptions of employees and employers across the diverse program areas of the importance of mathematics for success on jobs. But, moving to the specifics and skills of mathematics, we find significant differences in the perceptions of employers and employees across the diverse program areas. And these are the essential differences.

The findings of this research have diverse implications for policymaking and policy decisions. It will throw some light on the basic academic skills required for selection and graduation in vocational programs.

The work has implications for educators in different areas. These include (1) vocational instructors who are responsible for teaching related basic skills in communications and computations; (2) vocational instructors who see a need to supplement general courses in language and arithmetic with training in specific skills in language and mathematics; (3) specialists charged with teaching job-related skills; and (4) curriculum specialists charged with developing job-related curricula in the basic academic skills of reading, writing and composition.

The study provides educators with empirical information that can be diffused in many ways. Each vocational teacher or counselor, for example, can compare his or her perception of basic skill needs with those of employers and employees identified in this work. By doing this, educators will be able to see the relationship between their own opinions and the opinions of others. This will enable teachers and counselors to better assist students in understanding the basic academic skills pertinent to their "callings."

This study also paves the way for an urgent promotion of diagnostic basic skills tests for vocational students. This could be for admission into a program or for graduation. Using the information provided in this thesis will lead to a generation of more relevant course experiences for effective mastery of the basic academic skills in vocational activities.

The findings of this work pave the way for vocational teachers to organize remedial work (and experiences) for those students found deficient in any of the basic academic skills. This work has implications for program planning and improvement: curriculum builders, administrators, program planners and developers, including departmental heads, might be better equipped to create more relevant course experiences and exercises. A revisionary approach like this might provide closer union between basic academic skills courses and vocational specialty training.

This research will have payoffs in both information and materials. First, it will pay off in the knowledge of some of the basic skills that are associated with success in such areas of occupational preparation. The results of the investigation will also amount to an evaluation of the cognitive success of two-year, half-day, and off-site occupational programs in New York State. It will thus inform program planners at the state level about the present state of basic academic skills in occupational preparation.

The findings of the research will have implications in two major areas of educational programs: (1) in planning instruction and (2) in administering and organizing programs. It can easily be seen how the information issuing from the study will help in reporting student progress, in admissions, in planning remedial work, and for graduation. All these are pertinent to successful vocational preparation.

In conclusion, this study (1) provides information to assist students in making wise selections of basic mathematics or English courses in pursuit of their vocational goals; (2) provides information that will assist teachers in becoming aware of the mathematics/English concepts needed by students in their vocational areas; (3) provides examples for mathematics/English instructors to use in teaching these related concepts; (4) helps facilitate individual student learning; and (5) interrelates the disciplines of mathematics and English with vocational education.

CHAPTER 1

STATEMENT AND PURPOSE

Introduction and Statement of the Problem

Introduction

One of the basic expectations of education is that it prepares people for adult life. A major social function of schooling is vocational: to help young people find their way into jobs and occupations and work (Gowin, 1981). Vocational preparation has developed during the last hundred years along apparently very different lines in different countries in the world.[1] From time immemorial, diverse approaches have been taken to prepare youth for adult life. But, unlike some other parts of the world, the United States has built occupational preparation into the fabric of its high school education. In the United States, the high schools have long sufficed to prepare the masses of prospective workers for active participation in the world of work. Nonetheless, in spite of the long-time recognition of and respect for vocational preparation at the secondary school level, problems abound. Vocational education has been extremely specialized and it has been divorced from general education in the strict sense.

In recent years, the United States has rediscovered vocational education. It now realizes that education is the responsible link between social needs and social improvement. While Americans have traditionally been committed to the ideals of

---

[1] In the United Kingdom and Germany, the tradition of apprenticeship, inherited from craft days, has been adapted to the needs of industries. Elsewhere, general vocational education has been fitted into the fabric of the school system. In some countries, like Belgium and Sweden, it has replaced the apprenticeship system; in others, like France and the Netherlands, both types of education exist *pari passu*.

optimal development of each individual, there is increased public appreciation, awareness, and support for the values and benefits of education in general and vocational education in particular (Taylor, 1974).

Related to renewed public interest in vocational education are significant conceptual and procedural changes which have been stimulated and supported by the Federal Vocational Education Act of 1963 and the Amendments of 1968 and 1976. Educators in general and administrators in particular recognize that both the public attitude towards vocational education and vocational education itself have changed.

Parents and taxpayers are urging boards of education and policymakers to build programs of public education around the basic skills needed to become effective and decent citizens in a democratic society. The big question is, "What is basic public education?" or "What are the basics in public education?"

No matter how the issue of what should be basic in public education is approached, one has to encounter the basic academic skills. It is all right to talk about democracy, opportunity, equal opportunity, and other general ideas, but most people insist that, as important as these are, they do not represent the *basics* needed for survival in a technologically developed society such as the United States. These basics are, simply put, the ability to read, to calculate, and to write legibly and grammatically. The three R's, reading, writing, and arithmetic, are the basic skills in most people's minds, and that sentiment has considerable justification. If someone graduates from high school unable to read, write, or calculate, he or she will be at a distinct disadvantage in getting a job, voting, knowing about what's happening in the world, and even just getting around (Kohl, 1982). Such awareness has stimulated interest in academic circles in the relationship between vocational and basic academic skills acquisition at the secondary school level.

Scope and Statement of the Problem

In recent years, much has been written about the relationship between vocational and basic academic skills acquisition at the secondary school level. A foundation in the basic skills of reading, writing, and arithmetic is widely regarded as essential for students' success in learning both at school and at work (Corman, 1980). The need for basic skills in communication and computation is constantly growing. We are living in a society of increasing complexity. We face a continually growing need for training in basic skills to be offered at all levels of educational enterprises (Dunn, 1979). But research done in different countries and under diverse settings has shown that academic pre-occupational training has proceeded as if every occupation had the same academic requirements (Smith, 1978; Munday, 1979; Corman, 1980; Dunn, 1980).

It is generally assumed, though, that emphasis on particular skills varies considerably across occupations. The specific reading materials, mathematics problems, writing assignments, and oral communications tasks faced by workers differ from occupation to occupation. Certain occupations rely heavily on listening and speaking to communicate information, whereas others use reading and writing. The use of mathematics skills shows marked differences in emphasis from occupation to occupation.

One of the most recent studies on basic job skills requirements in industry, conducted by the Canadian Employment and Immigration Commission, pointed out that:

> It is increasingly recognized that the rate of technological change, as well as the fluctuations of specific labor markets, requires a degree of training and flexibility possessed by relatively few workers. The problem lies not in a resistance to change on the part of the labor force, but rather on the content of the curriculum which trains a person for a specific job rather than for a family of jobs, and the nature of the credentials for employment which fails to recognize, in this age of specialization, that many skills are transferable to a variety of occupations . . . Rather oddly, while skills training has been developed and carried out as if every occupation has unique skill requirements, *academic pre-occupation training has proceeded as if every occupation had the same academic requirements*. (Smith, 1978)

Significantly, students who choose to enter vocational preparatory programs may be informationally disadvantaged. They do not know which basic skills have relevance to their "callings." It seems, then, that the chasm between related studies in the basics and vocational specialty training is not effectively bridged.

The problem was recognized by President Carter, who initiated a major component of the Youth Act of 1980 in bills before the House and the Senate in the spring of 1980. This was aimed at improving the basic literacy and computational skills of low-income and minority youth as a partial means of reducing youth unemployment. The recent announcement of this initiative renders information on vocational educational students' basic academic skills especially timely.

Basic skills education has been a national priority theme in vocational education during the past few years and promises to be of continuing concern in the future. Recent legislation and funding allocations provide evidence of a strong commitment to basic skills education on the part of federal, state and local governments. The Basic Skills Act passed by Congress as Title II or the Education Amendments of 1978, and the Youth Act of 1980, are the major legislative mandates in recent years under which grants for basic skills education are being administered at the federal level.

The National Institute for Education (NIE), an organ of the federal government, identified basic academic skills as a priority research area in 1970. In 1973, a sum of $19.3 million was allocated for research to discover what reading and mathematics skills are required for adequate functioning in society, how children can overcome barriers to learning the basics, and how the teaching of reading and mathematics can be improved.[2] The NIE, with many research centers in the United States, is involved in many efforts related to the basic skills.

Such activity at the federal, state and local levels is a reflection of public concern over students' continually declining test scores on national assessments of reading, writing, and mathematics skills and the pervasive desire of citizens to reverse that trend. The yearly (1973–81) Gallup Polls of Public Attitudes towards education sponsored by Phi Beta Kappa have shown a continuing concern over the need for more instruction in the basics. The 1979 edition of *The Condition of Education* by the National Center for Educational Statistics showed that secondary school principals reported increased emphasis on reading, writing, and mathematics skills as the greatest challenge in the schools in the past five years, that is, since 1974.

The emphasis on basic academic skills education exists in vocational education as well. Vocational teachers along with other teaching specialists are confronted with

[2] It is to be noted, though, that the actual amount of money budgeted for basic skills has declined significantly. In 1975 it dropped to $12.4 million and in 1981 it came to $2.0 million.

the need to help students understand the importance of their subjects in different areas of application. For vocational educators, the term *basic*, therefore, refers to the competencies required for success in a given occupation.

What are these competencies? What are the basic academic skills associated with the mastery of each of the vocational programs? How are these skills related? What is the connection between the academic demands for learning those skills and the actual demands of occupation? How consistent are the basic academic skill demands of education and the basic academic skill demands of occupation? What is the fit between the programs that are preparing students and the jobs that are out there waiting? Do students in various occupational preparation programs have essentially the same basic academic skills? What are the minimum levels of skills associated with effective performance both at school and on the job? What variation, if any, exists in the basic academic skills of seniors in the various program areas? What is the scope of the basic skills performance of seniors in each area of vocational activity? What do employers and new employees believe to be the skills associated with success in each job area? What variation, if any, exists between the employers' and the employees' beliefs? What skills do employers believe their new employees do not possess? What are the policy implications of the answers to these questions?

Purpose and Objective of the Study

Considering the need for appropriate guidance and curricular relevance in vocational education, this work sets out to identify the basic academic skills of computation and communication—skills in reading, writing, and arithmetic—that are associated with success in various areas of vocational activity. It is the intent of the study to provide information that would help satisfy some of the unmet demands regarding basic academic skills needs in vocational specialty training both at the secondary school level and in the world of work.

The objectives of this study are: (1) to identify the basic academic skills of reading, writing, and mathematics computation that are associated with successful completion of each vocational program; (2) to study the variability in basic academic skill requirements across occupations; (3) to study the level and range of basic academic skills acquired by seniors in the various areas of occupational programs; (4) to analyze the variability in the basic skills scores of the 1981 graduates across jobs;[3] (5) to determine the basic academic skills presumably lacking in typical new entrants into the labor market; (6) to determine the variability in the opinions expressed by job holders in various occupations as regards the basic academic skills they believe are important and useful for successful job performance; (7) to determine the variability in the beliefs of employers in the various job areas about the basic academic skills that are important for successful job performance; (8) to analyze the variability in the perceptions of employers and employees on the basic academic skills that are associated with successful job performance; (9) to investigate the relationship between basic academic skills mastery and successful job retention; and (10) to analyze the differences in the scores of employees and whole program completers.

Related Research Questions

To achieve the objectives stated above, some pertinent questions were raised to guide the study and attempts were made, using the available data (see chapter 3), to answer the research questions:

[3] The group fell into five main categories. The 1981 vocational graduates are either attending schools, employed in jobs related to their occupational specialty training, employed in areas not related to their high school majors, unemployed (but looking for a job), or in the military.

1. *What is the distribution of test scores by areas of vocational program, and do they differ?*

This question is directed towards identifying the basic academic skills that are associated with completion of each vocational program area. It is hoped that such identification will enable us to determine the level of basic academic skills acquired by the 1981 seniors in each program area. Such identification will also enable us to inspect the pattern and profile of the skills possessed by the typical graduating seniors in each program area.

2. *Among the skills, are the relative strengths and weaknesses the same for the diverse areas of vocational programs?*

This question follows directly from question 1. After the identification of the skills and patterns of performance of seniors in the various program areas, the next important area is to analyze the variations that exist in the skills of seniors from program to program as measured by the Basic Skills Survey Items of 1981. Hence, this question is geared towards finding the variability between and among the basic skills scores of seniors in the diverse occupational programs. The answer to this question will enable us to further study the patterns of performance of seniors across program areas. The answer to this question, coupled with the answer to question 1, will also enable us to determine the skills associated with successful completion of each vocational program area. It is assumed that the information gleaned from these answers will provide us with the basis for advising on basic skills required for admission into each program area. We should also be better equipped to advise students on areas of basic academic skills that need remediation and those essential for graduation in each program area.

3. *What variation, if any, exists in the scores of graduates who are attending schools, employed in their areas of training, employed in areas not related to their training, not employed at all, and those in the military?*

This question was geared towards investigating the skills possessed by graduates in each of the five specified groups. Such a determination will enable us to study the patterns of performance of graduates in each category. The findings will enable us to explore whether or not the acquisition of basic skills might contribute to their classification.

4. *What skills do employers most often say that their new employees do not have?*

It will be an interesting investigation to inquire into the basic academic skills in which new entrants into the labor market are deficient. Knowledge of such skills will enable us to plan for (or at least provide advice concerning) remediation and the graduation requirements of basic academic skills across program areas. It will also help in structuring instructional programs to incorporate and meet such demand.

5. *What differences exist in the opinions expressed by new employees (employed in areas related to their high school programs) in different areas about how important the basic academic skills are for effective job performance?*

The answer to this question will provide us with the basic academic skills new entrants into the labor market use. Such an analysis will enable us to discover the skills that employees say are actually used on the job.

6. *What differences exist in the opinions expressed by employers of new high school graduates in the various occupational programs about how important the basic academic skills are for successful job performance?*

The answer to this question will enable us to further explore the basic academic skills used in different program areas. The findings in response to this question coupled with the answer to question 1 will enable us to scrutinize and study those skills that students have on graduation and those skills that are actually used on the job. The answers will help us to determine the fit between seniors' actual knowledge of basic academic skills and the actual need for academic skills by job.

7. *Within an area, do new employees and employers agree on the relative importance of the several basic academic skills for success on the job?*

This question was geared towards finding the fit between the opinions and beliefs expressed by both employers and employees about the skills used on the job. The findings here will enable us to better understand the skills that are actually used in each job area.

8. *Are the ability scores of those employed in relevant job areas significantly different from those of successful high school vocational program completers?*

Since the main focus of this study was to investigate the basic academic skills associated with success (both at high school and on the job) in various vocational program areas, it would be a good exercise to determine whether the skills acquired by typical successful high school graduates are the same as the skills used in jobs related to their high school majors. It is important to find out whether good performance on the Basic Skills Survey is related to employability. From this, we would be able to determine whether success at school is related to employment.

9. *Among those in the employed (in a relevant area) category, do those with a longer stay on the job score or perceive differently from those who stay for a shorter time?*

One of the basic assumptions of this investigation was that “a new employee who is on the job for at least six months has been successful.” It would be interesting to determine the difference in perception and scores of this group of workers and the perceptions and scores of those who did not stay up to six months at their jobs. Maybe there is a relationship between job retention and high performance on the Basics Skills Survey on the one hand and job retention and employees’ perceptions of the essential skills for effective and efficient performance at jobs on the other hand.

Significance of the Study

The relationship between basic academic skills and vocational education represents a subject that has won both national and international attention and it is acutely relevant to the key objectives of federal, state, and local policymakers. In relating how little is known about the basic academic skills of secondary vocational education students, it emphasizes the significance of heightened research efforts and of prudence in the adoption of remedial measures.

A foundation in the basic academic skills of reading, writing, and computing is essential for students’ subsequent learning both at work and at school. Although these skills are considered to be crucial and critical for success in vocational education and subsequent entry into the labor market, for upgrading skills, and for retraining, little is known about the differential patterns of basic academic skills attained by vocational students in secondary schools. This research will provide adequate information in discerning those areas of basic academic skills that are associated with each vocational program. This will enable teachers and curriculum planners to structure their programs and instructions accordingly. Understanding the need for individualizing instruction according to a student's individual needs is yet another area of importance for this study.

The proposed research should interest a wide range of people: educators, curriculum planners, policymakers, employers of labor, researchers, evaluators concerned with vocational education, program planners, school administrators, teachers, Department of Education officials in charge of vocational education, students in high schools and community colleges, parents, and guidance counselors. A number of theories attempt to explain the process of choice, but each rests on remarkably little empirical data. Demand for school counselors, government subsidies for the training of counselors, and the introduction of counseling into almost every manpower program illustrate the widespread assumptions that counseling and guidance are key to sound occupational preparation and occupational choice. All too often, however, counselors appear to be less available to vocational than to other students. They appear to be better informed about and overly trained towards college preparatory work, and prone to directing minority group members towards traditional minority occupations.[4]

---

[4] This new turn needs correction, realizing that guidance and counseling in schools began as vocational guidance with an emphasis on occupational selection and placement. The newer traditional way of describing guidance as having three aspects—vocational, educational, and personal-social—is now dying down. Vocational guidance, instead of being guidance, becomes a negligible part of guidance. The resurgence of interest in vocational-career guidance that began in the 1960s and was aided, in part, by a series of national conferences funded through the VEA of 1963 and later the amendments of 1968, contributed substantially to the renewed interest in the term 'guidance' and its practice in schools.

The findings of the research will be of significance to school counselors in focusing on vocational education. Guidance counselors have been less interested in vocational students in recent years, tending to show greater interest in college-bound students. This work will provide counselors with adequate information about the areas in which they should give advice and counsel. The guidance counselors will find this a useful working tool for advising students as to which programs to follow, which areas of skills need remediation, and which areas to stress and emphasize.

It is generally accepted that the basic objectives of vocational education in any public school are (1) to meet the manpower needs of society; (2) to increase the options available to every student; and (3) to serve as a motivating force for enhancing all types of learning. It is easy to see how important the findings of this research will be to manpower planners and policymakers. This work will help identify areas open to each student, thereby increasing his or her options. Students will also find the work useful in identifying the range, scope, and levels of basic academic skills associated with their "callings." The work will also be of significance to students in their first few years of high school for paying attention to the three R's and in combating any problem that may militate against their pursuing vocations of interest to them.

The findings of the research will have significance to employers. It will enable them to improve their training programs, get employees that have the needed basic skills, and also help them alleviate some of the problems employers face with new entrants into the labor market.

The policy implications of this research will interest policy decisionmakers in guiding them on selection, admissions, and the graduation requirements of basic academic skills in vocational programs.

Administrators will find the research findings extremely useful in helping them to organize their programs. Vocational teachers will find this work helpful in guiding them in deciding how to use their instructional time.

Educators in different areas will benefit from the findings of this research. These include (1) vocational instructors who are responsible for teaching related skills in communication and computation, (2) vocational instructors who see a need to supplement general courses in language and arithmetic with training in specific skills, (3) specialists charged with teaching job-related skills, and (4) curriculum specialists charged with developing job-related curricula in the basic academic skills of reading, writing, and computation.

It is hoped that the information provided can be used to make basic academic skills training more supportive of technical skills training and more relevant to potential jobs.

This work will pay off in both information and materials. First, it will lead to new knowledge about some of the basic academic skills that are associated with success in each area of occupational preparation. Second, it will provide information about the basic academic skills of communication and computation that are essential for successful, effective, and efficient performance across diverse job areas.

This work should be of interest to a variety of people and to all vocational educators, including teachers, administrators, federal agency personnel, researchers, and the national center staff.

The findings of the research will have significance in two major areas of educational programs: (1) planning instruction and (2) administering and organizing programs. It can easily be seen how the information issuing from the study will help in reporting student progress, in admissions, in planning remedial work, and for graduation. All these are pertinent to successful vocational preparation.

This study does not claim to span all the problem areas of basic academic skills and vocational preparation in New York State. Rather, the work acts as an eye-opener to further research in the various areas. A replication of this research in other modes of vocational preparation is hereby encouraged.[5]

The consistency of the basic academic skills demands of educational programs with the basic skills demands of corresponding occupations, that is, the fit between the program that is preparing students and the jobs that are out there for students, is yet another significant area of this investigation. It is the feeling of many people that the academic demands of any program of occupational education are by far higher than the academic demands of the occupations themselves, that is, that demands at school are more rigorous than demands on the job. This research will point out such relationships. Such findings may help us scale down (or up) the basic academic skills demand of the program to be more consistent with the demands of an occupation.

It is the investigator’s contention that the findings of the study might generate the knowledge and understanding on which academic teachers and occupational teachers can base their teaching and evaluations on greater objectivity, reliability, and validity.

---

[5] There are three major sources of secondary occupational education in New York State: (1) comprehensive occupational/technical high schools, (2) home schools (i.e., primary academic high schools, and (3) Boards of Cooperative Extension Services (BOCES).

Basic Assumptions

Several assumptions were made in carrying out this investigation. Among the most fundamental are:

1. Some level of skill in reading, writing, and computation are essential for success both at school and on the job.

2. Occupational training currently proceeds as if every occupation has the same academic requirements.

3. Tests can give a reasonable, minimal index of students' ability to read, write, and calculate.

4. Students who persist in their vocational education programs until the last month of their school year can be considered as having successfully completed their programs.

5. There are variations in the basic academic skills required for success in various areas of vocational education.

6. A new employee who can keep a job for six months or more probably has the minimum level of skills required for success on the job.

7. An employee who succeeds on a job either came to the job with the required basic academic skills or learned such essential skills on the job.

8. There may be differences between employees' and employers' perceptions of what basic academic skills are associated with (or essential for) effective and efficient performance on the job.

9. Employers and new employees are in the best position to give advice as to which basic academic skills are being used on their jobs.

10. The employer-targeted instruments used in this study are reliable and valid means for collecting information on basic academic skills and the world of work.

11. The skills listed as important are the same as those used on the job.

Limitations

This study suffers from several limitations, among the most striking of which are:

1. The specific findings are limited to two-year, half-day, off-campus vocational institutions in New York State.

2. The scope of the research was limited by time and financing.

3. The moderate response rate to the follow-up survey.

4. The indifferent attitude of some of the Boards of Cooperative Extension Services (BOCES) directors and vocational education graduates.

5. The uncooperative nature of some of the employers of labor.

Definition of Terms

Whenever there is a clash of theory or a conflict of interests, shades of meaning assume an excessive importance and themselves become the subject of controversy. It is essential, at the onset of this dissertation, to define the precise sense in which certain terms were used.

The term *vocational education* as used in this work refers to education for any occupation that normally requires less than a baccalaureate degree for the beginning worker.[6] It refers to the whole hierarchy of occupational preparations provided in high schools offering two-year, half-day, off-site programs of occupational education in New York State. Such programs include (1) agricultural education, (2) distributive education, (3) health occupational education, (4) home economics education, (5) business and office education, (6) technical education, and (7) training in trades, industrial, or service occupations. The term includes the whole spectrum of labor from semi-skilled workers to technicians and paraprofessionals. It is a preparation for employment in any occupation for which specialized education is required, for which there is a societal need, and which can be most appropriately done in the high schools (as defined above). Vocational education, as used in this context, is specialized because courses or programs are elected only by those individuals who are interested in preparing for a particular occupation or family of occupations. It is part of the total process of education aimed at developing the competencies needed to function effectively in an occupation or a group of occupations.

---

[6] Some special training can be provided more effectively and more efficiently on the job, but in this work we will deal with the public school's responsibility for vocational education. Some authorities have argued that since a vocation is a "calling," the term *vocational education* is broad enough to include preparation for the professions. They pointed out that a large university with its many professional schools—medicine, dentistry, law, engineering, social work, public health, and education—could appropriately be called a vocational school. Even though this notion of vocational education is correct, it is not used in this research.

Vocational education, as used here, may be differentiated from "general education" or "common learning."[7] Throughout this dissertation, '*vocational education' will be used to mean any specialized preparation for employment provided in high schools offering two-year, half-day, off-site programs of occupational education in New York State*. Such programs are geared towards the imparting and learning of knowledge and skills whose aims are to train and to prepare for tasks from which the performer can earn his or her living.

The term *basic academic skills* denotes those skills in communication and computation, that is, in reading, writing, and mathematics, that are used in vocational preparation.[8] The term 'basic skills' presupposes the existence of other skills to which such skills are basic. Skills can be specified as basic only when that to which they are basic is clearly stated, delineated, and identified. Skills are either basic or not basic to a specific occupation. In vocational education, basic skills are often defined as the physical and perceptual abilities, such as hand-eye coordination in operating a lathe, that are needed to successfully carry out the technical tasks associated with various occupations. Traditionally, basic academic skills in reading, writing, oral

---

[7] In its broadest sense, vocational education is that part of education that makes an individual more employable in one group of occupations than in another. It may be differentiated from general education, which is of almost equal value regardless of the occupation that is to be followed. For example, foreign language study is vocational education for those students who plan to be interpreters; drivers education is vocational for the broad range of occupations that require persons to be able to drive an automobile; education in any specialized field is vocational education for those persons who plan to teach in that field. While the intent of each student has a great deal to do with determining whether or not a particular subject is vocational education for him or her, it is possible, by choosing subject matter and methods of presenting that subject matter, to insure that a subject has little or no vocational value for any of the students enrolled. However, all general education subjects could be taught in a way that would emphasize their occupational value and relevance to society as a whole. Vocational education and general education are intimately interwoven. In most instructional situations some courses can have occupational value. An awareness of occupational goals leads students to see the relevance of certain content that otherwise might appear highly irrelevant.

[8] The word "basic" was used in its original Greek sense of being a stepping stone, a pedestal, a base, something that led somewhere, that supported or provided a foundation for something else. A basic skill is one that provides a road to a goal, a strength that enables a certain quality of life to be supported Basic skills have no meaning without a vision of the goal, not of education per se, but of society.

communication, and mathematics, and the technical skills needed for success on a job, have been viewed as separate entities. In many ways this has denied students in vocational education programs opportunities to learn academic skills. It is, however, becoming clear that basic academic skills either in their initial learning or as part of their performance are essential.

The movement toward competency-based education fostered three different approaches to the definition of basic skills: minimum academic competency, life skills, and occupational task analysis. In defining basic academic skills associated with success in various occupational areas, the author combines the best features of the three approaches. The broader usage of academic achievement as measured by grade point average (GPA) or class standing for vocational students will not be adopted in this work.[9]

By *successful completion* in a vocational program is meant the ability of a student in an occupational high school to persist in a program of occupational training until the last week of his or her senior year. Success in a program means persistence in the program for at least two years. A student who enters a program of occupational study in his or her junior year and remains in the program until the last week of his or her senior year is considered to have successfully completed the program. “Success” in this context means the ability to remain in a program of vocational preparation for at least two years (junior year through senior year) without dropping out.

[9] While academic achievement is related to basic skills attainment, it has a broader interpretation. Academic achievement is generally measured by GPA or class standing for vocational, academic, and general students.

CHAPTER 2

BACKGROUND OF THE PROBLEM

This chapter is divided into two major sections. The first section focuses on a historical overview of the changes in the United States that have stimulated interest in basic academic skills. The section will discuss why, in recent years, great emphasis has been placed on basic academic skills in the educational setting. The second section consists of a critical review of the literature related to basic academic skills in connection with vocational education.

Rationale for Emphasis on Basic Academic Skills

Changing Nature of the U.S. Economy

Interest in basic academic skills in the United States has both remote and immediate connotations. Within the last 80 years, there has been a real shift in the way people are employed throughout the United States. At the turn of the twentieth century, people were employed primarily in agriculture, with more than 87 percent working on farms. Presently, however, only 3 percent of the population works on a farm and most other people are engaged in offices, industries, and factories. Within the last 80 years, America has passed through three phases, from agricultural to industrial and then to post-industrial. The transformation has been primarily from an agriculturally based economy to an information-based economy. People are now engaged in the processing and sharing of information, mostly office-type work in banks, business offices, public agencies, services, and so on. All these demand different kinds of skills. Skills now have become highly academic. The shift towards information and service divisions calls for people with stronger academic backgrounds, people who are able to read, communicate, and process information.

Decline in Test Scores

From 1900 to 1981, the number of high school graduates rose from 3 percent to more than 75 percent of the secondary school age cohort. This rise brought along a lowering of test scores. Within the last eighteen years, 1963 to 1981, there has been a substantial decline in Scholastic Aptitude Test (SAT) scores (see appendix, p. 233). The College Entrance Examination Board (CEEB) reported a successive decline of about 5 percent in verbal ability and about 4 percent in mathematics ability as measured by the SAT (Munday, 1979). Other tests, like the National Assessment of Education Progress (NAEP) and the Iowa Proficiency Test, support this claim by the CEEB.

The *Chronicle of Higher Education* also reported a persistent decline in SAT scores, with the verbal average dropping to 424 and the mathematics average dropping to 466. It has also been estimated that if all three million high school seniors in the country took the SAT, the average verbal score would be 368 and the average mathematics score would be 403 (Dunn, 1980).

It is acknowledged that variation exists in the structure and composition of students from year to year, but the seemingly continuous decline in test scores in recent years suggests that less success in teaching skills is evident today than previously.

A special panel formed by the College Board indicated that the decline may be caused by such factors as lower teaching and learning standards, increased time devoted to television, changes in the family's role, and turbulence in national affairs. Many parents, politicians, and educators have blamed schools for the decline in test scores. The idea that the schools should be held accountable for the success or failure of students is new. In the past, especially in the early part of the twentieth century, most people accepted the idea that some students were uneducable either because of genetic "inferiority" or because of cultural "deficits" (Hurn, 1978). Whatever the causes, considerable numbers of high school students are lacking in basic academic skills.

Vocational teachers have noticed the same decline in abilities evidenced by test scores. The inability to follow oral directions, problems with reading information on a manufacturer's label, not being able to write complete sentences or to measure accurately are all things that become major impediments to success, both at school and at work. Vocational teachers see these problems not only in the context of school but also in relationship to success on the job. They are made aware of the impact that low basic skills have on student performance in entry-level jobs.

The awareness has come through their ongoing contact with employers who are familiar with the complexity of the labor market. This is a major social problem, given the need for people with basic skills in most occupations today. This raises many questions. The concern has been picked up by vocational teachers who are very aware of what it takes for a student to get a good job, to hold that job, and to advance within the occupation. Basic academic skills are the primary factor here. Teachers see the need in terms of the students, as employers are demanding students, and most especially new employees, with basic academic skills. Many employers are reporting that their new entry-level employees do not have adequate skills in reading, writing, and computation (i.e., in the three R's), and a lot of big corporations have started their own programs of instruction in the basic skills to remedy the shortcomings of public education. Many employers claim that vocational training does not matter, that what they (the employers) need instead are people who are *smart*, *intelligent*, and *adaptable*. The basic vocational skills can be taught on the job. What is more difficult is to give people the basic social and intellectual skills that they need. Many employers are setting up their own programs to teach basic skills. They choose people with the greatest potential and offer them additional instruction in mathematics and/or reading in order to make them function efficiently in their particular jobs.

In the last ten years, basic skills have emerged as an area upon which we should concentrate. In a recent national survey of public secondary school principals for the NIE, it was found that almost 90 percent of all high schools in the U.S. offer remedial reading and mathematics programs. Approximately one out of every ten students is in a remedial basic skill program. Over 94 percent of this nation's secondary school administrators report basic skills mastery as one of the most important objectives of school (Dunn, 1978).

It is clear from research that the inability to perform advanced academic tasks is sometimes the result of a lack of simple, but crucial, enabling skills. Whether these enabling skills are missing because (1) a student was absent when the skills were being taught, (2) the student was a poor learner who just never mastered the skills, or (3) the skills were poorly or perhaps even never taught, is unanswered.[10]

In many ways, the "back-to-basics" movement of the late 1970s was a rejection of the open-classroom concept. On a 1977 Gallup poll, 83 percent of

---

[10] All too often, basic skills training is assumed to be "remedial education," the implication being that something has to be "fixed up." It *is* often assumed implicitly to be the fault of students. Students are often assumed to lack motivation, ability, attention span, etc. But this represents a simplistic view of the problem.

Americans favored a return to basics. When asked what this means, most respondents said that schools should emphasize the three R's. The back-to-basics movement really started when parents began to sense that their children were not learning what *they* (the parents) had learned, that they were not gaining the skills that they had gained from school. Parents all over the U.S. put pressure on school boards to emphasize the basics. The result was a proliferation of new basic skills programs and the establishment of schools whose major emphasis was on basic skills.

Vocational education offers a real opportunity to teach basic skills because it utilizes small classes. The teachers and students are together for up to two years. The vocational curriculum is interesting to students and motivates them to learn the basic skills that they need. Philip Foster (1965), in his article, "The Vocational School Fallacy in Development Planning," puts forward the idea that formal school systems are indeed the best means of teaching basic competencies necessary to master specific skills offered in vocational schools.

Vocational education has always applied task analysis to make curriculum relevant to jobs. Given a job, what are the tasks needed to complete the job? Here, however, we have a variety of tasks besides technical tasks—being able to use tools and instruments—but some academic tasks, too, involving the ability to read, write, and do mathematics.

Basic academic skills have been a national and international priority during the past few years and this issue promises to be of continuing concern in the future. For vocational educators, the term 'basic' suggests basic to an occupation.

Review of Related Literature

The review of relevant literature is critical for successful delineation of any research and development efforts. It is an essential beginning point and, most importantly, a continuous process that terminates with the completion of the investigation. The review of literature helps to determine the state of the art in the area(s) of investigation germane to the research at hand in order to build on previously discovered ideas, theories, views, concepts, conjectures, principles, and information rather than having to rediscover what has already been discovered.

Critical investigation of such an academic exercise as we have here in this dissertation calls for an important intersection of two major areas of educational literature, as could be seen from the title of the study: *An Analysis of* ***Basic Academic Skills*** *Associated with Success in Various Areas of* **Vocational Education** *. . .”*

It is no surprise that a considerable body of literature has been accumulated on curricula reform. Of the many curricula reforms, that of basic academic skills has been, all along, the most controversial. To understand why this is so, one would need to go into some history and into the nature of basic academic skills and take a look at what is happening around us today. In other words, there are both remote and immediate causes of the revolution we now have in the *basics* cum *vocations*.

Public education has always been a part of the U.S. commitment to democracy. There never was a time when public education worked for all the children, but fortunately there also never was a time in U.S. history when some people were not struggling to make it work (Herbert, 1981). It is that task we continue here in this study.

Seven historical purposes have been proclaimed in American education since the turn of the century. The four familiar goals constitute the American "quadrivium," and they lead in different directions. One leads to *academic discipline*, one to *efficiency*, a third to *individual development*, and the fourth to *vocational competence*.

The three more recent purposes are much more controversial, much more complicated and, in some respects, more fundamental. Education is being called on to aid in the American people's renewed search for their three most cherished ideals: *liberty*, *equality*, and *justice* (or, political community). These form the new "trivium."

The schools and colleges could help society put into practice our proposed democratic ideas and ideals. This point is aptly delineated by Butts (1975) in his paper "The Search for Purpose in American Education."

Since the early 1900s, the structure and values of the American society have undergone substantial changes. Industry, business, services, and labor have become highly complex and occupational specialization continues to increase. Concurrently, urbanization, a mobile population, the increasing depletion of natural resources, and the emergence of a variety of groups and movements asking for recognition have brought about extensive psychological, sociological, and economic changes. The challenges these and other changes represent to individuals and society have caused the educational community to continue to seek ways to improve and extend educational programs at all levels and for all ages.

The individual and societal needs resulting from these changes are of particular concern for the education community because of the impact they have on the theory and practice of vocationalism and avocationalism in the educational setting. It is clear from an analysis of these needs that a reconceptualization of basic academic skills in vocational education is necessary to advance from an ancillary, crisis-oriented conception to a comprehensive, developmental conception based on personal and societal needs organized pragmatically around person-centered goals and activities designed to meet these needs.

Such a reconceptualization of basic academic skills in the context of vocational education requires that vocational programs become equal partners with instructional programs—with concern for the intellectual development of individuals. Traditionally, vocational programs have not been conceptualized and implemented in this manner. As Aubrey (1981) suggested, "vocation is still seen only as a supportive service that does not have a content base of its own."

Recent Trends in Vocationalism

The past thirteen years have witnessed an enormous jump in public support for vocational education. Not only has federal spending increased from 260 million dollars to 682 million dollars per year, but state and local allocations have risen tremendously as well. Federal spending has dropped from 19 percent to 11 percent of total expenditures for vocational education.[11] Such figures suggest that the value of vocational education is on the upswing.

According to 1975–76 data from the National Center for Educational Statistics, at least 8,000 schools (public and private) offer occupational training, business

[11] In 1970, the federal government devoted 260 million dollars while state and local governments spent 1,111 million dollars. But now the federal government has increased its spending to 682 million dollars while state and local governments put in 5,520 million dollars. The jump in both the federal and state/local government spending is an indication of the importance attached to vocational training. It is to be pointed out, though, that vocational education is an industry in its own right. It has its own advocacy groups, such as the American Vocational Association and the National Advisory Council of Vocational Education, and its assemblage of bureaucracies—from the Federal Department of Health, Education, and Welfare to the Department of Labor to state directors of vocational education and the National Association of Counties.

colleges, barber and cosmetology institutes, trade schools, and other kinds of job-related training. Such schools employed more than 120,000 people and they had an enrollment of more than 1.3 million students.

In recent Congressional testimony given by Daniel B. Dunham, HEW's commissioner for occupational and vocational education, he pointed out that 17 million students are presently enrolled in all job-related programs aided by federal funds: "secondary, post-secondary, and adult students in initial, refresher, or upgrading vocational educational programs."

The objectives for vocational education center on preparing people for employment. The Digest of Educational Statistics, published in 1978 by the National Center for Education Statistics reported that:

> There has been a growing awareness of the desirability and feasibility of training young people for useful employment as part of their formal education. This has resulted in a markedly upward trend in enrollments in and expenditures for vocational education programs at the secondary and post-secondary levels.

Dunham (1979) also made the same point when he observed that:

> In this time of high youth unemployment, of unprecedented numbers of women moving into the labor force, of demographic shifts to an older population, and of rapid advancements in technology, national attention is increasingly being focused on assisting persons to obtain satisfying employment.

Schools that provide training, of course, suggest that vocational education can help a person find a skilled job with a decent wage. Presumably, most of the people who enroll in vocational training do so with this expectation. Indeed, this is the public image of vocational education.

General Education and Vocational Education

A distinction between general education and vocational education will help in bringing our argument into focus. The term ‘general education’ is used by some educators to encompass all education—namely all educational experiences designed to contribute to the general development of the individual. Good (1974) defined general education as “a broad type of education aimed at developing attitudes, abilities and behavior considered desirable by society but not necessarily preparing the learner for a specific type of vocational or avocational pursuit.”

The term ‘general education’ is sometimes used loosely to mean “cultural” or “liberal” education. ‘General education’ as used in this context refers to the type of education designed to facilitate the general development of all individuals in relation to their personal, civic, and social responsibilities. *The ability to express ideas orally and in writing and the ability to work with numbers are developmental needs of all children and youth and therefore are properly designated as basic general education*. One of the principal purposes of general education is to provide a broader and more meaningful context for whatever specialization the individual enters into in life.

The nineteenth century brought compulsory education in nearly all developing and developed countries, and *the minimum education, thus enforced, has been measured chiefly in terms of being able to read, write the vernacular, and to perform ordinary arithmetical computation, which is believed necessary or valuable for all,* *irrespective of the particular vocations which they are to follow. The acquisition of the arts of reading and writing and particularly computation are of great importance in equipping children for the economic struggles later to be undertaken for ultimate success in their vocations*. General education has had and does possess significance in affecting vocational competence.

Vocational education covers a broad sense that is part of both unorganized and organized methods of securing occupational confidence and the experiences of any individual whereby he or she learns proficiency. In a narrower sense it implies the existence of a series of controlled and organized experiences used to train any person or persons for any given employment: the systematic controlled use of the experiences in any occupation for training people in the world of work.

Vocational education is the phase of education wherein emphasis is laid on preparation and participation in occupations of social value. Its means are both within and outside the schools. Broadly viewed, then, vocational education covers all formal instruction for both youth and adult.

Some educators contend that a general or fundamental course is the best preparation for a vocation. However, educators insist that general education subjects do not provide education for specific competencies needed in preparing for or progressing in a vocation. Wenrich and Wenrich (1974) advised that general education should contribute to vocational competence by providing the breadth or view and perspective that makes the individual a more effective worker and a more intelligent member of a society of free persons.

Some educators suggest that vocational education is associated with utility and general education with culture, but that utility and culture are not necessarily antagonistic. Vocational educators believe that a proper balance of these social features could be achieved by selection of certain subjects, some of which are narrowly utilitarian and some of which are broadly cultural.[12]

Various studies have shown that individuals differ in interests, needs, abilities, etc., and that no one type or kind of educational program is suited to the needs and capabilities of all students. Therefore, it would seem more beneficial to society to provide opportunities for many types and kinds of students rather than to limit these opportunities to the few who are preparing to enter the professions. Stoddard (1949), as Chairman of the Educational Policies Commission of the National Educational Association of America, made this point when he postulated that

> Vocational education should be regarded as a common right of all the people. We should not think of general education for some types of our people and vocational education for other types. Rather, we should think of all our people as having equal opportunities, according to their abilities, to acquire both the common integrating facts, knowledge, and skills essential for effective living and the facts, knowledge, and skills directly related to productive employment.

Vocational education can make substantial contributions in drawing upon students' backgrounds and experiences, adjusting to the influences of circumstance, developing and maintaining interests, appealing to hopes and aspirations, and in discovering both capacity and ability. Vocational guidance methods should be expanded to advise students on at least a tentative career choice. The need for particular efforts in

[12] Whitehead (1949) defined 'culture' as the activity of thought receptiveness to beauty and human feelings. Scraps of information have nothing to do with it. A merely well informed person is the most useless bore on God's Earth. What we should aim at producing are people who possess both culture and expert knowledge in some special directions. Their expert knowledge will give them the ground to start from and their culture will lead them as deep as philosophy and as high as art.

discovering both capacity and ability was first expressed to vocational educators in 1891 by John Dewey:

> High school students have little experience upon which to base vocational choices. Schools hours are limited, and time spent in one form of education and training is inevitably at the expense of some alternatives. As pointed out, vocational education is expensive and losses are considerable if no use is made of the training received. The skills that can be provided in high school courses are limited, and many of the more rapidly growing technical occupations are precluded. For all of these reasons, preparation is often increasingly delayed until after high school.

However, about three out of five youths still receive no formal post-secondary training, and one out of four fail to complete high school. Despite the high dropout rate for vocational students, who tend to be drawn from dropout-prone populations, occupationally oriented education at its best could presumably raise the school retention rate significantly.

Experimental programs have attempted simultaneous solutions to these interrelated problems. They seek to acquaint elementary and middle school students with the nature of the world of work, motivating them to absorb general education at the high school level by molding it around a core of occupational skills with training for broad job clusters rather than specific occupations. Experimentation in skill upgrading and remedial education and training has been sponsored largely under the Manpower Development and Training Act (MDTA) and other federal manpower programs rather than vocational education, although vocational educators have been deeply involved.

The call for a revitalization of vocational education is vocal and universal. Dunn (1981) recently pointed out that:

> This is not the time for vocational education to be timid, to sit back and wait for industry to define its labor needs. This is the time to be bold. This is the time to invest. This is the time to take a chance in preparing for the future. Now is the time for a revitalization of vocational education planning that requires imagination, research, and some hard decisions about allocation of resources. This is the time, and the opportunity, to overhaul the vocational education curriculum and delivery system and to create new structures for the decades ahead. We must be preparing education for the year 2000. Our goal should be to improve our vocational education programs so we may better serve youth and adults for the future, no just refine our current training programs, which are a legacy of the past.

Predicting the future of vocational education, Sven Grabe, Director of the Centre d'Information et de Recherche sur la Formation Professionalle (CIRF), a section of the International Labor Office, in an article published in October, 1916, maintained that vocational education was destined to enormous growth in the near future. He foresaw a closer connection between vocational and general education; a possible decrease of apprenticeship; the training and retraining of adults as a normal provision, not as "help for the needy"; and a new and improved form of training and research into the science and pedagogy of vocational education.

Still, retracing the history of vocational education and looking into the future, Dunn (1981) pointed out that vocational education has not changed very much in the last 50 or even 75 years. Aside from simple curriculum considerations, that is, aside from the periodic incorporation of new content into the curriculum, the methods of instruction, the targeted audiences for that instruction, and even our philosophy of vocational education has not changed much since the inception of vocational education in the early part of the twentieth century.

He pointed out further in the same discussion that vocational education has been, by and large, a school-based system, predicated on local school organizational and administrative patterns, and utilizing fairly traditional instructional techniques. As parents and taxpayers continue to raise questions about the relevance of our educational system for the needs of American society in the twenty-first century, we must, perforce, also raise questions about the relevance of the vocational education component of that educational system for American citizens of the twenty-first century.

Basics in Vocational Education

The teaching of basic skills in occupational settings has captured the attention of many since a panel of consultants appointed by President Kennedy in 1961 reported that, among other things:

> . . . general education. . . ., language and arithmetic skills, plus basic knowledge of the world about us . . . itself contribute indispensably to occupational competence. Vocational education and general education are complementary and equally important to individual occupational competence.

The belief that occupational skills and basic skills together contribute to occupational competence is reflected in the priorities recently set forth by the Office of Vocational and Adult Education in the United States Department of Education, which held that basic educational skills are essential to all persons and vocational education must complement basic skills remediation programs. Both academic and vocational programs complement each other if people are to succeed in vocational preparation.

Probably the greatest social waste that exists at present is our failure to detect tastes, capacity, and ability and to find for them channels in which they can operate with advantage to their possessors and with usefulness to others. We either put all individuals through an undifferentiated training, a required uniform training, in the pious hope that it will catch some of them, unspecified, at some point—also unspecified—or we permit individuals to drift along according to their own untrained and unenlightened wishes from moment to moment. We have, as yet I think, absolutely no conception of the possibilities of an education, its possibilities with respect to both personal happiness and social usefulness, which should engage youth in activities sufficiently varied and sufficiently productive to detect their capacities, needs, and powers; and then after that has been done, to concentrate our specialized resources upon a full training of these selected capacities.

New Directions in Vocational Education

Throughout its history vocational education has enjoyed a vigorously eclectic philosophy. No aspect of American education has been so consistently under attack as that designed to prepare its youth for employment. Perhaps the reason is that vocational education, having specific measurable goals, finds it more difficult to hide its shortcomings.

The search for improved techniques of employment preparation is widespread among vocational educators. A few general educators have recognized the key role of employment in American life and, therefore, the key role of employment preparation (Fuller, 1981). The result has been considerable experimentation and a widening recognition of adult education at the secondary, post-secondary, and out-of-school levels that prepare individuals for initial entrance into and advancement within an occupation or group of related occupations.

General education and vocational education are both essential aspects of the problem of preparing an individual for living and for earning a living—they cannot be thought of as hostile or mutually exclusive enterprises.

The goals of vocational education derive from a common, deep appreciation of the value and dignity of work. Vocational education aspires to aid the development of individual worth and dignity in all peoples, regardless of their degree of educability, by helping them enter and find a rewarding place in the world of work, enabling them to advance economically and socially by virtue of their capabilities, and enhancing their sense of individual adequacy through the release and exercise of the creative impulses latent within them.

The relationship between vocational education and general education has occasioned differences of opinion among individuals, more especially educators, since the beginning of the present century. However, teachers, school administrators, guidance counselors, and other personnel employed in vocational education take the position that vocational education and general education are major divisions of the total educational program—the two divisions are of equal importance and both are necessary in the education of workers. The two types of program should complement and further one another in producing persons who are prepared to function responsibly in the working world.

The Carnegie Council of Policy Studies in Higher Education recommended that the basic vocational and academic skills for the high school should concentrate on "skills in literacy, numeracy, . . ., and good work habits." In the same argument, however, Thurow (1979) showed that the three most important functions of vocational education should be *to provide literacy training*, because the cost to employers of providing training to workers is too high for them to meet; *to instill good work habits*, especially industrial discipline; and *to create salable skills*.

A survey of executives of 610 companies with more than 500 employees (Lusterman, 1977) indicated that business leaders are reluctant to provide services they think schools should provide. In all:

(1) Fifty-four percent of the sample believed that schools were deficient in teaching reading, writing, and other language skills

(2) Eight percent of the companies sponsored courses in basic education for employees

(3) Sixty percent offer management or supervisory training, and

(4) Fifty-four percent offer functional or technical training, although the latter may have included some instruction in basic skills

There is a universal call for greater emphasis on basic skill instruction as preparation for employment.

Diverse claims abound that education in basic skills is necessary to prepare vocational students to obtain and perform jobs, although certain critical questions about the relationship of basic skills to job performance remain to be answered.[13]

[13] For further discussion of this issue, see Corman, 1980.

For example:

(1) What level of proficiency in the different basic skills is required to perform the tasks of a particular occupation competently?

(2) Is the proficiency required in learning how to perform these tasks greater than that required to actually do them once learned?

(3) Is the proficiency in basic skills required to obtain a job greater than that required to do it competently?

Only the first of these questions, which concerns the level of proficiency of basic skills required for different occupations, has been subjected to research in industrial settings.

Underlying recent research on the basic skill requirements of different jobs is the idea that basic skills are critical to employability and occupational competence. These skills are “transferable” in the sense that they have applicability to a broad range of occupations and jobs (Corman, 1980). The wide applicability or transferability of basic skills is especially important in light of the fact that many people change occupations several times as labor market demands change.

This point was critically amplified by Dunn (1979), who pointed out that

> Skill requirements for employment are increasing. At the turn of the century, less than 10 percent of all jobs required more than a grade-school education. Today, approximately 15 percent of all positions require a college education, an additional 10–20 percent benefit from a college degree, and 30–45 percent require some form of technical training of the type commonly available in vocational education programs. The average worker changes jobs nine times in a working life. Fifty percent of high school youth change their career aspirations within one year of high school graduation. Clearly, sound

> preparation in basic academic skills is essential, not only to perform well on a job, but to qualify for job advancement as well.

In addition to employers, many others are calling with increasing frequency for greater emphasis on basic skill instruction as preparation for employment. Willard Wirtz, former Secretary of Labor, and Kenneth Clark, the psychologist and educationist, have recently emphasized the need for instruction in basic skills as job training for inner-city minority youth (*Education Daily*, October 2, 1979; *Education Daily*, October 24, 1979).

In giving 1980 Congressional testimony on youth unemployment, Dr. James E. Bottoms, Executive Director of the American Vocational Association, asserted that basic skill training is closely associated with employability. Isabel Sawhill, Director of the National Commission for Employment Policy, stated that "improvement in basic educational competencies for those who have not mastered the three R's is critical and will become all the more important as the U.S. economy becomes more technologically sophisticated and paper-oriented" (Sawhill, 1979).

In the report setting forth the reasoning behind President Carter's youth initiatives, it was noted that since 1950 the number of service jobs has steadily increased and is expected to continue to increase. The report pointed out that:

> Advancement in service sector firms, which are described in the report as white collar, office oriented and technical, depends largely on basic communications skills in contrast to advancement in industrial firms which allow people to take entry-level jobs and advance on the basis of seniority and experience.

As recently as five years ago, very little was known about the basic skill requirements of different occupations. The shortcomings of existing indicators of basic skill requirements were pointed out by Sticht (1975), who noted that the U.S.

Department of Labor General Education Development and the corresponding Reading Grade Level (RGL) required to perform different jobs are not objectively determined and that the RGL permits only the coarsest differentiation of the literacy requirements of jobs.

The *Dictionary of Occupational Titles* (fourth edition) provides ratings of the complexity of tasks that workers in many occupations perform that makes use of data (including numbers, words, symbols, and concepts), people, and things. These ratings, however, permit only indirect inferences about the levels of reading, writing, and arithmetic required in jobs.

Inferences concerning the levels of arithmetical reasoning and of vocabulary required in certain jobs could conceivably be drawn from screening tests, like the General Aptitude Test Battery (GATB) It is not known to what extent the skill levels used for hiring reflect inflated requirements, or to what extent deficiency in a skill measured by the GATB can be compensated for by proficiency in another skill that the GATB might not measure. For example, it is possible that a good sense of spatial relations may compensate for poor arithmetical reasoning in certain occupations such as drafting.

In the U.S., research on literacy requirements for jobs has been conducted in the military.

The most extensive research on basic skill requirements for jobs in industry has been conducted by the Canada Employment and Immigration Commission—The Generic Skills (Smith, 1977). This research provides both a methodology for determining skill requirements for different jobs and evidence in support of the idea that reading, writing, and arithmetical skills are applicable to a wide range of occupations. The need to examine the commonality of skills rather than the uniqueness of occupations, as stated in the project's report, has implications for vocational education. In a synthesis of research and literature on the nature of occupationally transferable skills, Sjogreen (1977) identified skills that seem to be highly transferable in the sense of being general to a number of occupations, and found that there are no non-transferable skills and that a good education through high school is capable of providing an individual with a good repertoire of skills for the world of work.

Education continues to be blamed for many of society's ills and liberal arts and occupational training advocates continue to argue about which is more important. Seiniger (1976), in his paper "Liberal Arts and Career Development," argued clearly that what is needed is a new perspective that focuses on education as the acquisition of either knowledge per se or narrow technical skills.

In a statewide assessment of mathematics performance conducted in 1976 by the Minnesota Department of Education on 16,000 17-year-olds attending public and non-public schools, sixty-two percent (1,920) of students in vocational education courses performed better in areas of higher mathematical concepts but students with the most vocational education scored higher in practical applications of mathematics skills. The expectations that students in career and vocational education mathematics activities would acquire mathematics skills relevant to the world of work appear confirmed.

In their work, Stephenson and Ward (1978) pointed out that vocational education students are characterized by the fact that they tend to lack role models and subsequently lack coping strategies. In addition, they lack educational planning. Many are casualties of prior hope in that they have already dropped out or have been pushed out of academic programs. At the same time academic training programs contain a complex and unique set of skills and language. This juxtaposition requires special help for students trying to learn new technical language for their areas. The authors advised that the materials must be approached with an attitude that recognizes the sequence of learning, and must be maintained and thoroughly considered so that concepts are built and presuppositions are kept to a minimum. The language of vocation is unique and must be represented with precise interpretation in order to maintain the philosophy of process and product.

To further understand the vocational development process, O'Reilly (1972) examined the relationships among various measures of in-school characteristic variables. The sample consisted of 109 students for the tenth-grade phase and 105 of the same students for the eleventh-grade phase. He found that *verbal aptitude*, *numerical aptitude*, *vocational maturity*, and *salary value* seem to be the most useful of student characteristics used in predicting the measures of success. Based on earlier studies reviewed by Prediger (1968), success in high school vocational education programs was found to be related to numerous ability measures in addition to post performances. One of the conclusions of this review was that verbal IQ was not the best predictor of success in vocational courses, as it was often found to be in academic courses.

Impelliteri and Kapes (1969) found success in tenth-grade vocational courses to be related to a number of ninth-grade GATB aptitudes, including several manipulative aptitudes. In other studies, Impelliteri at al. (1969) found vocational and academic boys to differ on other ninth-grade characteristics such as occupational values and vocational maturity.

In a paper presented at the annual meeting of the American Personnel and Guidance Association, Kapes (1972) raised many issues that have implications for vocational development, choice, and success. Among these implications are:

(1) By lowering their prestige values, unsuccessful academic male students may choose the vocational curriculum and become potentially successful vocational students.

(2) By increasing the prestige of the vocational program, more students may choose and be successful in the vocational program.

(3) While verbal and numerical ability are related to success in both the vocational and academic curricula, lesser degrees of that ability are necessary for success in many of the vocational programs. This finding could reflect a conscious effort in this direction on the part of those inclined to vocational education.

(4) Since success in the vocational curriculum is less related to verbal and numerical ability than the academic curriculum, other factors that could be identified by this study apparently play a bigger role in determining success in the vocational curriculum.

(5) Lower socioeconomic status is related to success in the academic curriculum, but on the vocational curriculum, it is possible that those students feel less motivated by the academic curriculum than by the vocational curriculum.

(6) While it is apparent that male students with a high level of maturity and socioeconomic background are likely to be successful in either curriculum, additional information is useful in predicting success for students with a

moderate or lesser level of such characteristics. For this latter group those who have chosen the vocational curriculum, those who place relatively little value on prestige, and those who possess a high degree of vocational maturity appear to have the greatest chance of success in school as measured by GPA.

What are the Basic Skills in Mathematics?

As was found in the ninth Gallup Poll of Phi Delta Kappa (Gallup, 1977), there is a discrepant understanding in the public mind about what basic education means. Most regard the basics as reading, writing, and arithmetic. Others tend to aggregate additional subject areas with the three R's as well as styles of earlier times. In relation to mathematics, the public often views the basics as a set of discrete concepts or skills to be incorporated by learners for day-to-day use. Mathematicians, as might be expected, view it much differently and more broadly.

Much to its credit, the National Institute of Education (NIE) conducted a conference on Basic Skills and Learning in 1975, and produced two volumes of conference reports for professional use.[14] Volume I (NIE, 1975a) presents position papers on the basic mathematics skills and learning. Volume II (NIE, 1975b) presents working group reports. Begle, in one of the thirty-three position papers found in Volume I, considered basic skills as those that are likely to be used by the average citizen in everyday life. Branca classified the objectives under either of two major emphases: (1) the utility of mathematics to individuals and society and (2) understanding and appreciating the nature and significance of mathematics as an abstract system.

[14] Vocational educators who are concerned about mathematics instruction and are interested in fostering collaborative activities with mathematics teachers related to mathematics instruction as it applies to vocational education should read these documents.

Fey (1975) stated that the challenge of describing basic skills in mathematics is an assignment full of pitfalls and that most attempts to establish reasonable lists end in failure. He also felt that the use of lists as curricular guidelines threatens to produce fragmented programs that resemble occupational training rather than education in mathematics methods and understanding that has the potential for generating long-range value.

Gibb (1975) saw four areas of basic skills in mathematics: (1) understanding mathematic concepts and techniques of computation, (2) using these concepts and techniques in computation, (3) solving problems, and (4) creative thinking. Although Gibb did not attempt to list what everyone should know in mathematics, she felt that all students have the right to learn mathematics according to their individual capabilities and must be given support so that they can learn, that roads be kept open in making decisions for careers, and that education in mathematics should provide as many career options as possible.

Research has shown that the reason for the shortage of women in mathematics-based careers is that only five percent of all high school girls have been encouraged and prepared to enter a college mathematics program. Twenty-five percent of all careers depend on mathematical training and hence mathematics becomes the “critical filter” for upper-level positions. Many colleges and universities have initiated mathematics centers that offer the opportunity to women to “catch up” in preparation, to alleviate the mathematics anxieties that prevail among students, and to encourage them to acquire skills in mathematics so that they may compete in the job market with confidence.

Vocational Educators versus Mathematics Educators

Vocational educators and mathematics educators are alike in recognizing the value of generalized mathematics competence. Long and Herr (1973) noted that, while mathematics teachers are competent in knowing the levels of mathematics required of mathematically oriented professionals as well as those reflected in college admissions requirements, they are not equally competent in specifying the mathematics that are important for skilled and craft occupations, or the vocational courses that are required for entry into those occupations. Those perceptions were reinforced by the survey data of the Editorial Panel of the Mathematics Teacher in 1976.

Moreover, vocational educators do not wish to dismember the 'mathematics curriculum' or to reduce its value for the comprehensive development of an individual's talent. They have no desire to dichotomize mathematics content into such categories as useful versus useless or applied versus intellectual. *Vocational educators must, however, search for and specify the mathematical applications that underlie vocational emphasis—those irreducible elements, the basics, of computing competence needed for success in the specialties they teach*.

Long and Herr (1973) noted that there is a pattern of need for more complex mathematical skills as one moves from craft and skilled areas to more technically oriented specialties. At every level, in all areas, vocational educators want to know, to the extent possible, what competencies are needed for optimum success, so that they can assure themselves and subsequent employers of their students that those skills have been mastered by the learner.

While a canon of belief among educators is that there are differing computing skills needed in various occupations, the mathematics of most concern to vocational teachers, to employers of their products, and those skills cited as being in need of remediation, are the most fundamental computing functions.

Some basic mathematics inquiries have been specified to certain of the occupations; others have been general and have been directed to many occupations. Examples of the occupationally specific type include the determination of the role of mathematics in electrical and electronic technologies. Barlow and Schill (1962) and Johnson (1972) analyzed competencies necessary for certain technicians and other levels of health occupations. Long and King (1975) reported on mathematics needs in relation to high school business education programs. Bookhammer (1974) studied the mathematics utilized by area vocational-technical school graduates of electronic technology programs. King and Long (1976) further discussed mathematical skills in relationship to secondary school health occupations trainees.

Other investigators have looked at mathematics skill needs in a variety of disciplines. Rhamlow and Winchell (1966) identified clusters of mathematics skills needed in occupations available to non-college-bound youth. Fitzgerald (1976) discussed 44 mathematics competencies needed by workers entering technical occupations after completing secondary schooling. Kawula and Smith (1975) studied skills generic to 82 different occupations in Saskatchewan. Mathematics was one of the skill areas addressed. Long, Enderlein, Ford, and King (1973) determined teacher-perceived student need for the basic mathematics skills for Pennsylvania secondary students in 61 vocational specialties. For each specialty, they also determined the need for remediation with respect to each of the 66 mathematics skills. Later, Long (1979) studied the same 66 skill needs and the need for remediation, as perceived by employers, of newly graduated students of secondary vocational programs. A series of studies in Pennsylvania, related to the 1973 work of Long, was done concerning mathematics skills of various sub-populations of vocational students. These include work by Brouse (1977), Caruso (1975), Fochler (1977), Robinson (1978), and Runkle (1978).

After extensively reviewing the literature on basic skills in mathematics and vocational education, Long (1980) came up with the following observations and recommendations for research and practice:

Observations

(1) Many of today's youth exhibit deficiencies in fundamental mathematics skills.

(2) The typical citizen desires that the basic skill deficiencies be remedied.

(3) Mastery of basic mathematics skills, at the minimum, is required for optimum success in vocational study.

(4) A person's vocational development, in the long run, is inhibited by deficiencies in fundamental academic skills, including mathematics skills.

(5) Support for attention to basic mathematics skills in relation to vocational study seems to be found in both mathematics and vocational disciplines.

(6) Information pools and literature are rich with reports of activities attending to basic mathematics skills in relation to vocational education.

(7) There is a paucity of rigorous, well-defined data that document the *critical* relationships between specific mathematics skills and specific occupations.

(8) The appeal of mathematics may be increasing, and fear or apathy may be remitted, for vocational students, by demonstrating the relevance of mathematics subject matter to occupations and careers.

(9) Teachers of mathematics would profit from experiences that promote awareness of the levels of mathematics required in trade and technical areas.

Recommendations

(1) Further curricular and instructional collaboration should occur between vocational and mathematics educators to promote basic skills development.

(2) Career education should be considered as a possible organizing theme for collaborating program activities designed to develop basic skills.

(3) Educators in both disciplines should use their individual and collective expertise to promote developmental research related to:

- The instrumental value of mathematics to various occupations
- The relative effects of the locus of mathematics instruction in relation to vocational education, i.e., shop-related or academic classrooms
- The effects of "relevance to vocational specialty" on mathematics achievement
- The relationship between mastery of fundamental skills and subsequent interest in higher mathematics for nonacademic students.
- The capability of vocational teachers to impart to students a recognition of the need for and desire to master mathematics skills

- The capability of various instructional strategies to remedy mathematics deficiencies
- The development of diagnostic instruments capable of measuring mathematics competencies critical to specific occupations
- The critical relationships between substance and strategy in instruction designed to alleviate mathematics deficiencies

Such research no doubt costs money to conduct, but it is also likely to pay dividends.

Mathematics in Vocational Education

To the world at large, mathematics is generally considered to be a basic academic skill, a skill essential for optimum efficiency in social, consumer, economic, and occupational endeavors. As such, it follows that formal education is expected to provide sequential experiences to help learners develop the basic computing skills as well as other mathematics capabilities that individual students might not be inclined to develop. Some authors have plumbed the relationship between mathematics capability competency levels and careers. Among these have been Long, Shoemaker, Smith, Veselko, and Gates (1975), the team of the National Council of Teachers of Mathematics, who wrote about career education in mathematics classrooms. Such writers suggest that mathematics instruction should, among other things, be basic to, supportive of, and ally itself with curricular design directed toward the development of vocational and occupational specialties.

Eschenman and O'Reilly (1979) described pre-vocational skills as those capabilities that identify the readiness of a learner to profit from vocational education and stated that those skills can be considered course prerequisites, as many of them are learned through schooling. They further stated that occupational prerequisites specify where occupational instruction should lead. If school experiences do not provide students with necessary skills, their occupational development will suffer. In describing a curriculum model for occupational preparation, Williams (1979) discussed job seeking, job keeping, and occupational skills. In terms of basic skills development, one readily sees the cogent relationship among these skill levels.

As typically delivered to the youth of the Western world, however, mathematics and language instruction begins early in life and thus precedes formal vocational decision-making and specialization. Thus, mathematics and language arts are pre-vocational curricular experiences that have subsequent rigorous and undeviating implications for curricular decision-making related to occupational specialization. While early basic skills instruction is largely pre-vocational, such instruction can also be co-vocational. Kaufman, Schaefer, Lewis, Stevens, and House (1967) found differences in modes of delivery of mathematics and language arts instruction to vocational students. Some instruction of vocational students was offered outside the laboratory block of time by a special related subjects teacher or by a purely academic teacher. Basic skills development can also accompany the decision-making, preparation, and occupational entry stages as they recur throughout life for older youths and adults.

The third of the three R's, arithmetic or computing skill, fits in an eminently powerful position among other cognitive skills when specialty curricula of all types and levels are considered and chosen. The level of mathematics competence acquired has its continuing effects on each of us. In truth, mathematical capability affects kids of all ages. Consequently, the relationship between computing capability and vocational education deserves the attention of specialists in both disciplines.

Language Arts and Vocational Education

Historically, teachers have not been favorably inclined toward considering any direct curricular relationships between English and vocational education. In 1917 the “Committee of Seventeen,” created jointly by the National Council of Teachers of English and the National Education Association, proclaimed that English is a preparation for life (which includes work); however, educators have drawn few inferences, and only superficial ones at that, from this statement with regard to links that exist between English as a school subject and vocational education. As late as 1967, Jacob Kaufman and his colleagues concluded from an attitudinal survey that, of more than 1,600 high school teachers, “academic teachers from comprehensive high schools ranked lowest in support of vocational education.”

Many teachers and curriculum planners acknowledge the necessity of one’s possessing “communicative competence” for nearly any sort of work, but a persistent assumption has been that English teachers develop such competence; anyway, jobs are to help students, so “why tax our minds by trying to determine how to structure (or restructure) a curriculum to reflect concrete relationships between an academic discipline such as English and vocational education,” which is generally viewed as something entirely different?

In the paper, “English and Vocational Education for the 80s,” by Charles L. Law, Jr. and Denney T Wolfe, Jr. (1981), the authors pointed out that both English teachers and vocational education teachers can benefit pedagogically and substantively from considering each of these subject areas in light of the other. They foresaw a greater collaboration than ever before between English and vocational education.

The 1970s have seen an unprecedented emphasis on "accountability" in education. State laws or policies calling for "minimum competency testing" have been established in nearly all states. The tests purport to measure students' reading and writing abilities, but the tasks that many of the tests require students to perform include filling out application forms, social security cards, bank signature cards, charge account forms, and income tax forms; they require students to write business letters and job résumés and to read and interpret labels, insurance forms, road signs and symbols, classified advertisements, warranty statements, maps, and charts. Obviously, the clear focus of the tests is on skills and materials related to work.

In a survey of Phi Delta Kappans, conducted by Harold Spears in 1973, the basic skills of reading, writing, speaking, and listening and the development of pride in work and self ranked one and two, respectively, among 18 goals rated by the respondents. The results of this survey suggest that educators in the 80s are likely to place a heavier emphasis than ever before on English and vocational education in the total curriculum.

In an article captioned "Comprehensive Writing Program Recommended," which appeared in the *Cornell Chronicle* of November 12, 1981, a comprehensive and long-range approach to enhance the level of student writing and writing instruction was proposed. A commission was formed by the Provost of Cornell University. In its report, the commission pointed out that "the concern about writing skills is hardly peculiar to Cornell . . . . The refrain 'students can't write' has been chanted in the national press, and the 'crisis of literacy' has generated a profusion of new writing programs in universities throughout the United States." The complete commission recommendations are:

(1) That faculty share the responsibility for the quality of student writing skills and that writing skills be emphasized throughout the curriculum.

(2) That all students graduating from Cornell take at least four courses that provide formal instruction and practice in writing. A sequence of courses in the freshman year would be augmented by two upper-level courses emphasizing the development and refinement of writing skills.

(3) That a University Bureau for Professional Writing be established to assist in the implementation of the upper-level writing requirement. The bureau would provide a structure for the interaction of faculty who teach writing and would respond to additional needs as they develop.

(4) That a university-wide Freshman Composition Curriculum be developed. The English Department would offer the greatest part of first-semester courses. Second-semester instruction would build on the first semester's work and would be offered by the English Department and other appropriate departments. The director of the program would be responsible for overseeing it.

(5) That a University Committee on Writing be established to survey, coordinate, and encourage efforts to teach writing at all levels of instruction. In addition, the committee would advise the director of the proposed Freshman Composition Curriculum.

In 1977, 19-year-old Edward Donohue sued the Copiague, Long Island, school district for "education malpractice." Donohue had graduated from high school in June 1976, but he read at only the fourth-grade level. His was not an isolated case.

Estimates are that, in 1977, 50 to 85 percent of students attending inner-city schools in Manhattan were a year or more behind their respective grades in reading level.

The New York Times reported the same problem, revealing that 24,745 city pupils were held back for reading deficiencies.[15] A recent federally funded study reported that school children do not develop adequate thinking skills or the ability to interpret what they read beyond a superficial level.

The National Assessment of Educational Progress (NEAP) found that more than 100,000 students tested in 1980 demonstrated very few skills for examining the nature of the ideas that they take away from their reading. In its conclusion and recommendations, the NEAP urged schools around the country to put more emphasis on writing, structured discussions, and problem-solving exercises in order to prepare students to function in a society in which the management of information has become "the fastest growing sector in the economy."

Basic Skills Assessment around the United States

Interest in minimal competency testing continues unabated. Spurred by national concern that too many U.S. high school graduates are deficient in the basics necessary to function as effective and useful citizens, a large number of states are taking steps to require their students to demonstrate mastery of certain academic skills before they can graduate. In some states, legislation has been passed that mandates minimum competency programs at the state or local level; in others, the impetus has come from state board of education action, often followed by legislative mandate. In still others, local school districts have taken the initiative, independent of state action,

[15] See appendix, pp. 238 and 240, for the two articles: (1) "24,745 City Pupils Held Back for Reading Deficiencies," *New York Times*, Tuesday, June 30, 1981; (2) "Reading Analysis is Called Lacking," *New York Times*, Thursday, November 12, 1981.

and have launched their own programs to improve student performance in terms of the basic academic skills.

Colleges, too, are responding to the current concern over lack of basic skills in high school instruction. All across the U.S., college and university graduation requirements relating to writing skills have been tightened and new courses and special programs such as writing labs and math labs have been introduced.

The effects of efforts to upgrade the basic skills are evident in television, also, where a large cooperative effort of sixteen states in the U.S. and two Canadian provinces have produced sixty 15-minute programs designed to improve and extend instruction in the essential learning skills. The programs were made available to schools in the United States and Canada in September 1979.

There are several varieties of minimum competency programs being run across the U.S.[16] One is the development of a state-level high school graduation test, requiring school participation. This is the practice in New York State. Another is the use of state-level high school equivalency tests, as is the practice in California and Florida. Yet another approach calls for local districts to evaluate student competency in basic skills areas, using its own minimum standards or those set by the state.

Having agreed that a high school diploma should mean something more than the recognition of attendance, educators have set out to improve the situation, but do not always agree on the modus operandum. Some favor setting a level of minimum competency in reading, math, and language skills at a particular grade level, usually eighth or ninth grade, while others lean in the direction of "survival skills" such as

[16] For a list of states and their involvement in basic skills competency, see the ETS Information Report on federal, state, and local school district activities relating to minimum standards and basic skills assessments: "Basic Skills Assessment around the Nation," September 1977.

dealing with application forms, driver’s licenses, bank statements, and similar items. Some states incorporate both aspects into their proficiency-based graduation requirements.

As laudable as this approach may sound, it is fraught with problems: Connected with any competency program is the major difficulty of determining what exactly constitutes a minimum level of competency. How much should a student master to be competent? What constitutes functional literacy? How many competencies are enough? These are all questions that educators faced with the task of setting the standard must first answer. A related concern is that imposing an arbitrary cut-off point will result in too many youngsters failing the test, with the poor and minorities most directly affected. Knowing that intensive remedial instruction is built into minimum competency programs should serve to allay that fear.

The minimum competency movement is not a panacea. But thoughtfully developed and reasonably applied, a minimum competency program can do much to improve the quality of American education. Given the weight of such a program, a high school diploma would certify that the student possessed the basic skills needed to be a productive adult citizen capable of functioning in a complex society such as that of the United States.[17]

[17] Despite the emphasis on minimum competency in high school students’ basic skills, nothing is said about the vocational students, who need these skills most. Vocational students graduate and enter the world of work basically unequipped to face that world. They lack the basics essential to function effectively on the job.

CHAPTER 3

DESIGN AND METHODS

Introduction

This chapter describes the research design and methods used to investigate the basic academic skills associated with success in various areas of vocational education. The population, samples, data collection techniques, and instruments used are explained. The data analysis techniques used for examining each of the research questions posed by this study in chapter 1 are also discussed.

Preliminary Investigation

A longitudinal approach was undertaken in carrying out this investigation. The study started in the spring of 1981 with the identification of basic academic skills in reading, writing, and mathematical computation that are associated with student mastery of various vocational programs.[18]

Sources and Nature of Data

The data for this research came from three major sources: (1) the 1981 Statewide Basic Academic Skills Survey, (2) the 1982 Employers' Survey, and (3) the 1982 Graduates' Follow-up Survey.

---

[18] On the whole, 70 vocational programs were identified (see appendix, p. 257). For ease of analysis, these were regrouped and classified, according to their relatedness, into seven major occupational areas: (1) agricultural education; (2) distributive education; (3) health occupation education; (4) home economics education; (5) business and office education; (6) technical education; and (7) trade, industrial or service occupation education.

The 1981 Statewide Basic Skills Survey[19]

The 1981 statewide, criterion-referenced survey of basic academic skills, carried out by the Cornell Institute for Occupational Education (CIOE), looked at students who were in programs preparing them for certain jobs to find out what kind of basic academic skills they had upon completion of their programs.

CIOE was interested in finding out what basic academic skills successful students in each vocational preparation area had. Such information could be used (1) to select students into programs, (2) prepare instruction units, and (3) to qualify them for graduation. These objectives obviously are not mutually exclusive. Combinations of these functions are possible. For some students, admission might be the only question; for others, remedial instruction might be provided together with standard criteria for graduation.

The data for the statewide survey were collected in the spring of 1981 from vocational education seniors in 75 institutions in New York State. Two thousand one hundred (2,100) randomly selected seniors in their last month of two-year, half-day, off-campus vocational education programs voluntarily participated in the survey. The students were drawn from a set of 27 randomly selected school districts.

Population

The population of school district sites surveyed for the study consisted of all high schools offering two-year, half-day, off-site programs of occupational education

[19] This survey was carried out by the staff of the Cornell Institute for Occupational Education (CIOE), a component of the State Research Coordination Unit, Division of Occupational Education Planning and Information, Research, and Evaluation, with funds provided by the Division of Occupational Education Supervision, under the terms of Grant no. 53-81-055, funded from the Vocational Education Amendments of 1976. Thanks are due to Professor James A. Dunn, Director of the Institute, for permission to participate in the survey and to use part of the data for this study.

in New York State.[20] Such programs are offered by BOCES and two-year vocational technical schools in large city schools districts in New York State. The population of students was selected for ease of administration and to ensure the participation of the full universe of schools with respect to their enrollment characteristics.

Sample Selection

With this population clearly defined, the stage was set for the selection of the survey samples. Samples for the Basic Skills Survey were selected from occupational high schools plus BOCES facilities in Rochester and Syracuse. Rochester and Syracuse were chosen so as to have representation from large cities in New York State.

In all, 27 school districts or local education agencies (LEA) in 37 of 66 New York counties were selected randomly. Due to practical constraints only 25 agencies allowed their schools to participate in the initial survey. Thirty occupational high schools and 45 home high schools serving the 25 agencies participated in the statewide survey. Over 1,332 students responded to the mathematics surveys, with 1,366 responding to the language arts surveys.

Student participation was voluntary. This was made clear to participants at each administration of the survey questionnaire.

[20] Students typically enter these programs in the fall of junior year. They attend their academic or home high school for half a day and are bused to an occupational high school for the other half. This way of delimiting the target population has some methodological and practical justification. The major practical justification is that a project of this size cannot adequately cover the populations that are enrolled in all three major sources of secondary occupational education in New York State—comprehensive occupational/technical high schools, home (i.e., primarily academic) high schools, and BOCES. Additionally, this choice permitted comparisons within students regarding their attitudes towards occupational versus home schools, measured at the same time. The focus of the investigation was on seniors in two-year, half-day, off-site vocational education programs in New York State and we hope to generalize the findings of the study to that population of students.

Data Collection Procedure

In order to standardize the procedure and minimize confusion during the survey administration, it was decided not to have school staff administer the questionnaire; CIOE staff traveled to the participating schools to conduct both the pilot and statewide surveys.

Data Types

The survey of mathematics basic skills contains items on (1) arithmetic computation and (2) general mathematics. The arithmetic computation items were whole numbers operations, fractions operations, and decimal operations. The general mathematics items spanned decimals, fractions, percentage conversions, percentage multiplication, measurement, geometry, equations, and story problems.

The language arts survey contained items on (1) reading and (2) grammar and mechanics, i.e., usage. The reading section had the following parts: (a) reading for instructions, (b) reading for concepts, (c) reading to detect persuasive intent, and (d) reading graphic materials. The grammar contains items on (a) use of possessives, (b) use of adjectives, and (c) use of verbs. On mechanics, items covered punctuation, capitalization, sentence completion, and alphabetization.

The items covering both mathematics and language arts basic skills were pretested on a sample of the target population before being fully administered. On the strength of the outcome of the pretests, some items were removed while others were added. On the whole, there were 60 items on mathematics and 54 items on language arts in the final instruments (see appendix, pp. 274-275).

All the items on mathematics and language arts basic skills were scaled and categorized into small sets of sub-skills (see appendix, pp. 276-281). This was done to ensure easier analysis of the data.

The 1982 Employees' Survey

In the spring of 1982, a follow-up survey of a selected set of 1981 seniors who participated in the statewide basic skills survey was carried out. Prior to data collection, information was sought from the seniors' schools on the employment or whereabouts of the 1981 graduates (see appendix, pp. 266-267).

Fifteen of the 30 BOCES directors responded to our requests. Since we had no information about the employment of the 1,088 graduates, the whole population identified by the 15 BOCES directors was used instead of using a sample.

With this information, questionnaires were mailed out to the graduates to determine which reading, writing, and computation skills were used on their jobs and which they judged to be associated with successful and efficient performance on their jobs.

We were interested in finding out whether they were (1) attending schools, (2) employed in their areas of specialization, (3) employed in areas not related to their major training, (4) not employed at all, or (5) in the military. We hoped this would enable us to determine the pattern of performance of each group in the statewide Basic Skills Survey. The investigator was also interested in finding out about the demographics of the participants.

It should, however, be noted that our main interest was on graduates employed in jobs related to their own areas of high school vocational specialization.

A total of 1088 questionnaires were mailed out to the graduates approximately nine months after graduation. Of these, 276, or 25.4 percent, were returned. Of those returned, only 251 contained valid responses. The remaining 25 responses could not be analyzed due to non-completion, improper marking, or mutilation.

The 1982 Employers' Survey

A third source of data came from the employers of the recent graduates.[21] They were asked what they believed to be the skills in reading, writing, and mathematics that were essential for effective and efficient performance in jobs they supervise, and what skills in communication and computation, in their opinion, their typical new employees lacked. Other questions included: In which areas did they feel their employees were best trained? Which additional skills were needed for promotion? What were the biggest handicaps faced by new employees upon first coming to work (see appendix, pp. 268-269)?

Employer/Employee Instrumentation

The employees' and employers' questionnaires asked essentially the same questions. Each asked respondents to indicate which skills from among a list of basic academic skills they believed were important to them in their jobs.

[21] We were interested in surveying employers of the recent graduates since those employers have direct experience with the graduates. More importantly, many employers reported that their new entry-level employees do not have the basic skills in communication and computation. Significantly enough, many large corporations have started their own programs of instruction in the basics to remedy the shortcomings of public education.

In addition, employees were further asked to indicate how easy they found it to master each basic academic skill while employers were asked to identify skills in which they found their new employees to be deficient. The skills of interest were classified into seven categories:

(1) *Whole numbers*: These included items on addition, subtraction, multiplication, and division of whole numbers (items on basic mathematical operations)

(2) *Fractions*: These included items on addition, subtraction, multiplication, and division of fractions (items on basic mathematical operations)

(3) *Decimals*: These included items on addition, subtraction, multiplication, and division of decimals (items on basic mathematical operations)

(4) *Measurements*: These included items on measuring lengths and weights and working with geometric figures, changing decimals to percentages, changing percentages to fractions, reading rules, reading micrometers, working with liquid measures, and measuring angles

(5) *General mathematics*: These included items on solving simple equations, working with percentages, reading charts and graphs, estimating answers to problems, working with ratios and proportions, rounding numbers, reducing fractions to lowest terms, and changing common fractions to decimals and vice-versa.

(6) *Reading*: These included items on reading for facts, reading instructions, reading for new ideas, reading to detect fallacies, and reading to detect persuasive intent

(7) *Writing*: These included items on using correct grammar, spelling correctly, using correct punctuation, and writing complete sentences correctly

A Likert-style 5-point scale was used in both the employees' and employers' questionnaires.

Data Gathering Strategy

Acknowledging the inherent problems in any follow-up survey, diverse strategies were employed to ensure an acceptable rate of return. First, questionnaires were mailed to all 1,088 graduates rather than to a sample. By using this approach, we hoped to have a greater number (albeit possibly not a higher percentage) of responses to the questionnaires than we would have had by merely surveying a sample of the graduates. Second, a month after we mailed the first set of questionnaires, a duplicate questionnaire with a reminder letter was mailed to each of the graduates who did not respond to the first questionnaire, to encourage participation. Potential respondents were promised letters of appreciation if they completed the questionnaires and returned them to us. Lastly, telephone call reminders were made. Some of the graduates gave their responses to items over the phone. All of the strategies employed produced the desired effect to some degree.

To save money and time, employers' questionnaires were enclosed in the employees' envelopes and all graduates were requested to give the employers' questionnaires to their immediate supervisors. Graduates were requested to provide the names and addresses of their employers or immediate supervisors. This was done to facilitate eventual follow-up purposes. The anonymity of each respondent was guaranteed. Each questionnaire was sent out with a self-addressed envelope.

Data Analysis Procedures

"Good data are important," wrote Professor Rosenberg in his book, *The Logic of Survey Analysis*, "but what is done with them is equally so." Data must be viewed within the framework of a certain logic. It is the explication of this logic, the reasoning behind the analytical operation, which is the central concern of this section and the next chapter.

After the data collected from the questionnaires were coded and placed on computer tape, they were analyzed using the Statistical Package for the Social Sciences (SPSS). Diverse statistical analyses were carried out using the available data. First, a contingency analysis of the 1982 follow-up samples (N=251) and the 1981 program completers (N=2,100) was carried out.[22] Then, the mean scores from the follow-up sample were computed and these were compared with the mean scores of the 1981 program completers. A further statistical analysis was commenced to determine the differences in the mean scores of the two groups. Second, a series of cross-break analyses were carried out, and means and standard deviations were computed for each of the variables across programs. Various other statistical tests and analytical techniques were applied to determine the diverse program areas. These include, but are not limited to, one-way analysis of variance (ANOVA), multivariate analysis of variance (MONOVA), and analytical techniques to determine the variations and agreement that existed among the diverse program areas. These include, but are not limited to, one-way ANOVA, MONOVA involving nested design without covariates, a series of multiple comparison tests, Scheffe's method (the S-method), Tukey's Honestly Significant Difference (the L-method), Student Newman Keul's

[22] On the whole, 251 graduates participated in the 1982 follow-up survey, while 2,100 seniors took part in the 1981 Basic Skills Survey.

(SNK), Kendel coefficients of concordance, Mann Whitney U-tests, and Darlington. Interactions between factors and variables were also analyzed.

A Two-stage Analytic Procedure

In pursuance of the goals of this study and to further analyze the basic academic skills of reading, writing, and mathematical computation associated with success (both at school and on the job) in various areas of vocational activities, descriptive and inferential statistical analyses were conducted. The analyses were carried out to answer the nine research questions raised in chapter 1 above, and to further confirm or disprove the findings from the descriptive analysis with respect to each research question. A two-stage analytic procedure was undertaken for diverse reasons ranging from utilitarian to academic. It was our conviction that mere descriptive analysis, even though statistically sound, is fraught with suspicion, doubt, hesitation, qualms, and jubilation, and thus may not be academically adequate for this work.[23] Above all, the work may likely appeal to diverse audiences, as explained in relation to the significance of this study in chapter 1.

There is no point in trying to emphasize the fact that there are variations in the basic academic skills used across program areas, but the big questions are: (1) Are the variations significant enough to warrant a change in our teaching and program planning methods and strategies? (2) What are the ranges and levels of skill required

[23] The descriptive statistical analyses are a step in deciding whether or not to do the inferential statistical analyses. It helps to find out whether the inferential statistics are worth the effort. With a little understanding of what we are doing provided by the descriptive statistical analyses, the reader can then go on to look at abstract inferential statistical analyses and make sense of them. It is further necessary to carry out an inferential analysis to confirm or disprove whatever might be our findings or assumptions based on descriptive analyses. Based on the descriptive analyses, there might have been variations due to a figment of the researcher's imagination. Variation might not be consistent and might be due to error of measurement in the test or variation might not be real variation between groups. By just looking at profiles or distributions as depicted by the descriptive statistics, one might be led to erroneous conclusions.

(or used) by each job area for effective and efficient performance? (3) Were there significant differences in the basic skills scores of graduates in the different job areas? (4) Is employability related to or contingent on these? (5) Are the academic demands of these skills higher or lower than the demands of the jobs? In other words, is there a fit between the academic demands of the basic academic skills and occupational demands? Which demands are greater? The investigator tried to answer these and many other questions in this study.

The core of the analysis was built around answering the research questions raised in chapter 1. In all, nine research questions were formulated to assist in evaluating the basic academic skills that are associated with student mastery of vocational programs. The research questions and forms of statistical analysis used to answer each question are as follows:

1. *What is the distribution of test scores by area of vocational program, and do they differ?*

The statistical analyses used were both descriptive and inferential. A distribution of test scores of the 2,100 seniors was made for each of the seven major program areas. Means and standard deviations of the scores (for each skill) were computed. A one-way ANOVA was carried out to determine the differences in the means for statistical significance. This was done for each skill across the seven vocational program areas. Since the overall ANOVA F-test was statistically significant, several multiple comparison tests (Tukey's Honestly Significant Difference Test) were carried out. Data from the Basic Skills Survey (data on seniors) were used in these analyses.

2. *Among the skills covered, are the relative strengths and weaknesses the same for the diverse areas of vocational programs?*

There are two basic questions to be answered here. The first one has to do with the scope of the skills. How broad is the range of skills that students in each program area use? Do they use addition, subtraction, multiplication, and division in these areas? Do they use all the basic skills in the language areas or all the skills in the mathematics areas, or just a selected subset? The second question is: What is the level of skills involved? How sophisticated do the skills have to be? Do they need to be able to punctuate and use capital letters correctly, or do they need to put together compositions, reports, and so on? Do they need merely to be able to do simple whole number operations or are they going to be operating with fractions, solving word problems, and so on, in the different program areas?

Each job title or program area could be rated in terms of the *level* and *range* of skills needed and used.

The questions were answered in two stages. First, we carried out a descriptive statistical analysis of the data from the 1981 Basic Skills Survey (N=1,047, and 109 for the 1982 follow-up survey). This included the explication and representation of variations among skills and programs in pictorial form (profile analysis), and also a depiction of a table of means and standard deviations for each skill across the seven program areas. Rather than using the correct percentage for the different skills and plotting them for each program, we plotted each raw score for the diverse skills and for each program area (see appendix, pp. 283-284). Second, since the question addressed interaction between programs and skill areas, a further analysis (a two-way ANOVA) was carried out by nesting the independent variables representing program area, skill area, and students within program areas to determine the extent of interaction between program areas and types of basic skills.

(3) *What variation, if any, exists in the scores of graduates who are attending schools, employed in their areas of training, employed in areas not related to their training, not employed at all, or in the military?*

Respondents to the graduates' follow-up survey fell into five major categories: (a) those attending school, (b) those employed in jobs related to their vocational specialty training, (c) those employed in other areas, (d) those neither employed nor attending school, and (e) those in the military.

An analysis of their scores on the 1981 Basic Skills Survey was carried out to find out the patterns of performance of respondents in each group. First, we carried out a cross-break analysis (i.e., a contingency analysis). This was followed by distribution of scores on each of the basic skills. Distribution was done for each of the five groups. Means and standard deviations were calculated for each test score. An ANOVA was carried out to determine the variation among the mean scores for each group. The analysis was followed up with a multiple comparison test.

(4) *What skills do employers most often say that their new employees do not have?*

A portion of the data on the employers' survey was analyzed to answer this question. A cross-break analysis of the employers' responses was carried out for each of the seven program areas. Means and standard deviations were computed for each basic skill. A distribution of these was done for each program area. The degree of agreement among employers' perceptions was further investigated by noting the standard deviation in the rating for each skill. The analyses were done for each basic skill and across the diverse program areas.

(5) *What differences exist in the opinions expressed by new employees (employed in areas related to their high school programs) in the different areas about how important the various basic academic skills were for effective job performance?*

A portion of the employees' responses to the follow-up graduate survey questionnaire was analyzed. Employee responses were categorized into the seven major vocational areas. Then a cross-break analysis was carried out for each one. A distribution of scores was made for each group. Means and standard deviations were computed for each of the basic skills. Differences in mean opinions across program areas (for each skill) were tested for significance using ANOVA. These tests were followed up with a series of multiple comparison tests. The degree of agreement among employee perceptions with a program area was assessed by noting the size of the standard deviation in the ratings for each of the skills.

(6) *What differences exist in the opinions expressed by employers of new high school graduates in the various occupational areas about how important the basic academic skills were for successful job performance?*

A portion of the employers' responses to the follow-up graduate survey questionnaire was analyzed. Employer responses were categorized into the seven major vocational areas. Then a cross-break analysis was made for each. A distribution of scores was made for each group. Means and standard deviations were computed for each basic skill. Differences in opinions across program areas (for each skill) were tested for significance using ANOVA. These were followed up with a series of multiple comparison tests. The degree of agreement among employers' perceptions within a program area was assessed by noting the size of the standard deviation in the rating for each skill.

(7) *Within an area, do new employees and their employers agree on the relative importance of the several basic academic skills for success on the job?*

The "importance" aspects of both employers' and employees' data were analyzed. First, a contingency analysis was done for each group. A distribution of responses was also done for each group. The tables were compared for agreement by doing a series of correlational analyses. Comparison tests were conducted for each program area.

Means and standard deviations were computed for each skill across the program areas. Since the question addressed interaction between group and skill level, a further ANOVA was carried out using skill area, group (employers or employees), and individuals within groups as the independent variables. The analysis was done separately for data for each program area.

(8) *Are the ability scores of those employed in relevant job areas significantly different from the state norms for successful high school vocational program completers?*

A distribution of mean scores and standard deviations was depicted for each program area. This was done for the employees and the whole program completers. Seven tables were generated. Casual comparisons were made. Differences in mean scores were tested for significance by running a series of t-tests.

(9) *Among those in the employed-in-relevant-area categories, do those with a longer stay on the job score or perceive the importance of basic skills to their success differently from those with a shorter stay on the job?*

In this analysis, new employees who stayed on a job for more than six months were regarded as having stayed long on the job, while those with less than six months of experience on a given job were considered as not having stayed long enough on the job.

Data from both the Basic Skills Survey and the follow-up Employees' Survey were analyzed. Apart from finding the differences in their scores, we were also interested in their perceptions.

We carried out a partition analysis and followed this up with a distribution of scores for each group. Means and standard deviations were computed for each skill and for each group. The differences between the mean scores on each basic skill area across the two groups were tested for significance using 2-sample t-tests for independent groups.

CHAPTER 4

PRESENTATION AND INTERPRETATION OF DATA

Introduction

The declared intent of this study was to investigate the basic academic skills of communication and computation, skills in reading, writing, and arithmetic (the three R's) that are associated with success (both at school and at work) in various areas of vocational programs. It was hypothesized that the general emphasis on one area of skill or another varies considerably among occupations; that the specific reading materials, mathematics problems, writing assignments, and oral communication tasks faced by students differ from occupation to occupation; that certain occupations rely heavily on listening and speaking to communicate information whereas others use reading and writing; and also that the use of mathematics skills shows marked differences in emphasis among vocational programs.

The investigator also proposed to provide evidence on (1) the basic academic skills that are associated with successful completion of each vocational program, (2) the variability in basic skills requirements across occupations, (3) the level and range of basic academic skills required by seniors in the various areas of occupational programs, (4) the variability in the basic skills scores of the graduates, (5) the basic academic skills lacked by typical (or average) new entrants into the labor market, (6) the variability in opinions expressed by job holders in the various occupational areas as regards the basic academic skills that are important and useful for successful job performance, (7) the variability in the beliefs of employers of labor in the various job areas on the basic academic skills that are important for job success, (8) the variability in the perceptions of employees and employers in the diverse job areas on the basic skills demanded by work, and (9) the relationship between basic academic skills mastery plus positive perception and successful job performance. An analysis of these research objectives revealed the following questions for which answers were sought:

(1) What is the distribution of test scores by vocational program area, and do they differ?

(2) Among the skills, are the relative strengths and weaknesses the same for the diverse vocational program areas?

(3) What variation, if any, exists in the scores of graduates who are attending schools, employed in their areas of training, employed in areas not related to their training, those not employed at all, and those in the military?

(4) What skills do employers most often say that their new employees do not have?

(5) What differences exist in the opinions expressed by new employees (employed in areas related to their high school programs) in the different areas about how important the various basic academic skills were for effective job performance?

(6) What differences exist in the opinions expressed by employers of new high school graduates in the various occupational programs about how important basic academic skills were for successful job performance?

(7) Within an area, do new employees and employers agree on the relative importance of the several basic academic skills for success on the job?

(8) Are the ability scores of those employed in relevant job areas significantly different from the state norms for successful high school vocational program completers?

(9) Among those in the employed-in-relevant-area category, do those with longer stays on the job score or perceive differently from those whose stays were shorter?

Through this series of research questions we hoped to learn more about the basic academic skills that are associated with success (both at school and on the job) in various areas of vocational and avocational preparation.

Both descriptive and inferential statistical analyses were used. The analysis and interpretation of each question starts with a descriptive interpretation of the data, depicting profiles and distribution tables. These were followed with appropriate inferential analyses and interpretations of data.

Before examining the nine research questions, comparisons were made that confirmed the absence of bias in the sampling procedures (and assumptions) used in the follow-up survey. These were followed by a series of distribution tables showing gender, high school major, types of job held, length of employment, and stability in terms of job retention of employees. This part focused on the distribution of variables, and considered the pattern of influence that may have any effect on the findings of the research.

First, a preliminary analysis was carried out to determine the differences in means and standard deviations between the state norm scores in the basic skills and the norm scores of the surveyed graduates. This was done to test the absence of bias in our sampling procedure. A t-test for unequal groups indicated a non-significant difference at the 0.05 level.

Sampling Characteristics

A total of 1,088 questionnaires were mailed out. Of these, 276, or 25.4 percent, were returned. Of those returned, only 251 contained valid responses. The other twenty-five questionnaires were not included in the analysis for various reasons such as non-completion, improper marking, or mutilation. The follow-up questionnaire carried some variables of interest to the investigator, which may have had some effects on the research findings. These variables are gender, high school major, type of job held, length of employment, and stability in terms of job retention of each of the graduates.

Tables 001 through 005 show the characteristics of the 251 graduates included in the analysis. The tables depict the number and percentage in each category.

Table 001: Distribution of Respondents According to High School Major

High School Major	Number	Percentage
Agricultural Education	27	10.76
Distributive Education	16	6.38
Health Education	22	8.77
Home Economics	28	11.16
Business Education	31	12.35
Technical Education	18	7.17

Table 001 (Continued)

Trade and Industry	109	43.43
Total	251	100.02*

*The percentage sum does not equal 100 due to rounding error.

Table 002: Distribution of Respondents According to Employment

Nature of Employment	Number	Percentage
Schooling	43	17.13
Employed in Related Areas	130	51.79
Employed in Unrelated Areas	29	11.55
Not Employed (Looking for Job)	9	3.59
Military	40	15.94
Total	251	100

Table 003: Distributiuon of Respondents According to Sex

Sex	Number	Percentage
Male	156	62.15
Female	95	37.85
Total	251	100

Table 004: Distribution of Respondents According to Length of Employment

Length of Employment	Number	Percentage
Less than Six Months	19	7.57
More than Six Months	121	48.21
Unspecified	111	44.22
Total	251	100

Table 005: Distribution of Respondents According to Job Retention

Job Retention	Number	Percentage
Changed Job	17	6.77
Retained Job	114	45.42
Unpecified	120	47.81
Total	251	100

Table 006: Distribution of Respondents Employed in Jobs Related to their High School Majors

Program Areas	Number	Percentage
Agricultural Education	13 out of 27	48.15
Distributive Education	13 out of 16	81.25
Health Education	17 out of 22	77.27
Home Economics	17 out of 28	60.71
Business Education	10 out of 31	32.26

Table 006 (Continued)

Technical Education	13 out of 18	72.22
Trade and Industry	47 out of 109	43.12
Total	130 out of 251	51.79

Of the 83 questionnaires returned by employers of labor, only 75 were included in this study. The other eight could not be analyzed. Table 006 shows the distribution of respondents employed in jobs related to their high school majors across the seven program areas. Their numbers and percentages are shown in the table.

Table: 007 Distribution of Employers According to Program Areas

Program Area	Number of Employers	Mean Employers
Agric Education	9	12.0
Dist. Education	5	6.7
Health Education	8	10.7
Home Economics	10	13.3
Business Educ.	9	12.0
Technical Educ.	6	8.0
Trade & Industry	28	37.3
Total	75	100.00

Table 007 shows a distribution of the number and percentages of employers in each program area.

The following distribution table shows the means and standard deviations of the 1981 seniors who participated in the statewide Basic Skills Survey and those of the respondents to the 1982 follow-up survey. Each table exhibits scores for each program area.

Table 008: Distribution of Scores in Agricultural Education

	1981 Seniors		!982 Follow-up Survey	
	N = 122		N = 27	
Skills	$\overline{X}$	Sd	$\overline{X}$	Sd
Whole Number Operations	9.1	4.02	10.8	1.23
Operations with Fractions	4.5	3.5	8.2	3.72
Decimal Operations	6.0	4.04	8.8	3.54
Measurement	2.5	2.00	4.2	1.70
General Mathematics	9.9	7.0	16.9	6.17
Reading	15.7	6.77	17.7	3.66
Language Usage	14.5	6.71	18.9	2.18
Grammar	5.7	2.57	7.4	1.29
Mechanics (Writing)	8.8	4.61	10.7	1.21

The above table 008 shows the distribution of scores of the 122 agricultural education seniors who participated in the 1981 statewide Basic Skills Survey and the 27 agricultural education graduates who returned the 1982 follow-up questionnaires.

On average, the group of respondents to the 1982 survey performed consistently better in all skills areas than their state norms.[24]

Table 009: Distribution of Scores in Nursing Programs

	1981 Seniors		!982 Follow-up Survey	
	N = 157		N = 22	
Skills	$\overline{X}$	Sd.	$\overline{X}$	Sd.
Whole Number Operations	10.8	2.10	11.2	0.80
Operations with Fractions	6.4	3.69	7.4	2.94
Decimal Operations	7.6	3.67	8.8	2.63
Measurement	2.6	1.93	3.1	1.71
General Mathematics	10.5	6.62	14.8	4.77
Reading	17.5	4.35	18.8	2.71
Language Usage	18.3	3.03	17.8	1.43
Mechanics (Writing)	11.3	2.46	9.8	1.20

Table 009 provides a profile of the scores of the 1981 seniors in nursing-related programs who participated in the statewide Basic Skills Survey as well as those of the respondents to the 1982 follow-up survey. On the whole, 157 seniors in a nursing program participated in the 1981 survey and 22 took part in the 1982 follow-up survey.

[24] An additional analysis was carried out to determine the pattern of performance of those employed in areas related to their high school majors. This is discussed later in reference to Question 8. Their mean scores were compared with state norms across the seven program areas.

On average, the 1982 respondents performed better than their state norms on each of the basic academic skills. There are differences in their scores. The significance or non-significance of these differences will be discussed later.

Table 010: Distribution of Scores in Home Economics

	1981 Seniors		!982 Follow-up Survey	
	N = 122		N = 27	
Skills	$\overline{X}$	Sd	$\overline{X}$	Sd
Whole Number Operations	10.0	2.52	11.1	0.97
Operations with Fractions	5.2	3.28	7.41	3.84
Decimal Operations	6.7	3,71	9.1	3.18
Measurement	2.4	1.64	3.9	1.76
General Mathematics	1.1	5.21	14.8	3.24
Reading	16.8	4.00	17.8	3.70
Language Usage	16.7	3.75	18.8	2.60
Grammar	6.7	1.11	7.6	1.36
Mechanics (Writing)	10.0	3.20	9.7	2.53

Table 010 shows a distribution of scores of the 1981 seniors in home economics programs who participated in the 1981 Basic Skills Survey and those of the graduates who responded to the 1982 follow-up survey. On the whole, 112 seniors in home economics programs took part in the 1981 survey and 27 graduates responded to our employees' questionnaires.

On average, the graduates who responded to the follow-up survey performed consistently better than the corresponding norms. The significance of the differences will be tested later. Another observation is that there are variations in their scores across the basic academic skills.

Table 011: Distribution of Scores in Business Education

	1981 Seniors		!982 Follow-up Survey	
	N = 343		N = 31	
Skills	$\overline{X}$	Sd	$\overline{X}$	Sd
Whole Number Operations	9.7	4.00	11.3	0.90
Operations with Fractions	6.4	4.07	8.1	3.13
Decimal Operations	7.7	4.31	9.3	3.09
Measurement	2.8	2.00	3.2	1.71
General Mathematics	12.0	7.25	14.1	2.18
Reading	16.4	7.10	19.3	2.90
Language Usage	16.4	6.87	19.2	3.54
Grammar	6.1	2.64	7.5	1.45
Mechanics (Writing)	10.3	4.47	10.9	2.47

Table 011 shows a distribution of scores of 343 seniors in business education who participated in the 1981 statewide Basic Skills Survey and the 31 graduates in business education who took part in the 1982 follow-up survey.

On the whole, the scores of the graduates were higher than were those of the seniors. Apart from that, there were variations in the scores across the skill areas. The significance of these variations between the two groups and within each group will be discussed later.

Table 012: Distribution of Scores in Technical Programs

	1981 Seniors		!982 Follow-up Survey	
	N = 117		N = 18	
Skills	$\overline{X}$	Sd	$\overline{X}$	Sd
Whole Number Operations	9.3	4.02	10.8	1.10
Operations with Fractions	6.2	4.08	5.6	3.3
Decimal Operations	6.9	4.44	7.0	3.61
Measurement	3.4	2.38	3.4	1.60
General Mathematics	12.6	8.31	12.8	2.13
Reading	16.0	6.68	17.9	4.80
Language Usage	15.6	6.75	17.9	3.21
Grammar	6.0	2.70	6.5	1.17
Mechanics (Writing)	9.5	4.45	10.0	2.75

Table 012 shows a distribution of scores of the 117 seniors in technical education who voluntarily participated in the statewide Basic Skills Survey of 1981 and the 18 graduates in this area who responded to the follow-up survey of 1982. In nearly all skills areas the graduates performed better than the seniors did. And within each group, student scores on the skills were different. We will find out later whether such differences are statistically significant at the 0.05 level.

Table 013: Distribiution of Scores in Trade and Industrial Education

	1981 Seniors		!982 Follow-up Survey	
	N = 1047		N = 109	
Skills	$\overline{X}$	Sd	$\overline{X}$	Sd
Whole Number Operations	10.2	2.79	10.9	1.44
Operations with Fractions	5.8	3.68	7.1	3.08
Decimal Operations	7.0	4.08	8.7	3.10
Measurement	2.9	2.01	3.7	1.69
General Mathematics	11.1	6.87	14.6	2.13
Reading	16.8	4.87	17.6	3.49
Language Usage	16.3	4.71	18.1	20.5
Grammar	9.9	3.45	10.2	1.13
Mechanics (Writing)	9.9	3.45	10.2	1.64

Table 013 shows the profile of scores of the 1,047 trade and industrial education seniors who took part in the 1981 statewide Basic Skills Survey and the 109 graduates who participated in the 1982 follow-up survey. In all skill areas the graduates performed better than the seniors did. Within each group, there are variations in their scores across the basic academic skills. The significance of both differences will be discussed later.

Research Question 1: *What is the distribution of test scores by area of vocational program, and do the scores differ?*

For easier interpretation of data, the mean scores of the graduates were scaled down and rounded to one decimal point. Table 014 shows the profile of scores across the seven program areas for graduates who participated in the 1982 follow-up survey.

Table 014 seems to exhibit variations in scores across the seven program areas. Seniors in business education performed consistently better (except in measurements) than seniors in the other program areas. Students across program areas performed better on whole number operations than on any other skill area. Reading, decimal operations, and grammar ranked next, while they performed worst on measurement skills. Students in six of the seven program areas performed fairly well on fractional operations. Technical students had the lowest mean score, 5.6.

Even though there are differences in mean scores on each basic academic skill, we cannot say with certainty that the differences are significant across the seven program areas. The significance of these differences was tested using one-way ANOVA. See tables 015 through 023 below. Since this was an exploratory study, simple inspection was used on accession to identify areas for possible future study, even though the ANOVA did not detect the differences.

Table 014: Basic Skills Competency Profiles of the 1982 Follow-up Survey Respondents across Program Areas*

Skill\Area	Agr. Ed.	Dist. Ed	Health Ed.	Home Ec.	Business Ed.	Tech. Ed.	Tr. & Ind.
Whole No. operations	10.8	11.1	11.2	11.1	11.3	10.8	10.9

Table 014 (Continued)

Operations w/Fractions	8.2	7.5	7.4	7.4	8.1	5.6	7.1
Decimal Operations	8.8	8.3	8.8	9.1	9.3	7.0	8.7
Measurement	8.3	6.9	6.2	7.8	6.3	6.9	7.4
General Math	8.5	6.9	7.4	7.4	7.1	6.4	7.3
Reading	8.9	9.6	9.4	8.9	9.7	8.9	8.8
Language Usage	8.4	8.2	8.2	8.4	8.9	8.3	8.3
Grammar	8.9	8.4	8.2	9.1	9.1	7.8	8.4
Mechanics (Writing)	8.6	7.9	7.9	7.8	8.7	8.0	8.1

*Maximum score = 12.

Table 015: Analysis of Variance of Graduates's Means Scores across Programs (Whole Number Operations)

Source	DF	Sum of Squares	Mean Squares	F Ratio	F Prob	Sig/Not-Sig
Between Groups	6	4.39	0.73	0.47	0.83	Not-Sig
Within Groups	219	338.50	1.55			
Total	225	342.89				

Significance established at 2.10 at the 0.05 level.

Since the F-ratio, as shown in table 015, was not significant at the 0.05 level, we concluded that there was no significant difference in the mean scores of the 1981 graduates on whole number operations skills across the seven program areas. No two groups were significantly different at the 0.05 level across the program areas.

Table 016: Analysis of Variance of Graduates' Mean Scores across Programs (Operations with Fractions)

Source	DF	Sum of Squares	Mean Squares	F Ratio	F Prob	Sig/Not-Sig
Between Groups	6	71.20	11.78	1.15	0.33	Not-Sig
Within Groups	180	1852.77	10.29			
Total	186	1923.97				

Significance established at 2.10 at the 0.05 level.

Since the F-ratio, as shown in table 016, was not significant at the 0.05 level, we agreed that there was no significant difference in the mean scores of the 1981 graduates on fractional operations across the diverse program areas. No two groups were significantly different at the 0.05 level.

Table 017: Analysis of Variance of Graduates' Mean Scores across Programs (Decimal Operations)

Source	DF	Sum of Squares	Mean Squares	F Ratio	F Prob	Sig/Not-Sig
Between Groups	6	49.91	8.32	0.86	0.54	Not-Sig
Within Groups	171	1682.47	9.84			
Total	177	1732.38				

Significance established at 2.10 at the 0.05 level.

Since the F-ratio, as shown in table 017, was not statistically significant at the 0.05 level, we concluded that there was no significant difference in the mean scores of the 1981 seniors on decimal operations across the diverse program areas. No two groups were significantly different at the 0.05 level.

Table 018: Analysis of Variance of Graduates' Mean Scores across Programs (Measurement Operations)

Source	DF	Sum of Squares	Mean Squares	F Ratio	FProb	Sig/Not-Sig
Between Groups	6	13.98	2.33	0.82	0.56	Not-Sig
Within Groups	164	165.86	2.84			
Total	170	497.84				

Significance established at 2.10 at the 0.05 level.

Since the F-ratio, as shown in table 018, was not statistically significant at the 0.05 level, we concluded that there was no significant difference in the mean scores of the 1981 seniors of the surveyed 251 vocational seniors on measurement skills across the seven program areas. No two groups were significantly different at the 0.05 level.

Table 019: Analysis of Variance of Graduates' Mean Scores across Programs (General Mathematics)

Source	DF	Sum of Squares	Mean	F Ratio	F Prob	Sig/Not-Sig
Between Groups	6	104.32	17.39	0.64	0.77	Not-Sig
Within Groups	138	3755.88	27.22			
Total	144	3860.20				

Significance established at the 2.10, 0.05 level.

Since the F-ratio, as shown in table 019, was not statistically significant at the 0.05 level, we concluded that there was no significant difference in the mean scores on general mathematics skills across the diverse program areas. No two groups were significantly different at the 0.05 level.

Table 020: Analysis of Variance of Graduates' Mean Scores across Programs (Reading)

Source	DF	Sum of Squares	Mean	F Ratio	F Prob	Sig/Not-Sig
Between Groups	6	93.4299	15.5716	1.31	0.26	Not-Sig
Within Groups	194	2306.7433	11.8904			
Total	200	2400.1731				

Significance established at 2.10 at the 0.05 level.

Since the F-ratio, as shown in table 020, was not statistically significant at the 0.05 level, we concluded that there was no significant difference in the mean scores of the 1981 graduates on reading skills across the seven program areas. No two groups were significantly different at the 0.05 level.

Table 021: Analysis of Variance of Graduates' Mean Scores across Programs (Language Usage)

Source	DF	Sum of Squares	Mean	F Ratio	F Prob	Sig/Not-Sig
Between	6	35.35	5.89	1.06	0.39	Not-Sig
Within Groups	167	929.19	5.64			
Total	173	964.54				

Significance established at 2.10 at the 0.05 level.

Since the F-ratio, as shown in table 021, was not significant at the 0.05 level, we concluded that there was no significant difference in the mean scores of the 1981 graduates on language use skills across the diverse program areas. No two groups were significantly different at the 0.05 level.

Table 022: Analysis of Variance of Graduates' Mean Scores across Programs (Grammar)

Source	DF	Sum of Squares	Mean	F Ratio	F Prob	Sig/Not-Sig
Between Groups	6	21.19	3.53	2.23	0.04	Sig
Within Groups	221	349.4	1.58			
Total	227	370.68				

Significance established at 2.10 at the 0.05 level.

Since the F-ratio, as shown in table 022, was significant beyond the 0.05 level, we concluded that there was a significant difference in the mean scores of the 1981 seniors on grammar skills across the seven program areas. Post hoc comparisons revealed that no two groups were significantly different at the 0.05 level.[25]

Table 023: Analysis of Variance of Graduates' Mean Scores across Programs (Mechanics)

Source	DF	Sum of Squares	Mean	F Ratio	F Prob	Sig/Non-sig
Between	6	20.7	3.46	1.04	0.40	Non-sig
Within Groups	172	572.14	3.33			
Total	178	592.92				

Significance established at 2.10 at the 0.05 level.

Since the F-probability, as shown in table 023, was higher than 0.05, we concluded that there was no significant difference in the mean scores of the surveyed 1981 graduates on mechanical usage of language (writing skills) across the seven program areas. No two groups were significantly different at the 0.05 level.

[25] Scheffe's comparison method, a suitable method for comparing unequal groups, is quite conservative. The differences might have been in the pooled mean differences rather than between group means. This is a complex comparison.

Summary

From the above distribution tables (tables 009 through 013), we can infer that graduates who participated in the 1982 follow-up survey performed consistently better than state norms in all skill areas across the seven program areas.

Although there were some variations in the mean scores of graduates in our survey, as depicted in our descriptive analysis, these differences in mean scores were not large enough to cause any significant differences between any two groups at the 0.05 level, as shown by our inferential statistical analyses (tables 015 through 023).[26] We can then conclude, tentatively, that the mean scores on basic skills of the 251 graduates in our survey were not significantly different across the seven program areas, except with respect to measurement skills. Graduates in home economics, agriculture, and trade and industry maintained fair performances in all skill areas. The worst-performing group consisted of those in technical education.

Research Question 2: *Among the skills, are the relative strengths and weaknesses the same for the diverse areas of vocational programs?*

Table 024 shows a profile of mean scores across the seven program areas of the 251 graduates who participated in the 1982 follow-up survey. Each score is out of a maximum of 12 points. Graduates across the seven program areas performed very well in whole number operations, followed by reading. Their worst performance across the seven program areas was in measurement. Graduates in business education performed consistently better than other graduates did in whole number operations, decimal operations, reading, language usage, and mechanics. Graduates in health education performed very well in all skill areas except measurement. Home economics

[26] The nature of any variability across programs is discussed under research question 2 below.

graduates, agriculture graduates, and graduates in trade and industry maintained fair performances in all skill areas. The worst-performing group consisted of those in technical education.

Since there were no significant differences in the mean scores for each skill across the seven program areas, as shown under question 1 above, we undertook a MANOVA to determine the interaction between program areas and skill areas. Due to the presence of empty cells and a singular matrix, it was difficult to arrive at any valid conclusions about interaction effects.

Table 024: Profile of Graduates' Mean Scores across Program Areas*

Area	All Grads	Agr. Ed.	Dist. Ed	Health	Home	Business	Tech. Ed.	Tr. &
Skill	N = 251	N = 27	N = 16	N = 22	N = 28	N = 31	N = 18	N = 109
Whole No.	11.1	10.8	11.1	11.2	11.1	11.3	10.8	10.9
Operations.	7.3	8.2	7.5	7.4	7.4	8.3	5.6	7.1
Decimal	8.7	8.8	8.3	8.8	9.1	9.3	7.0	8.7
Measurement	7.5	8.3	6.9	7.4	7.4	7.1	6.4	7.3
General	7.5	8.5	6.9	7.4	7.4	7.1	6.4	7.3
Reading	9.0	8.9	9.6	9.4	8.9	9.7	8.19	8.8
Language	8.4	8.7	8.2	8.2	8.4	8.9	8.2	8.3
Grammar	8.4	8.7	8.2	8.2	8.4	8.9	8.2	8.3
Mechanics	6.8	7.1	6.5	6.6	6.5	7.3	6.3	6.8

*Maximum score = 12.

Table 025: Distribution of Graduates' Mean Scores across Program Areas (Whole Number Operations)

Program Area	$\overline{X}$	Sd	95% Confidence Interval
Agric. Education	10.83	1.23	10.29 to 11.36
Dist. Education	11.1	1.27	10.34 to 11.80
Health Education	11.18	0.80	10.34 to 11.80
Home Economics	11.05	0.97	10.61 to 11.49
Business Education	11.25	0.90	10.87 to 11.63
Technical Education	10.83	1.10	10.29 to 11.38
Trade & Industry	10.90	1.44	10.62 to 11.18

Based on table 025, we can deduce that all graduates across the seven program areas performed very well in whole number operations. No group deviates in its performance. On the strength of this distribution we cannot say that people need or use skills in whole number operations in one specific area more than in any other area. More discussion will follow later.

Table 026: Distribution of Graduates' Mean Scores across Program Areas (Operations with Fractions)

Program Area	$\overline{X}$	Sd	95% Confidence Interval for
Agric. Education	8.2	3.72	6.37 to 10.07
Dist. Education	7.50	3.03	5.58 to 9.43
Health Education	7.38	2.94	6.04 to 8.72
Home Economics	7.43	3.84	5.21 to 9.64
Business Education	8.10	3.12	6.64 to 9.56

Table 026 (Continued)

Technical Education	5.64	3.27	3.75 to 7.53
Trade & Industry	10.90	1.44	10.62 to 11.18

Table 026 shows a profile of mean scores of the 251 graduates in fractional operations. Even though all groups performed very poorly on this skill, business education and agriculture education graduates did better than those in all other groups. Graduates in technical areas performed the worst on fractional operations. Maybe they did not use this skill on their jobs; we cannot say here. Further discussion will follow in connection with questions 5, 6, and 7.

Table 027: Distribution of Graduates' Mean Scores across Program Areas (Decimal Operations)

Program Area	$\overline{X}$	Sd	95% Confidence Interval for
Agric. Education	8.81	3.54	6.92 to 10.70
Dist. Education	8.27	3.13	6.17 to 10.38
Health Education	8.70	2.63	7.57 to 9.96
Home Economics	9.13	3.18	7.37 to 10.90
Business Education	9.29	3.09	7.88 to 10.69
Technical Education	7.00	3.61	4.82 to 9.18
Trade & Industry	8.73	3.10	8.04 to 9.41

Table 027 presents a distribution of scores on decimal operations. There is no appreciable difference in scores across the seven program areas. The scores ranged from 7.00 to 9.29 out of a maximum of 12 points. Again, graduates in business education and home economics did better than graduates in other program areas. Perhaps decimal operations are used more regularly in business and home economics. Further discussion will follow in connection with question 7.

Table 028: Distribution of Graduates' Mean Scores across Program Areas (Measurement with Numbers)

Program Area	$\overline{X}$	Sd	95% Confidence Interval for
Agric. Education	4.17	1.70	3.09 to 5.25
Dist. Education	3.46	1.57	2.40 to 4.51
Health Education	3.14	1.71	2.36 to 3.92
Home Economics	3.89	1.76	2.53 to 5.25
Business Education	3.16	1.60	2.33 to 3.98
Technical Education	3.43	1.60	2.50 to 4.35
Trade & Industry	3.69	1.69	3.33 to 4.06

Table 028 presents the distribution of mean scores of graduates across the seven program areas on measurement skills. The maximum possible score is 6 points. There appears to be a uniform performance pattern. No group's score was extremely high or extremely low. The scores varied from 52.3 percent to 64.8 percent. Even though the scores across the seven program areas appear uniform, they are low, suggesting that new employees across the seven program areas were not proficient in measurement skills. Further discussion follows later.

Table 029: Distribution of Graduates' Mean Scores across Program Areas (General Mathematics)

Program Area	$\overline{X}$	Sd	95% Confidence Interval for
Agric. Education	16.90	6.17	12.4 to 21.32
Dist. Education	13.80	6.25	9.33 to 18.27
Health Education	14.77	4.14	12.63 to 16.90
Home Economics	14.75	6.14	9.63 to 19.88
Business Education	14.11	5.18	11.54 to 16.69
Technical Education	12.75	4.41	9.95 to 15.55
Trade &. Industry	14.60	5.18	13,36 to 15.84

Table 029 presents the distribution of mean scores of employees across the seven program areas in general mathematics. There appeared to be some variability in the scores across the seven program areas. The highest mean score was 16.9 or 70.4 percent and the lowest was 12.75 or 53.1 percent out of a maximum of 24 points. The significance of the differences in means across the seven program areas will be discussed later.

Table 030: Distribution of Graduates' Mean Scores across Program Areas (Reading)

Program Area	$\overline{X}$	Sd	95% Confidence Interval for
Agric. Education	17.70	3.66	15.99 to 19.41
Dist. Education	19.21	2.61	17.71 to 20.72
Health Education	18.75	2.71	17.48 to 20.02
Home Economics	17.78	3.70	15.94 to 19.62

Table 030 (Continued)

Business Education	19.33	2.90	18.11 to 20.56
Technical Education	17.86	4.80	15.09 to 20.63
Trade & Industry	17.57	3.49	16.84 to 18.30

Table 030 shows a distribution of mean scores of employees on reading across the seven program areas. The scores appeared to be uniform, ranging from a maximum of 19.33 or 80.5 percent for the business group to 17.57 or 73.2 percent for trade and industry. The statistical significance of the differences will be discussed later.

Table 031: Distribution of Graduates' Mean Scores across Program Areas (Language Usage)

Program Area	$\overline{X}$	Sd	95% Confidence Interval for
Agric. Education	18.8	2.18	17.65 to 20.00
Dist. Education	17.71	2.56	16.24 to 19.19
Health Education	17.83	1.43	17.13 to 18.54
Home Economics	18.25	2.60	16.60 to 19.90
Business Education	19.22	3.54	17.46 to 20.98
Technical Education	17.90	3.21	15.60 to 20.20
Trade & Industry	18.05	2.05	17.60 to 18.49

Table 031 provides evidence to support the uniformity in the performance of employees on language usage across the seven program areas. The mean scores ranged from 19.22 or 73.9 percent for business education to 17.71 or 68.1 percent for those in distributive areas. The significance of the differences in mean scores will be addressed later.

Table 032: Distribution of Graduates' Mean Scores across Program Areas (Grammar)

Program Area	$\overline{X}$	Sd	95% Confidence Interval for
Agric. Education	7.40	1.29	6.87 to 7.93
Dist. Education	7.00	1.41	6.22 to 7.78
Health Education	6.74	1.39	6.14 to 7.34
Home Economics	7.55	1.37	6.92 to 8.19
Business Education	7.54	1.45	6.95 to 8.12
Technical Education	6.53	1.17	5.96 to 7.09
Trade & Industry	7.03	1.13	6.81 to 7.26

Table 032 shows a distribution of mean scores of employees in grammar usage across the seven program areas. There appears to be little variability in the mean scores across the seven program areas. The highest mean score was 7.54 or 75.4 percent for those in business education and the lowest mean score was 6.53 or 65.3 percent for those in technical education. No one group performed poorly on this skill. The statistical significance of the differences will be discussed later.

Table 033: Distribution of Graduates' Mean Scores across Program Areas (Mechanics)

Program Area	$\overline{X}$	Sd	95% Confidence Interval for
Agric. Education	10.71	1.27	10.08 to 11.33

Table 033 (Continued)

Dist. Education	9.67	1.69	8.93 to 10.80
Health Educ.	9.83	1.20	9.24 to 10.43
Home Economics	9.71	2.53	8.27 to 11.17
Business Education	10.89	2.47	9.6 to 12.12
Technical Education	10.00	2:75	8.03 to 11.97
Trade & Industry	10.16	1.64	9.81 10.51

Table 033 presents a distribution of mean scores on mechanical use of language (writing) across the seven program areas. The means score ranged from 10.89 or 72.6 percent for employees in business to 9.67 or 64.5 percent for those employed in distributive areas. No group performed very poorly on this skill, although there are differences in the mean scores across the seven program areas. The variability appears to be minimal. The significance of this variability will be discussed later.

To further study the relative strengths of each skill across the diverse program areas, the investigator carried out further statistical analyses. Tables 024 through 033 have provided the profiles of mean scores, standard deviations, and 95 percent confidence intervals for each skill across the seven program areas.

Summary

The above analysis suggests that all students were proficient in whole number operations. All groups did very well on this skill. All groups also did fairly well on reading, decimal operations, language usage, and grammar.[27] Performances in the other skill areas vary considerably.

Research Question 3: *What variation, if any, exists in the scores of graduates who are attending school, employed in their areas of training, employed in areas not related to their training, unemployed, or in the military?*

Of the 251 respondents to the 1982 follow-up survey, 43 were attending school, 130 were employed in areas related to their high school majors, 29 were employed in areas not directly related to their vocational specialization, 40 were unemployed (but looking for jobs), and 9 were in the military.

To determine their performance patterns on the 1981 statewide Basic Skills Survey, an analysis of their scores on each basic skill across the five job areas was carried out. Table 034 presents a profile of mean scores in each skill across the five job areas.[28] Graduates in the first three columns performed relatively better in some skill areas than did graduates who were either in the military or unemployed. The difference, though, is not great enough to enable us to arrive at any valid conclusion with regard to performance patterns. There is no difference in the pattern of performance of those employed in areas related to their specializations and those employed in other areas.

[27] This assumes that a mean score of 7.5 out of 12 or 62.5 percent is a required level of performance. Let us assume that this is the cut-off point.
[28] To give us a better picture, the means were rounded to one decimal place and scored out of a maximum of 12 points.

Table 034: Basic Skills Competency Profile across Job Areas

Skills\Employ-ment status	In School	Employed in Related Areas	Employed in Unrelated Areas	Unemployed (Looking for work)	Military
	N=43	N =130	N=29	N=40	N=9
Whole No	11.0	11.1	10.8	10.7	10.9
Operations with	7.9	7.3	7.2	7.2	6.3
Decimal	9.0	8.7	8.1	8.8	7.2
Measurement	6.9	7.5	8.0	6.3	5.0
General	7.2	7.5	7.8	6.3	7.2
Reading	9.1	9.0	9.7	8.7	9.0
Language Usage	8.5	8.4	8.3	8.5	7.9
Grammar	8.7	8.4	8.5	8.6	8.9
Mechanics	8.3	8.2	7.9	8.3	7.6

We can also see from table 034 that graduates who were employed exhibited a relatively better pattern of scores than those in other groups did. Graduates in the military performed consistently lower in all the skills areas (except in whole number operations, reading, and grammar) than graduates in other groups. Again, table 034 shows that students who were employed performed better on measurement skills than those in other areas. The unemployed graduates performed consistently well in nearly all the skills areas, except in measurement and general mathematics. Based on this finding we can say only that their inability to secure jobs may be due to their lack of measurement or general mathematics skills, but also perhaps to some other reason or reasons not covered in this study. Even though there were differences in scores on the basic skills across job areas, we cannot categorically assert here that the differences were statistically significant. Tables 035 though 043 present the significance of the differences.

Table 035: Analysis of Variance of the Differences in Mean Scores on Whole Number Operations across Job Areas

Source	DF	Sum of Squares	Mean Squares	F Ratio	F Prob	Sig,/Not-Sig
Between Groups	4	5.68	1.42	0.96	0.43	
Within Groups	231	343.21	1.42			Not-Sig
Total	235	348.89				

Significance established at the 2.37, 0.05 level.

Table 036: Analysis of Variance of the Differences in Mean Scores on Operations with Fractions across Job Areas

Source	DF	Sum of Squares	Mean Squares	F Ratio	F Prob	Sig,/Not-Sig
Between	4	16.80	4.20	0.41	0.80	
Within Groups	190	1939.48	10.21			Not-Sig
Total	194	1956.28				

Significance established at 2.37at the 0.05 level.

Table 037: Analysis of Variance of the Differences in Mean Scores on Decimal Operations across Job Areas

Source	DF	Sum of Squares	Mean Squares	F Ratio	F Prob	Sig,/Not-Sig
Between	4	21.11	5.28	0.54	0.71	
Within Groups	182	1788.50	9.83			Not-Sig
Total	186	1809.62				

Significance established at 2.37 at the 0.05 level.

Table 038: Analysis of Variance of the Differences in Mean Scores on Measurements across Job Areas

Source	DF	Sum of Squares	Mean Squares	F Ratio	F Prob	Sig,/Not-Sig
Between	4	18.69	4.67	1.70	0.15	Not-Sig
Within Groups	174	476.89	2.74			
Total	178	495.58				

Significance established at 2.37 at the 0.05 level.

Table 039: Analysis of Variance of the Differences in Mean Scores on General Mathematics across Program Areas

Source	DF	Sum of Squares	Mean Squares	F Ratio	F Prob	Sig,/Not-Sig
Between	4	119.91	29.98	1.15	0.34	Not-Sig
Within Groups	147	3827.92	26.04			
Total	151	3947.83				

Significance established at 2.37 at the 0.05 level.

Table 040: Analysis of Variance of the Differences in Mean Scores on Reading across Program Areas

Source	DF	Sum of Squares	Mean Squares	F Ratio	F Prob	Sig,/Not-Sig
Between	4	48.50	12.12	1.02	0.40	Not-Sig
Within Groups	207	2444.61	11.81			
Total	211	2493.10				

Significance established at 2.37 at the 0.05 level.

Table 041: Analysis of Variance of the Differences in Mean Scores on Language Usage across Program Areas

Source	DF	Sum of Squares	Mean Squares	F Ratio	F Prob	Sig/Not-Sig
Between	4	16.90	4.22	0.77	0.55	Not-Sig
Within Groups	178	982.01	5.52			
Total	182	998.90				

Significance established at 2.37 at the 0.05 level.

Table 042: Analysis of Variance of the Differences in Mean Scores on Grammar across Job Areas

Source	DF	Sum of Squares	Mean Squares	F Ratio	F Prob	Sig/Not-Sig
Between	4	3.98	0.99	0.60	0.66	Not-Sig
Within Groups	238	385.51	1.65			
Total	242	389.49				

Significance established at 2.37 at the 0.05 level.

Table 043: Analysis of Variance of the Differences in Mean Scores on Mechanics across Job Areas

Source	DF	Sum of Squares	Mean Squares	F Ratio	F Prob	Sig/Not-Sig
Between	4	7.98	2.00	0.61	0.66	Not-Sig
Within Groups	183	597.12	3.26			
Total	187	605.10				

Significance established at 2.37 at the 0.05 level.

Based on the findings of table 035, with $F(4, 231)=0.96$ and $p=0.43$ (so $p>0.05$), we concluded that there was no significant difference in the mean scores of the 1981 graduates in whole number operations across the job areas.

Based on the findings of table 036, with $F(4, 190)=0.41$ and $p=0.08$ (so $p>0.05$), we concluded that there was no significant difference in the mean scores of the surveyed 1981 graduates on fractional operations across the five job areas. No two groups were significantly different at the 0.05 level.

Based on the findings of table 037, with $F(4, 182)=0.54$ and $p=0.71$ (so $p>0.05$), we concluded that there was no significant difference in the mean scores of the surveyed 1981 graduates on decimal operations across the five job areas. No two groups were significantly different at the 0.05 level.

Based on the findings of table 038, with $F(4, 174)=1.70$ and $p=0.15$ (so $p>0.05$), we concluded that there was no significant difference in the mean scores of the surveyed 1981 graduates on measurement skills across the five job areas. No two groups were significantly different at the 0.05 level.

Based on the findings of table 039, with $F(4, 147)=1.15$ and $p=0.71$ (so $p>0.05$), we concluded that there was no significant difference in the mean scores of the surveyed 1981 graduates on general mathematics skills across the five job areas. No two groups were significantly different at the 0.05 level.

Based on the findings of table 040, with $F(4, 207)=1.02$ and $p=0.40$ (so $p>0.05$), we concluded that there was no significant difference in the mean scores of the surveyed 1981 graduates on reading skills across the five job areas. No two groups were significantly different at the 0.05 level.

Based on the findings of table 041, with $F(4, 178)=0.77$ and $p=0.55$ (so $p>0.05$), we concluded that there was no significant difference in the mean scores of the surveyed 1981 graduates on language usage skills across the five job areas. No two groups were significantly different at the 0.05 level.

Based on the findings of table 042, with F(4, 238)=0.60 and p=0.66 (so p>0.05), we concluded that there was no significant difference in the mean scores of the surveyed 1981 graduates on grammar skills across the five job areas. No two groups were significantly different at the 0.05 level.

Based on the findings of table 043, with F(4, 183)=0.61 and p=0.66 (so p>0.05), we concluded that there was no significant difference in the mean scores of the surveyed 1981 graduates on general mathematics skills across the five job areas. No two groups were significantly different at the 0.05 level.

Summary

Even though there seemed to be variations in the performances of the 1981 graduates across job areas as depicted in the descriptive statistical analysis, such differences were not significant enough.

The different inferential statistical analyses point out that the mean scores on the diverse skill areas across the five groups were not significantly different from one another at the 0.05 level.

Research Question 4: *What skills do employers most often say that their new employees do not have?*

Employers in this study were asked to rate each of the thirty-eight basic academic skills of reading, writing, and arithmetic according to how skilled their new employees were on each basic academic skill. Their responses were placed in five categories: (1) "highly skilled," (2) "quite skilled," (3) "moderately skilled," (4) "not quite skilled," and (5) "not at all skilled."

The employers' ratings were later classified into three main categories: skilled, moderately skilled, and unskilled (or lacking skill). "Highly skilled" and "quite skilled" were grouped as skilled, while "not quite skilled" and "not skilled at all" were reduced to unskilled (or lacking skill). The mid-point rating ("moderately skilled") was left unchanged. The reduction of the 5-point scale was undertaken for ease of presentation, interpretation, and analysis of data.

The rating of writing was fairly uniform, with 37.7 percent reporting "unskilled," 24 percent reporting "moderately skilled," and 38.7 percent reporting "highly skilled" for new entrants into the world of work.

Our main interest was to find the skills in which employers reported that their new employees were deficient. The following tables display the patterns of responses of the employers who participated in the Employers Survey of spring 1982.

Table 044: Crossbreak Analysis of Employers' Perceptions of Employees' Skills

Ratings	Whole	Fractions	Decimals	Measure-	General	Reading*	Writing
Quite Skilled	61 (81.3%)	17	30 (40%)	13 (17.8%)	14 (18.9%	22 (30.1%)	28 (37.3%)
Moderately	14 (18.7%)	23	22 (29.3%)	12 (16.4%)	11	17 (23.3%)	18 (24.0%)
Unskilled	–	33	23 (30.7%)	48 (65.8%)	49	34 (46.6%)	29 (38.7%)
(Lacking)	–	–	–	–	–	–	–
Total	75 (100%)	73	75 (100%)	73 (100%)	74 (100%)	73 (100%)	75 (100%)

*There are missing cases here.

Table 044 suggests that employers (in general) felt that their new employees were skilled in whole number operations, since all of the employers rated employees either as “skilled” (81.3 percent) or as “moderately skilled” (18.7 percent). No employer reported that typical new employees lacked skills in whole number operations. Yet nearly half the employers (45.2 percent) reported that their new employees were deficient in fractional operations skills, while 31.5 percent reported that typical new employees had moderate skills in fractional operations. In all, only 23.3 percent of the employers reported a high rating for this skill.

As for decimal operations, employers were quite divided. Forty percent maintained that their new employees did not have adequate skills in working with decimal operations, while 29.3 percent reported moderate skill and 30.7 percent reported that their new employees were wanting in working with decimals.

About two-thirds of the employers reported that their new employees were deficient in measurement skills, while only 16.4 percent and 17.8 percent agreed that their new employees had moderate and high skills, respectively. Nearly the same ratings were given for general mathematics, where 66.2 percent, 14.9 percent, and 18.9 percent, respectively, rated their new employees as unskilled, moderately skilled, and highly skilled, respectively.

The ratings for reading took a different form. Nearly half (46.6%) rated their new entrants into the labor market as lacking, while 23.3 percent and 30.1 percent, respectively, reported that new employees were moderately skilled and highly skilled.

Writing earned fairly uniform ratings, with 38.8 percent rating new entrants into the world of work as unskilled, 24 percent rating them moderately skilled, and 27.3 rating them highly skilled.

The above observations were also confirmed by the distribution of means and standard deviations of employers' ratings. See table 045 below.

Table 045: Mean Distribution of Employers' Perceptions

Skill Area	$\overline{X}$	N
Whole Number Operations	1.68	75
Fractions	3.43	73
Decimals	2.79	75
Measurements	3.61	73
General Mathematics	3.52	74
Reading	3.29	73
Writing	3.01	75

On the basis of the table 045 data we can conclude that, in the opinions of employers (in general), new entrants into the labor market were quite skilled in whole number operations, moderately skilled in decimals, below average in fractions, reading and writing, and somewhat deficient in measurement and general mathematics.

To further study the nature of the variation in the perceptions of employers across diverse vocational program areas, additional statistical analyses were carried out. Tables 046 through 052 show the cross-break analyses of employers' responses across the seven program areas: agricultural education, distributive education, health education, home economics education, business education, technical education, and trade and industry education.

Table 046: Crossbreak Analysis of Agricultural Employers' Perceptions of Employees' Selected Skills

Ratings	Whole	Fractions#	Decimals	Measure-	General	Reading	Writing
Quite Skilled	8	–	3 (333%)	1 (12.5%)	2 (25%)	2 (22.2%)	2 (222%)
Moderately	1	6 (75%)	4 (44.4%)	2 (25%)	–	2 (22.2%)	5 (55.6%)
Unskilled	–	2 (25%)	2 (22.2%)	5 (62.5%)	6 (75%)	5 (55.6%)	2 (22.2%)
Lacking	–	–	–	–	–	–	–
Total	9	8 (100%)	9 (99.9%)*	8 (100%)	8 (100%)	9 (100%)	9 (100%)

There are missing cases here.
* Rounding-up error.

Nine employers in the agricultural areas responded to our questionnaire. Nearly all the employers rated their new employees as being skilled in whole number operations. No employer reported that new entrants into the labor market were deficient in whole number operations, as six of the eight employers (75%) rated their new employees as being moderately skilled in fractions, while two rated them as wanting in this skill. No employer reported adequate skills in operations with fractions. Only two out of the nine employers rated their new employees as lacking in decimal skills, while four and three, respectively, rated them as moderately skilled or highly skilled, respectively. The ratings of measurement skills given by employers were skewed. Five of eight employees (62.5%) rated their new employees as lacking in the art of measurement, while two and one, respectively, rated them as moderately skilled or highly skilled. Eight employers responded to the question on general mathematics skills, six of whom (75%) rated their new employees as unskilled in this area. Two employers (25%) reported adequate skills in reading, five of the nine employers (55.6%) reported that their new employees are wanting, while two reported that their new employees are moderately skilled and highly skilled, respectively. Employers' ratings on writing are normally distributed, with two rating their new employees as skilled, five rating them as moderately skilled, and two rating them as unskilled.

In conclusion, more than 50 percent of the employers in the area of agriculture rated their new agricultural graduates as being deficient in measurement skills, general mathematics skills, and reading skills, while 25 percent, 22.2 percent, and 22.2 percent reported similarly on fractions, decimals, and writing, respectively. All employers reported that their new employees have adequate skills in whole number operations.

Table 047: Crossbreak Analysis of Distributive Employers' Perceptions of Employees' Selected Skills*

Ratings	Whole	Fractions	Decimals	Measure-	General	Reading	Writing
Quite	4 (80%)	1 (20%)	3 (60%)	1 (20%)	2 (40%)	2 (40%)	3 (60%)
Moderate-	1 (20%)	2 (40%)	1 (20%)	3 (60%)	1 (20%)	2 (40%)	–
Unskilled	–	2 (40%)	1 (20%)	1 (20%)	2 (40%)	1 (20%)	2 (40%)
(Lacking)	–	–	–	–	–	–	–
Total	5 (100%)	5 (100%)	5 (100%)	5 (100%)	5 (100%)	5 (100%)	5 (100%)

*There are missing cases here.

Table 047 shows that all participating employers in the distributive field agreed that their new employees were proficient enough in whole number operations. They rated 40 percent of their new employees as unskilled in fractional operations, and 40 percent as moderately skilled. Eighty percent of the employers agreed that their new employees were either quite skilled or moderately skilled in decimal operations. Only 20 percent rated their new employees as unskilled. The ratings of new employees on measurement were normally distributed, with 20 percent rated as skilled, 60 percent rated as moderately skilled, and 20 percent rated as unskilled. The ratings of general mathematics skills were weighted on the ends, with 40 percent rating new employees as skilled, 20 percent rating them as moderately skilled, and 40 percent rating them as unskilled. On reading, 80 percent rated their new employees as either skilled or moderately skilled, while only 20 percent rated them as deficient. In the art of reading, 60 percent of the employers agreed that their new employees were skilled in writing, while 40 percent rated them as unskilled. Conclusively, we can see that two-fifths of all the employers who responded rated their new employees as lacking in fractional operations, general mathematics, and writing skills, while 20 percent reported that their new employees were deficient in decimal operations skills, measurement skills, and reading skills. They all reported that new graduates in distributive education were proficient in whole number operations skills.

Table 048: Crossbreak Analysis of Health Employers' Perceptions of Employees' Selected Skills*

Ratings	Whole	Fractions	Decimals	Measure-	General	Reading	Writing
Quite	8 (100%)	4 (5%)	6 (75%)	4 (50%)	4 (50%)	4 (50%)	6 (75%)
Moderate-	–	3 (37.5%)	1 (12.5%)	1 (12.5%)	1 (12.56%)	2 (25%)	–
Unskilled	–	1 (12.5%)	1 (12.5%)	3 (375%)	3 (37%)	2 (25%)	2 (25%)
(Lacking)	–	–	–	–	–	–	–
Total	8 (100%)	8 (100%)	8 (100%)	8 (100%)	8 (100%)	8 (100%)	8 (100%)

There are missing cases here.

Table 048 shows the ratings of employers in health-related areas on the adequacy of basic skills of their entry-level employees. In nearly all the skills, at least 62.5 percent of the employers in health professions reported that their new employees were either skilled or moderately skilled in the seven skill areas. All the employers agreed that their new employees were proficient in whole number operations skills, 87.5 percent reported that their new employees were either skilled or moderately skilled in fractional operations, while only 12.5 percent reported that their new employees were unskilled. Nearly the same ratings were reported for decimal operations, with 75 percent of employers rating new employees as skilled, 12.5 percent as moderately skilled, and 12.5 percent as unskilled. New employees had the same ratings on measurement and general mathematics, with four of eight rating them as skilled, one rating them as moderately skilled, and three rating them as unskilled.

Only two employers rated their new employees as deficient in reading and writing skills.

Table 049: Crossbreak Analysis of Home Economics Employers' Perceptions of Employees' Selected Skills*

Ratings	Whole	Fractions	Decimals	Measure-	General	Reading	Writing
Quite	8 (80%)	–	3 (30%)	–	–	5 (55.6%)	7 (77.7%)
Moderate-	2 (20%)	2 (20%)	2 (20%)	–	1 (10%)	2 (22.2%)	1 (l1.1%)
Unskilled	–	8 (80%)	5 (50%)	10 (100%)	9 (90%)	2 (22.2%)	1 (l1.1%)
(Lacking)	–	–	–	–	–	–	–
Total	10	10 (100%)	10 (100%)	10 (100%)	10	9*(99.9%)	9*(99.9%)

*There are missing cases here.

Table 049 shows that 50 percent of employers in home economics rated their new employees as unskilled in decimal operations, 80 percent rated them as unskilled in fractions, 100 percent rated them as unskilled in measurement, and 90 percent rated them similarly in general mathematics. New employees received poor ratings in computation skills (except for whole number operations). Only 22.2 percent of the home economics employers felt that their new employees were deficient in reading skills, while 11.1 percent rated them as deficient in writing skills.

Table 050: Crossbreak Analysis of Business Employers' Perceptions of Employees' Selected Skills

Ratings	Whole	Fraction	Decimals	Measure	General	Reading	Writing
Quite Skilled	7 (77.8%)	6	5 (55.6%)	3	3 (333%)	4	7
Moderately skilled	2 (22.2%)	2	2 (22.2%)	3	4 (44.4%)	4	1
Unskilled	–	I (1U%)	2 (22.2%)	2 (25%)	2 (222%)	1	1 (l1.l%)
(Lacking)	–	–	–	–	–	–	–
Total	9 (100%)	9	9 (100%)	8	9 (99.9%)	9	9

Employees in the business area, as shown in table 050, reported favorably on the skills of their new employees. They all agreed that their new employees were either skilled or moderately skilled in whole number operations, with some reporting that they were wanting in fractional operations (11.1%), decimal operations (22.2%), measurement (25%), general mathematics (22.2), reading (11.1%), and writing (11.1%) skills.

Table 051: Crossbreak Analysis of Technical Employers' Perceptions of Employee's Selected Skills

Ratings	Whole	Fraction	Decimals	Measure	General	Reading	Writing
Quite Skilled	6	–	1 (16.7%)	–	–	–	–
Moderately skilled	–	1 (20%)	1 (16.7%)	2	–	2 (33.3%)	2
Unskilled	–	4 (80%)	4 (66.7%)	4	6(100	4 (66.7%)	4

Table 051 (Continued)

(Lacking)	–	–	–	–	–	–	–
Total	6	5	6 (100%)	6	6(100	6 (100%)	6

Based on the data presented in table 051, we observe that employers in trade and industry rated more than 50 percent of their employees as not having the required skills in fractional operations, measurement, general mathematics, reading, and writing. Twenty-eight percent reported that their new entry-level employees were deficient in decimal operations, while all employers reported that their new employees were either quite skilled or moderately skilled in whole number operations.

Table 052: Crossbreak Analysis of Trade and Industry Employers' Perceptions of Employees' Selected Skills*

Ratings	Whole	Fraction	Decimal	Measure	General	Reading	Writi
Quite Skilled	20	6	9	4	3 (10.7%)	5 (18.5%)	3
Moderately Skilled	8	7 (25%)	11	1 (36%)	4 (14.3%)	3 (11.1%)	9
Unskilled	–	15	8	23	21 (75%)	19 (70.4%)	16
(Lacking)	–	–	–	–	–	–	–
Total	28	28	28	28	28 (100%)	27 (100%)	28

*There is a missing case here.

Table 052 indicates that employers in the trade and industry area rated more than 50 percent of their employees as lacking required skills in operations with fractions, measurement, general mathematics, reading, and writing. They reported that only 28.6 percent of their new entry-level employees were deficient in decimal operations, while all employers rated their new employees as either quite skilled or moderately skilled in whole number operations.

To further study employer perceptions about the skills of new employees, additional analyses were carried out. Tables 053 through 059 present the means, standard deviations and 95 percent confidence intervals for each skill across the seven program areas. We hoped that through this method we could study the variability in the opinions expressed by employers on the skills of their new employees.

Since we could not tell from the distribution of means and standard deviations whether the differences in employer's perceptions were statistically significant, we followed these analyses with one-way ANOVAs. This was done for each skill across the seven program areas.

Table 053: Mean Distribution of Employers' Ratings of the Skills of their New Employees in Whole Number Operations

Program Area	$\overline{X}$	Sd	95% Confidence Interval for Mean
Agric. Education	1.67	0.71	1.12 to 2.21
Dist. Education	1.60	0.89	0.49 to 2.71
Health Education	1.25	0.46	0.86 to 1.63
Home Economics	1.80	0.83	1.24 to 2.36
Business Education	1.80	0.83	1.14 to 2.42
Technical Education	1.33	0.52	0.79 to 1.88
Trade & Industry	1.82	0.86	1.49 to 2.186

Table 053 shows the mean distribution of employers' ratings (across the seven program areas) of the skill levels of their new employees on whole number operations. Even though there was variability in the opinions expressed by employers across all program areas, the differences were not significantly large. Employers in the health and technical areas rated their new employees as very skilled in whole number operations while other employers in the other areas rated their new employees as "quite skilled." No group of employers rated their new employees as deficient or lacking in whole number operations.

Table 054: Mean Distribution of Employers' Ratings of the Skills of their New Employees in Operations with Fractions

Program Area	$\overline{X}$	Sd	95% Confidence Interval for Mean
Agric. Education	4.00	2.00	2.46 to 4.56
Dist. Education	3.20	1.48	1.36 to 5.04
Health Education	2.25	1.17	1.28 to 3.22
Horne Economics	4.40	0.84	3.80 to 5.00
Business Education	2.11	1.05	1.30 to 2.92
Technical Education	3.50	1.38	3.05 to 4.95
Trade & Industry	3.46	1.20	3.00 to 3.93

Table 054 shows the distribution of mean ratings given by employers across the seven program areas on their employees' fractional operations skills. Only two groups of employers (in the health and business areas) rated their new employees as quite skilled with fractions. All other employer groups rated their new employees as deficient in fractional operations. The worst ratings were given by employers in agriculture and home economics, who rated their new employees as not quite skilled. Their average ratings were 4.00 and 4.40, respectively.

Table 055: Distribution of Mean Employers' Ratings of the Skills of their New Employees in Decimal Operations

Program Area	$\overline{X}$	Sd	95% Confidence Interval for Mean
Agric. Education	3.00	1.00	2.23 to 3.77
Dist. Education	2.60	0.89	1.49 to 3.71
Health Education	1.75	1.17	0.78 to 2.72
Home Economics	3.30	1.34	2.34 to 4.26
Business Education	2.44	1.42	1.35 to 3.54
Technical Education	3.50	0.84	2.62 to 4.38
Trade & Industry	2.82	1.02	2.43 to 3.22

Table 055 shows a distribution of mean ratings given by employers across the seven program areas of their new employees' decimal operations skills. There was variability in the employers' perceptions. Employers in health and business rated their new employees as quite skilled while those in agricultural education, distributive education, home economics, and trade and industry reported that their new entry-level employees were moderately skilled in decimal operations. The worst rating came from employers in technical areas, who reported that their new employees were not quite skilled in decimal operations.

Table 056: Mean Distribution of Employers' Ratings of the Skills of their New Employees in Measurement

Program Area	$\overline{X}$	Sd	95% Confidence Interval For Mean
Agric. Education	3.89	1.36	2.84 to 4.94
Dist. Education	2.80	1.10	1.44 to 4.16
Health Education	2.75	1.49	1.51 to 3.99
Home Economics	4.20	0.42	3.90 to 4.50
Business Education	3.33	1.41	2.25 to 4.42
Technical Education	3.83	0.75	3.04 to 4.62
Trade & Industry	3.73	0.93	3.39 to 4.10

Table 056 shows the distribution of mean ratings given by employers of the measurement skills of new entry-level employees. Nearly all the employers rated their new employees as deficient in this skill area. Two groups of employers, in distributive and health education, rated their new employees as moderately skilled, while employers in the other five program areas rated their new entrants into the labor market as lacking and deficient in measurement skills. There appears to be variability in their ratings, as can be seen from the standard deviations, which range from 0.42 to 1.49 at the 95 percent confidence interval distribution.

Table 057: Mean Distributiion of Employers' Ratings of the Skills of their New Employees in General Mathematics

Program Area	$\overline{X}$	Sd	95% Confidence Interval For Mean
Agric. Education	3.67	1.41	2.58 to 4.75
Dist. Education	3.00	1.00	1.76 to 4.24

Table 057 (Continued)

Health Education	2.63	1.30	1.54 to 3.71
Home Economics	4.10	0.57	3.69 to 4.50
Business Education	3.00	1.00	2.23 to 3.77
Technical Education	4.00	0.0	4.00 to 4.00
Trade & Industry	3.68	0.98	3.30 to 4.06

Table 057 presents the distribution of means and standard deviations of the ratings given by employers across the seven program areas of their new employees' skills in general mathematics. Nearly all the employers reported low ratings for their new employees in this skill area. Employers in the health, distributive, and business areas reported that their new employees were moderately skilled while the other groups of employers maintained that their new entrants into the world of work did not possess the required skills in general mathematics. No group of employers reported that their new employees had adequate general mathematics skills for effective job performance.

Table 058: Mean Distribution of Employers' Ratings of the Skills of their New Employees in Reading

Program Area	$\overline{X}$	Sd	95% Confidence Interval For Mean
Agric. Education	3.22	1.09	2.38 to 4.06
Dist. Education	2.60	1.14	1.18 to 4.02
Health Education	2.50	1.20	1.50 to 3.50
Home Economics	3.30	1.16	1.75 to 4.85

Table 058 (Continued)

Business Education	2.67	0.71	3.12 to 3.21
Technical Education	3.83	0.75	3.04 to 4.62
Trade & Industry	3.75	1.24	3.27 to 4.23

Table 058 presents the average ratings given by employers of their new employees' reading skills. Their ratings ranged from moderately skilled to not quite skilled. Only three groups of employers—in distributive, health, and business education—reported that their new employees were moderately skilled in reading, while the other four groups—in agricultural education, home economics, technical education, and trade and industry education—rated their new entry-level employees as not quite skilled in reading.

Table 059: Mean Distribution of Employers' Ratings of the Skills of their New Employees in Writing

Program Area	$\overline{X}$	Sd	95% Confidence Interval For Mean
Agric. Education	2.89	0.93	2.18 to 3.60
Dist. Education	2.40	1.52	0.52 to 4.28
Health Education	2.25	1.17	1.28 to 3.22
Home Economics	3.10	2.28	1.47 to 4.73
Business Education	2.22	0.83	1.58 to 2.87
Technical Education	3.67	0.52	3.13. to 4.21
Trade & Industry	3.46	3.14	3.14 to 3.79

Table 059 presents the distribution of mean ratings given by employers across the seven program areas of their new employees' writing skills. Two of the employer groups, those in the technical and trade/industry areas, rated their new employees as being deficient in writing skills, while the other groups rated their employees as moderately skilled. There was variability, however, in their ratings. There appears to be a wide variation as indicated by the standard deviations at the 95 percent confidence interval.

Table 060: Analysis of Variance of Employers' Perceptions of the Skills of New Employees in Whole Number Operations

Source	DF	Sum of Squares	Mean Squares	F Ratio	F Prob	Sig/Not-Sig
Between Groups	6	3.02	0.50	0.83	0.55	Not-Sig
Within Groups	68	41.30	0.61			
Total	74	44.32				

Significance established at 2.24 at the 0.05 level.

Table 061: Analysis of Variance of Employers' Perceptions of the Skills of New Employees in Operations with Fractions

Source	DF	Sum of Squares	Mean Squares	F Ratio	F Prob	Sig/Not-Sig
Between Groups	6	46.29	7.72	4.60	0.00	Sig
Within Groups	68	114.05	1.68			
Total	74	160.35				

Significance established at 2.24 at the 0.05 level.

Table 062: Analysis of Variance of Employers' Perceptions of the Skills of New Employees in Decimal Operations

Source	DF	Sum of Squares	Mean Squares	F Ratio	F Prob	Sig/Not-Sig
Between Groups	6	15.96	2.66	2.14	0.06	Not-Sig
Within Groups	68	84.63	1.25			
Total	74	100.59				

Significance established at 2.24 at the 0.05 level.

Table 063: Analysis of Variance of Employers' Perceptions of the Skills of New Employees in Measurement

Source	DF	Sum of Squares	Mean Squares	F Ratio	F Prob	Sig/Not-Sig
Between Groups	6	14.92	2.49	2.14	0.66	Not-Sig
Within Groups	68	78.87	1.16			
Total	74	93.79				

Significance established at 2.24 at the 0.05 level.

Table 064: Analysis of Variance of Employers' Perceptions of the Skills of New Employees in General Mathematics

Source	DF	Sum of Squares	Mean Squares	F Ratio	F Prob	Sig/Not-Sig
Between Groups	6	15.84	2.64	2.61	0.03	Sig
Within Groups	68	68.88	1.01			
Total	74	84.72				

Significance established at 2.24 at the 0.05 level.

Table 065: Analysis of Variance of Employers' Perceptions of the Skills of New Employees in Reading

Source	DF	Sum of Squares	Mean Squares	F Ratio	F Prob	Sig/Not-Sig
Between Groups	6	18.61	3.10	1.84	0.11	Not-Sig
Within Groups	68	114.94	1.69			
Total	74	133.55				

Significance established at 2.24 at the 0.05 level.

Table 066: Analysis of Variance of Employers' Perceptions of the Skills of New Employees in Writing

Source	**DF**	**Sum of Squares**	**Mean Squares**	**F Ratio**	**F Prob**	**Sig/Not-Sig**
Between Groups	6	20.65	3.44	2.38	0.04	Sig
Within Groups	68	98.34	1.45			
Total	74	118.99				

Significance established at 2.24 at the 0.05 level.

Based on table 060, where $F(6, 68)=0.83$ and $p=0.55$ (so $p>0.05$), we concluded that there was no significant difference in the perceptions of employers of how skilled their new employees were in performing whole number operations. No two groups were significantly different in their opinions at the 0.05 level.

Based on table 061, where $F(6, 68)=4.60$ and $p=0.00$ (so $p<0.05$), we concluded that there was a significant difference in the opinions expressed by employers of how skilled their new employees were in performing fractional operations. A post hoc comparison test (Scheffe's test) revealed that employers in the business area perceived employees' skills differently from the way in which employers in home economics perceived them.

Based on table 062, where $F(6, 68)=2.14$ and $p=06$ (so $p>0.05$), we concluded that there was no significant difference in the perceptions of employers across the seven program areas of how skilled their new employees were in performing decimal operations. No two groups were significantly different from each other at the 0.05 level.

Based on table 063, where $F(6, 68)=2.14$ and $p=0.06$ (so $p>0.05$), we concluded that there was no significant difference in the opinions expressed by employers of how skilled their new employees were in measurement. No two groups differed significantly in their opinions at the 0.05 level.

Based on table 064, where $F(6, 68)=2.16$ and $p=0.03$ (so $p<0.05$), we concluded that there was a significant difference in the opinions expressed by employers across the seven program areas of their new employees' general mathematics skills, but a Scheffe's comparison test revealed that no two groups were significantly different from each other at the 0.05 level. An additional SNK test confirmed that there was no significant difference at the 0.05 level.[29]

Based on table 065, where $F(6, 68)=1.84$ and $p=0.11$ (so $p>0.05$), we concluded that there was no significant difference in the opinions expressed by employers of how skilled their new employees were in reading. No two groups of employers differed significantly in their opinions.

Based on table 066, where $F(6, 68)=2.38$ and $p=0.04$ (so $p<0.05$), we concluded that there was a significant difference in the opinions expressed by employers about their new employees' writing skills. Scheffe's comparison tests

[29] There were differences in complex situations.

revealed that no two groups were significantly different from each other at the 0.05 level.

Research Question 5: *What differences exist in the opinions expressed by new employees who are employed in areas related to their high school programs in the different program areas about how important the various basic academic skills were for effective job performance?*

After analyzing the skills possessed by seniors in the last month of school, we followed up to determine which skills were actually used on their jobs. Graduates employed in the seven program areas were requested to rate 38 skills associated with reading, writing, and computation according to how important each skill was to success on their jobs. A 5-point Likert scale was used with a score of 1 indicating "very important," 2 indicating "quite important," 3 indicating "moderately important," 4 indicating "not quite important," and 5 indicating "not at all important."

The graduates' responses were further classified into three levels: very important, moderately important, and unimportant, with "very important" or "quite important" classified as important and "not quite important" and "not at all important" classified as unimportant. The middle classification "moderately important" was left untouched. The classification was done for easier analysis and interpretation of data.

Both descriptive and inferential analyses were then conducted. Tables 067 through 074 show the contingency analyses of the employees' ratings. Each table presents the number and percentage of employees in each category.

Table 067: Crossbreak Analysis of Employee's Perceptions of the Importance of Selected Skills for Job Success*

Ratings	Whole Numbe	Fractions	Decimals	Measurement	Gen. Math	Reading	Writing
Very Important	118	92 (70.7%)	93 (72.1%)	47 (36.4%)	69	87	71
Moderately Important	6	23 (17.7%)	20 (15.5%)	38 (29.9%)	35	33	26
Unimportant	6	15 (11.6%)	16 (12.4%)	44 (34.1%)	26	0 (7.7%)	32
Total	130	130 (100%)	129	129 (100%)	130	130	129

*There are missing cases here.

Table 067 shows the mean ratings given by 130 employees across the seven program areas of the importance of the seven skill areas to success on their jobs. Employees across the seven program areas perceived that all skill areas were significant for success and efficient job performance. For example, 95.4 percent of the employees rated having skills in performing whole number operations as an important ingredient for success on their jobs. Another 88.4 percent reported that fractional operations skills were important for successful job performance, while 87.6 percent identified decimal operations skills, 66.3 percent identified measurement skills, 80 percent identified general mathematics skills, 92.32 percent identified reading skills, and 75.2 percent identified writing skills as essential to success on their jobs.

Table 068: Crossbreak Analysis of Agricultural Employees' Perceptions of the Importance of Selected Skills for Job Success

Ratings	Whole Number	Fractions	Decimals	Measurement	General	Reading	Writing
Very Important	13 (100%)	9 (69%)	13 (100%)	11 (84.6%)	12	11	10

Table 068 (Continued)

Moderately	–	3 (23.1%)	–	1 (7.7%)	–	2 (15.4%)	2 (16.7%)
Unimportant	–	1 (7.7%)	–	1 (7.7%)	1 (7.7%)	–	–
Total	13 (100%)	13 (100%)	13 (100%)	13 (100%)	13 (100%)	13(100%)	12 (100%)

Table 068 indicates that all employees in agricultural education reported that skills in whole number operations and decimal operations were very important for success on their jobs, while they all rated reading and writing as either very important or moderately important for effective job performance. A total of 92.3 percent of the employees reported that skills in fractional operations, measurement, and general mathematics were essential for job success.

Table 069: Crossbreak Analysis of Distributive Employees' Perceptions of the Importance of Selected Skills to Job Success

Ratings	Whole Number	Fractions#	Decimals	Measurement	General	Reading	Writing
Very Important	12 (92.3%)	6 (46.2%)	11	5 (41.7%)	6 (46.2%)	8 (61.5%)	9 (69.2%)
Moderately	1 (7.7%)	4 (30.8%)	1 (7.7%)	3 (25.0%)	6 (46.2%)	4 (30.8%)	2 (15.4%)
Unimportant	–	3 (23.1%)	1 (7.7%)	4 (33.3%)	1 (7.7%)	1 (7.7%)	1 (7.7%)
Total	13 (100%)	13	13 (100%)	12 (100%)	13 (100%)	13 (100%)	12 (100%)

*There is a missing case here.
Percentage does not equal 100 due to rounding error.

According to table 069, all employees in distributive areas rated whole number operations skills as either very important or moderately important. Among all employees, 92.3 percent rated skills in decimal operations, general mathematics, and reading as either very important or moderately important, with 84.6 percent identifying writing skills, 77.0 percent identifying fractional operations skills, and 66.7 percent identifying measurement skills as essential for effective job performance.

Table 070: Crossbreak Analysis of New Health Employees' Perceptions of the Importance of Selected Skills for Job Success

Ratings	Whole	Fractions*	Decimals*	Measurement*	General	Reading	Writing*
Very Important	15 (88.2%)	13 (76.5%)	13 (76.5%)	8 (47.1%)	12 (70.6%)	13 (76.5%)	14 (82.4%)
Moderately		3 (19.6%)	2 (11.8%)	4 (23.5%)	2 (11.8%)	3 (17.6%)	1 (5.9%)
Unimportant	–	1 (5.9%)	2 (11.8%)	5 (29.48%)	3 (17.6%)	1 (5.9%)	2 (11.8%)
Total	17 (100%)	17 (100%)	17	17 (100%)	17 (100%)	17 (100%)	17 (100%)

***** Percentage does not equal 100 due to rounding error.

Table 070 presents a distribution of ratings given by employees in health-related areas of the importance of each of the seven skill areas to job success. All the employees reported that skill with whole number operations was either very important or moderately important to success on their jobs. In addition, 94.1 percent rated fractional operations skills and reading skills as important to job success while 88.2 percent reporting that skills associated with decimal operations and writing were essential for effective job performance, with 82.4 percent identifying general mathematics skills and 70.6 percent identifying measurement skills as essential for effective job performance.

Table 071: Crossbreak Analysis of New Home Economics Employees' Perceptions of the Importance of Selected Skills for Job Success

Ratings	Whole	Fractions	Decimals*	Measurements	General	Reading	Writing
Very Important	16 (94.1%)	15	10	1 (5.9%)	3(17.6%)	10	5(29.4%)
Moderately	–	1 (5.9%)	3 (17.6%)	4 (23.5%)	6(35.3%)	5(29.4%)	6(35.3%)

Table 071 (Continued)

Unimportant	1 (5.9%)	1 (5.9%)	4 (23.5%)	12 (70.6%)	8 (47.1%)	2 (11.8%)	6(35.3%)
Total	17 (100%)	17(100%)	17(99.9%)	17 (100%)	17 (100%)	17(100%)	17(100%)

* Percentage does not equal 100 due to rounding error.

Table 071 shows a distribution of the ratings given by employees in home economics of the importance of the basic academic skills in the seven areas to job success. Nearly all of the home economics employees (94.1%) reported that the skills used in whole number operations (addition, subtraction, multiplication, and division) were "very important" to success on their jobs. There appeared to be wide variations in their ratings of other skill areas, with 94.1 percent rating skills used in fractional operations as either very important or moderately important, 89.2 percent rating reading skills similarly, and 76.5 rating decimal operations skills, 64.7 percent rating writing skills, 52.9 percent rating general mathematics skills, and only 29.4 percent rating measurement skills as either very important or moderately important for job success.

Table 072: Crossbreak Analysis of New Technical Employees' Perceptions of the Importance of Selected Skills for Job Success

Ratings	Whole	Fractions	Decimals	Measurement	General	Reading	Writing
Very Important	12 (92.3%)	9 (69.2%)	11	6 (46.2%)	9 (69.2%)	7 (53.8%)	7 (53.8%)
Moderately Important	1 (7.7%)	3 (23.1%)	2 (15.4%)	5 (38.5%)	4 (30.8%)	6 (46.2%)	3 (23.1%)
Unimportant	–	1 (7.7%)	–	2 (15.4%)	–	–	3 (23.1%)
Total	13 (100%)	13	13 (100%)	13 (100.1%)	13 (100%)	13	13

Table 072 presents a distribution of ratings given by employees in technical areas of the importance of the seven basic academic skills to success on their jobs. All the technical employees reported that skills in whole number operations, decimal operations, general mathematics, and reading were essential to job success. With respect to the other skill areas, 92.3 percent rated fractional operations skills as important for successful job performance, while 84.6 percent and 76.9 percent gave similar ratings to measurement skills and writing skills, respectively.

Table 073: Crossbreak Analysis of New Trade and Industry Employees' Perceptions of the Importance of Selected Skills for Job Success

Ratings	Whole	Fractions	Decimals	Measurement	General	Reading	Writing
Very Important	40 (85.1%)	34 (72.3%)	26 (56.5%)	15 (31.9%)	22 (46.8%)	29 (61.7%)	19 (40.4%)
Moderately	2 (4.3%)	6 (12.8%)	11 (23.9%)	17 (36.2%)	12 (25.5%)	13 (27.7%)	12 (25.5%)
Unimportant	5 (10.6%)	7 (14.9%)	9 {19.6%)	15 (31.9%)	13 (27.7%)	5 (10.6%)	16 (34.1%)
Total	47(100%)	47 (100%)	47 (100%)	47 (100.1%)	47 (100%)	47 (100%)	47 (100%)

Table 073 shows a distribution of the ratings given by employees in trade and industry of the importance of the seven skill areas to job success. They all reported that whole number operations skills were necessary for success in business-related areas. They also rated general mathematics skills as either very important or moderately important. Reading and fractional operations skills were deemed essential to job success by 90 percent of the employees, while 70 percent felt similarly about writing skills and 50 percent felt the same about measurement skills.

Table 074: Crossbreak Analysis of New Business Employees' Perceptions of the Importance of Selected Skills for Job Success

Ratings	Whole	Fractions	Decimals	Measurement	General	Reading	Writing
Very Important	10 (100%)	6 (60%)	9 (90%)	1 (10%)	5 (50%)	9 (90%)	7 (70%)
Moderately	––	3 (30%)	1 (10%)	4 (40%)	5 (50%)	–	–
Unimportant	–	1 (10%)	–	5 (50%)	–	1 (10%)	3 (30%)
Total	10 (100%)	10 (100%)	10 (100%)	10 (100%)	10 (100%)	10 (100%)	10 (100%)

Table 074 shows a distribution of the ratings given by employees in the business area of the importance of the seven skill areas to job success. They all reported that whole number operations skills were important to job success. They also rated skills in general mathematics as very important or moderately important. Ninety percent said that skills in reading and operations with fractions were important in the business area, while 70 percent rated writing and 50 percent rated measurement skills as important.

To further study the ratings given by employees of the importance of each skill on their jobs across the seven program areas, we calculated the means and standard deviations of their ratings. Tables 075 through 081 show the distributions of means, standard deviations, and 95 percent confidence intervals for each skill across the seven program areas.

Table 075: Mean Distribution of Employees' Ratings of the Importance of Whole Number Operations

Program Area	—	Sd	95% Confidence Interval for Mean
Agric. Education	1.23	0.40	0.97 to 1.50

Table 075 (Continued)

Dist. Education	1.77	0.60	1.41 to 2.13
Health Education	1.47	0.72	1.10 to 1.84
Home Economics	1.40	0.52	1.03 to 1.77
Business	1.46	0.66	1.06 to 1.86
Technical	1.65	0.79	1.24 to 2.05
Trade & Industry	1.79	1.08	1.47 to 2.11

Despite some differences in the perceptions of new employees (as should be expected in any opinion survey), the mean ratings fell between 1.23 and 1.79, putting the means between very important and quite important. The variations in ratings within programs were minimal. All new employees across the seven program areas rated whole number operations skills as essential to success on their jobs. Even though there were some small differences in their mean perceptions, the variations were not large enough to indicate any significant differences among the groups or between any two program areas at the 0.05 level.

Table 076: Mean Distribution of Employees' Ratings of the Importance of Operations with Fractions

Program Area	—	Sd	95% Confidence Interval for Mean
Agric. Education	2.08	1.19	1.36 to 2.79
Dist. Education	2.85	1.21	2.11 to 3.58
Health Education	1.88	0.93	1.41 to 2.36
Home Economics	1.77	0.83	1.34 to 2.19

Table 076 (Continued)

Business	2.40	1.17	1.56 to 3.24
Technical	2.15	0.90	1.61 to 2.70
Trade &	2.17	1.22	1.81 to 2.53

The mean ratings of skills in operations with fractions given by new employees in six of the seven program areas were, as shown in table 076, around 2.00, that is, quite important. The other group rated such skills at around 3, which is moderately important. Taken together these results suggest that fractional operations skills were important for success in the diverse program areas. Despite minor differences in the opinions expressed by new employees across the program areas, the variations were not significant enough at the 0.05 level. Hence, there was no significant result shown by the ANOVA.

Table 077: Mean Distribution of Employee's Ratings of the Importance of Decimal Operations

Program Area	—	Sd	95% Confidence Interval for Mean
Agric. Education	1.54	0.52	1.23 to 1.85
Dist. Education	2.15	0.99	1.56 to 2.75
Health Education	2.00	1.00	1.49 to 2.51
Home Economics	2.59	0.94	2.11 to 3.07
Business	1.70	0.68	1.22 to 2.18
Technical	1.69	0.75	1.24 to 2.15
Trade & Industry	2.53	1.18	2.19 to 2.88

Turning to table 077 and decimal operations skills, the differences in mean perceptions were compensated for by the uniformity of the variances. The mean perception was around 2.00 (i.e., quite important) in five of the seven program areas, while the mean perception of the other two—home economics and trade and industry—was around 3.00 (i.e., somewhat important). Still, the variations in the ratings given by employees in some of the first five groups were larger than were those in the other groups. The standard deviation for home economics was 0.94 with a mean of 2.59. We can therefore conclude that despite the differences in the opinions of employees about the importance of decimal operations skills, these differences were not large enough to be significant at the 0.05 level.

Table 078: Mean Distribution of Employees' Ratings of the Importance of Measurement Skills

Program Area	—	Sd	95% Confidence Interval for Mean
Agric. Education	2.15	0.99	1.56 to 2.75
Dist. Education	3.15	1.21	2.42 to 3.89
Health Education	2.65	1.27	1.99 to 3.30
Home Economics	3.59	0.80	3.18 to 4.00
Business	3.40	0.70	2.90 to 3.90
Technical	2.69	0.75	2.24 to 3.15
Trade & Industry	3.04	0.96	2.76 to 3.32

Table 078 shows that the mean ratings of measurement skills range from 2.15 to 3.59. A critical look at the distribution table reveals that, despite the low mean ratings given by employees in some program areas, there is considerable uniformity.

The ratings within each program area were homogeneous. This could be seen from home economics, with a mean of 3.59 and a standard deviation of 0.70. There is a wide variation in the mean ratings given by home economics employees and those from agricultural education resulting in the significant difference reported above. The wide variation is also seen in the distribution of the 95 percent confidence interval for the means, 1.56 to 4.00.

Table 079: Mean Distribution of Employees' Ratings of the Importance of General Mathematics

Program Areas	$\bar{X}$	Sd.	95% Confidence Interval for Mean
Agric. Education	1.77	0.83	1.27 to 2.27
Dist. Education	2.54	0.78	2.07 to 3.01
Health Education	2.06	1.44	1.47 to 2.65
Home Economics	3.29	0.99	2.79 to 3.80
Business	2.30	0.82	1.71 to 2.89
Technical	2.08	0.76	1.62 to 2.54
Trade & Industry	2.72	1.04	2.41 to 3.03

Table 079 shows the mean distribution of new employee ratings of the importance of general mathematics to job success. The distribution ranged from 1.77 (quite important) to 3.29 (moderately important). There appears to be a significant difference in their ratings across the program areas. The 95 percent confidence interval for the means ranges from 1.27 to 3.80. This is a wide range.

Table 080: Mean Distribution of Employees' Ratings of the Importance of Reading

Program Area	—	Sd	95% Confidence Interval for Mean
Agric. Education	1.85	0.69	1.43 to 2.26
Dist. Education	2.15	0.99	1.56 to 2.76
Health Education	1.82	0.95	1.34 to 2.31
Home	2.29	0.99	1.79 to 2.80
Business	2.00	0.82	1.42 to 2.58
Technical	2.39	0,65	1.99 to 2.78
Trade &	2.38	0.90	2.12 to 2.65

Table 080 shows the profile of ratings given by employees of the importance of reading skills for success on their jobs. The ratings ranged from 1.82 to 2.39. The variation across the program areas is minimal. The average rating across the seven program areas was 2.00, or quite important. There appear to be no significant differences in their mean ratings as shown in the table. Even though the 95 percent confidence interval ranged from 1.34 to 2.80 across the diverse program areas, all the employees regarded reading as an important skill for success in their programs.

Table 081: Mean Distribution of Employee's Ratings of the Importance of Writing

Program Area	—	Sd	95% Confidence Interval for Mean
Agric. Education	2.00	1.41	1.15 to 2.86
Dist. Education	2.08	1.32	1.28 to 2.88
Health Education	1.65	1.06	1.10 to 2.19

Table 081 (Continued)

Home Economics	3.06	1.20	2.44 to 3.68
Business	2.30	1.49	1.23 to 3.37
Technical	2.69	0.86	2.18 to 3.21
Trade & Industry	2.79	1.30	2.41 to 3.17

There is seen in table 081 some variation in the mean perceptions of new employees across the diverse program areas of the significance of writing skills for job success. The mean opinions ranged from 1.65 (quite important) to 3.06 (moderately important). The difference in mean perception is observable, but not great enough to conclude that any two groups were significantly different at the 0.05 level. Employees across the diverse program areas regard writing skills as indispensable tools. Success on the job is contingent on adequate efficiency in these skills.

Even though there appear to be differences in the opinions and beliefs of employees in each of the seven program areas about the importance of basic academic skills to job success, we cannot say here that such differences are statistically significant. We then conducted further analysis using one-way ANOVA, with each test at the 0.05 level of significance. Tables 082 though 088 present our findings.

Table 082: Analysis of Variance of Employees' Perceptions of the Importance of Whole Number Operations to Job Success

Source	DF	Sum of	Mean Squares	F Ratio	F Prob	Sig/Not-
Between	6	4.76	0.79	1.13	0.35	Not-Sig
Within	123	86.24	0.70			

Table 082 (Continued)

Total	129	91.00				

Significance established at 2.10 at the 0.05 level.

Based on table 082, where $F(6, 123)=1.13$ and $p=0.35$ (so $p>0.05$), we concluded that there was no significant difference in the opinions expressed by new employees across the diverse program areas about the importance of whole number operations to job success. No two groups were significantly different at the 0.05 level. This finding confirms the descriptive statistical analysis that pointed out that new employees in all the program areas agreed that skills in performing whole number operations were essential to success in their programs.

Table 083: Analysis of Variance of Employees' Perceptions of the Importance of Operations with Fractions to Job Success

Source	DF	Sum of	Mean Squares	F Ratio	F Prob	Sig/Non-
Between	6	10.75	1.79	1.47	0.19	Non-sig
Within	123	150.17	1.22			
Total	129	160.92				

Significance established at 2.10 at the 0.05 level.

Based on table 083, where $F(6, 123)=1.47$ and $p=0.19$ (so $p>0.05$), we concluded that there was no significant difference in the perceptions of new employees in the seven program areas of the significance of fractional operations skills to success on their jobs. No two groups were significantly different at the 0.05 level.

Table 084: Analysis of Variance of Employees' Perceptions of the Importance of Decimal Operations to Job Success

Source	DF	Sum of	Mean Squares	F Ratio	F Prob	Sig/Not-
Between	6	19.96	3.33	3.42	0.0037	Sig
Within	123	119.61	0.97			
Total	129	139.57				

Significance established at 2.10 at the 0.05 level.

Based on table 084, where F(6, 123=3.42 and p=0.0037 (so p<0.05), we concluded that there was a significant difference in the opinions expressed by new employees about the importance of decimal operations skills to job success. Two post hoc tests were carried out. A Scheffe's test revealed that no two groups were significantly different at the 0.05 level.[30] An S-test pointed out that even though there were differences, they were not significant enough between any two groups.

Table 085: Analysis of Variance of Employees' Perceptions of the Importance of Measurement to Job Success

Source	DF	Sum of	Mean Squares	F Ratio	F Prob	Sig/Not-Sig
Between	6	20.46	3.41	3.54	0.0029	Sig
Within	123	118.47	0.96			
Total	129	138.93				

Significance established at 2.10 at the 0.05 level.

Based on table 085, where F(6, 123)=3.41 and p=0.0029 (so p<0.05), we concluded that there was a significant difference in the perceptions of new employees of the importance of measurement skills for job success. A post hoc comparison test

[30] The significant difference might have been within the complex groups and not from group to group.

revealed that the perceptions of new employees in the agricultural education area were significantly different from the perceptions of employees in home economics. This observation supports an earlier finding of the descriptive analysis. No other two programs were significantly different from each other in their perceptions of the importance of measurement skills.

Table 086: Analysis of Variance of Employees' Perceptions of the Importance of General Mathematics to Job Success

Source	DF	Sum of	Mean Squares	F Ratio	F Prob	Sig/Not-Sig
Between	6	26.06	4.34	4.67	0.0003	Sig
Within	123	114.44	0.93			
Total	129	140.50				

Significance established at 2.10 at the 0.05 level.

Based on table 086, where $F(6, 123)=4.67$ and $p=0.0003$ (so $p<0.05$), we concluded that there was a significant difference in the perceptions of new employees in the diverse program areas of the significance of general mathematics skills to success on their jobs. Post hoc comparisons revealed that the differences were pronounced between home economics and health education on the one hand and home economics and agricultural education on the other hand. No other two groups were significantly different at the 0.05 level.

Table 087: Analysis of Variance of Employees' Perceptions of the Importance of Reading to Job Success

Source	DF	Sum of	Mean Squares	F Ratio	F Prob	Sig/Non-sig
Between	6	6.62	1.10	1.42	0.21	Non-sig
Within	123	95.57	0.78			

Table 087 (Continued)

Total	129	102.19				

Significance established at 2.10 at the 0.05 level.

Based on table 087, where F(6, 123)=1.42 and p=0.21 (so p>0.05), we concluded that there was no significant difference in the opinions expressed by new employees about the importance of reading skills to job success. No two groups were significantly different at the 0.05 level.

Table 088: Analysis of Variance of Employees' Perceptions of the Importance of Writing to Job Success

Source	DF	Sum of	Mean Squares	F Ratio	F Prob	Sig/Not-Sig
Between	6	27.94	4.66	2.98	0.0095	Sig
Within	123	192.49	1.57			
Total	129	220.43				

Significance established at 2.10 at the 0.05 level.

Based on table 088, where F(6, 123)=2.98 and p=0.0095 (so p>0.05), we concluded that there was a significant difference in the opinions of new employees across the seven program areas about the importance of writing skills for success on their jobs. A post hoc comparison test revealed that, even though there were differences, they were not significant enough to conclude that any two groups were significantly different from each other at the 0.05 level.

Research Question 6: *What differences exist in the opinions expressed by employers of new high school graduates in the various occupational programs about how important the basic academic skills were for successful job performance?*

In recent years, employers of labor have been complaining bitterly about the inadequacy of their new employees' basic skills. In this investigation, employers of new graduates in the diverse job areas were requested to indicate, in their opinions, which basic academic skills were important for job success and which ones were not important. They were requested to rate each of the 38 identified skills associated with reading, writing, and computation on a five-point Likert scale, with ratings of 1, 2, 3, 4, and 5 indicating, respectively, "very important," "quite important," "moderately important," "not quite important," and "not at all important."

Their ratings were further reclassified into three main categories, with ratings of "very important" and "quite important" reclassified as "very important" and "not quite important" and "not at all important" reclassified as "unimportant." The classification "moderately important" was left unchanged. Tables 089 through 096 present the crossbreak analyses of employer ratings of the importance of basic academic skills to the success of new high school graduates.

Table 089 below shows that, in the opinions of employers across the various vocational areas, writing skills were the most important. All the employers rated this skill as essential to effective and efficient job performance. Second in rank was that of whole number operations, with 97.3 percent of employers reporting that this skill was important for success on the job. This was followed in the ranking by reading skills at 95.9 percent, fractional operations skills at 93.3 percent, decimal operations skills at 89.3 percent, general mathematics skills at 85.4 percent, and measurement skills at 78.7 percent.

Table 089 also permits us to observe that the employers' emphases on skills varied from program to program.

Aside from measurement skills, at least 50 percent of employers in each program area rated all the skills as essential for job success.

Based on further analysis of specific measurement skills, we concluded that the use of each of these specific skills varies from program to program. Some programs, such as health education, agricultural education, and home economics, emphasized the use of liquid measurement, while others, such as technical education, trade and industry education, and distributive education, emphasized the measurement of lengths as well as weights. No two occupational groups reported identical importance across skills.

Table 089: Crossbreak Analysis of Employers' Perceptions of the Importance of Selected Skills to Job Success

Skills	All Employers N = 75	Agric. Educ. N = 9	Dist. Educ. N = 5	Health Educ. N = 8	Home Econs N = 9	Business Educ. N = 9	Tech. Educ. N = 6	T & T N= 28
Whole No Operations	97.3%	100%	100%	100%	100%	88.9%	100%	100%
Fraction Operations	93%	88.9%	100%	87.5%	90%	88%	100%	100%
Decimal Operations	89.3%	100%	100%	87.5%	70%	55.5%	100%	89.3%
Measurements	78.7%	88.9%	80%	87.5%	20%	77.8%	100%	96.4%
General Mathematics	85.4%	88.9%	100%	87.5%	50%	88.9%	100%	92.9%
Reading	95.9%	100%	100%	100%	90%	100%	100%	96.4%
Writing	100%	100%	100%	100%	100%	100%	100%	100%

Table 090: Crossbreak Analysis of Agricultural Employers' Perceptions of the Importance of Selected Skills to Job Success

Ratings\	Whole	Fractions	Decimals	Measurement	General	Reading	Writing
Very Important	9 (100%)	7	9 (100%)	8 (88.9%)	5 (77.8%)	8	8 (88.9%
Moderately	–	1	–	–	1 (11.1 %)	1	1 (11.1%)

Table 090 (Continued)

Unimportant	–	1	––	1 (11.1%)	1 (11.1%)	–	–
Total	9 (100%)	9 (100%)	9 (100%)	9 (100.1%)	9 (100%)	9 (100%)	9 (100%)

Table 090 indicates that nearly all the employers in the agricultural area reported that all the skills were important to success on the job. There was unanimous agreement on the importance of whole number operations and decimal operations, while 88.9 percent rated measurement, reading, and writing skills as important, while 77.8 percent rated fractional operations skills as essential to job success. Only one employer reported that fractional operations, measurement, and general mathematics skills were unimportant. Additional analysis revealed that the same employer gave these three ratings.

Table 091: Crossbreak Analysis of Distributive Employers' Perceptions of the Importance of Selected Skills to Job Success

Ratings\	Whole	Fractions	Decimals	Measurement	General	Reading	Writing
Very	5 (100%)	5 (100%)	5 (100%)	2 (40%)	5 (100%)	4 (80%)	4 (80%)
Moderately	–	–	–	2 (40%)	–	1 (20%)	1 (20%)
Unimportant	–	–	–	1 (20%)	–	–	–
Total	5 (100%)	5 (100%)	5 (100%)	5 (100.1%)	5 (100%)	5 (100%)	5 (100%)

Table 091 indicates that employers in distributive occupations agreed that skills in whole number operations, fractional operations, decimal operations, and general mathematics were essential to job success. Only one of the five employers in this area rated measurement skills as unimportant. All others rated each of the seven skills as either important or moderately important.

Table 092: Crossbreak Analysis of Health Employers' Perceptions of the Importance of Selected Skills to Job Success

Ratings\	Whole	Fractions	Decimals	Measurement	General	Reading	Writing
Very	8 (100%)	6 (75%)	7 (87.5%)	6 (75%)	7 (87.5%)	8 (100%)	8 (100%)
Moderately	–	1 (12.5%)	–	1 (12.5%)	–	–	–
Unimportant	–	1 (12.5%)	1 (12.5%)	1 (12.9%)	12 (12.5%)	–	–
Total	8 (100%)	8 (100%)	8 (100%)	8 (100.1%)	8 (100%)	8 (100%)	8 (100%)

Table 092 shows the distribution of ratings given by employers in health-related areas who responded to our questionnaire. All eight employers reported that skills in whole number operations, reading, and writing were essential to success in health-related areas. Seven of the eight employers reported that skills in fractional operations, decimal operations, measurement, and general mathematics were important or moderately important.

Table 093: Crossbreak Analysis of Home Economics Employers' Perceptions of the Importance of Selected Skills to Job Success

Ratings\	Whole	Fractions	Decimals	Measurement	General	Reading	Writing
Very	10 (100%)	8 (80%)	5 (50)	–	–	9 (90%)	9 (90%)
Moderately	–	1 (10%)	2 (20%)	2 (20%)	5 (50%)	–	1 (10%)
Unimportant	–	1 (100%)	3 (30%)	8 (80%)	5 (50%)	1 (10%)	–
Total	10 (100%)	10 (100%)	10 (100%)	10 (100%)	10 (100%)	10 (100%)	10 (100%)

Table 093 shows that employers in fields related to home economics did not agree on the significance of some of the seven skills. They all rated whole number operations skills as essential to successful job performance, while 90 percent rated reading and writing skills as essential, and 80 percent rated fractional operations skills as important. Only 50 percent and 20 percent, respectively, rated general mathematics and measurement skills as important.[31]

Table 094: Crossbreak Analysis of Business Education Employers' Perceptions of the Importance of Selected Skills to Job Success

Ratings\	Whole	Fractions	Decimals	Measurement	General	Reading	Writing
Very	8 (88.9%)	8 (88.9%)	3 (33.3%)	2 (22.2%)	7 (77.8%)	8(88.9%)	7(77.8%)
Moderately	–	–	2 (22.2%)	5 (55.6%)	1 (11.1%)	I(lU %)	2(22.2%)
Unimportant	1 (11.1%)	1 (11.1%)	4 (44.4%)	2 (22.2%)	1 (l1.1%)	–	–
Total	9 (100%)	9 (100%)	9 (100%)	9 (100%)	9 (100%)	9(100%)	9(100%)

Table 094 shows the distribution of ratings given by employers in business areas who responded to the survey. There is no uniform rating indicated by employers. Even though more than 50 percent of business employers agreed that all the skills were important, they were not unanimous in their ratings, with 88.9 percent rating whole number operations, fractional operations, and reading skills as important.

Table 095: Crossbreak Analysis of Technical Education Employers' Perceptions of the Importance of Selected Skills to Job Success

Ratings\	Whole	Fractions	Decimals	Measurement	General	Reading	Writing
Very	6 (100%)	6 (100%)	5 (83.3%)	6 (100%)	6 (100%)	4 (80%)	6 (100%)

[31] Additional analysis revealed that home economics employers did not agree on the significance of some specific measurement skills, even though they rated some of these skills highly.

Table 095 (Continued)

Moderately	–	–	1 (16.7%)	–	–	1 (20%)	–
Unimportant	–	–	–	–	–	–	–
Total	6 (100%)	6 (100%)	6 (100%)	6 (100%)	6 (100%)	5 (100%)*	6 (100%)

* A case of missing data

Table 095 shows that all employers in fields related to technical education rated all seven skills areas as either very important or moderately important. None rated any of the skills as unimportant.

Table 096: Crossbreak Analysis of Trade & Industry Employers' Perceptions of the Importance of Selected Skills to Job Success

Ratings\	Whole	Fractions	Decimals	Measurement	General	Reading	Writing
Very	26 (92.7%)	26 (92.7%)	21 (75%)	19 (67.9%)	14 (50%)	17	22 (78.6%)
Moderately	1 (3.6%)	2 (7.1%)	4 (14.3%)	8 (28.6%)	12	10	6 (21.4%)
Unimportant	1 (3.6%)	–	3 (10.7%)	1 (3.6%)	2 (7.1%)	1 (3.6%)	–
Total	28 (100%)	28 (100%)	28 (100%)	28 (100%)	28 (100%)	28	28 (100%)

Table 096 shows a distribution of the mean ratings given by employers in fields related to trade and industry education of the importance of the seven skill areas to effective job performance. Even though there are variations in the ratings of these employers across skill areas, about 90 percent rated all skills as either very important or moderately important for job success. Additional analyses were carried out to determine the ratings given by employers in each program area across the seven sub-skills. In spite of the differences indicated in employers' perceptions of the significance of each basic skill to job success, we cannot conclude that the variations in opinions were statistically significant. Tables 097 through 103 present our findings from a series of ANOVA analyses carried out for each skill area across the seven program areas.

Table 097: Analysis of Variance of Employers' Perceptions of the Importance of Whole Number Operations to Job Success

Source	DF	Sum of	Mean Squares	F. Ratio	F Prob	Sig/Non-sig
Between	6	2.18	0.36	0.85	0.54	Non-sig
Within	68	29.21	0.43			
Total	74	31.39				

Significance established at 2.24 at the 0.05 level.

Based on table 097, where F(6, 68)=0.85 and p= 0.54 (so p>0.05), we concluded that there was no significant difference in the opinions expressed by employers across the seven program areas about the importance of whole number operations skills to success on the job. No two groups were significantly different from one another at the 0.05 level.

Table 098: Analysis of Variance of Employers' Perceptions of the Importance of Operations with Fractions to Job Success

Source	DF	Sum of	Mean Squares	F. Ratio	F Prob	Sig/Non-sig
Between	6	11.37	1.89	2.13	0.06	Non-sig
Within	68	6958	0.89			
Total	74	71.95				

Significance established at 2.24 at the 0.05 level.

Based on table 098, where F(6, 68)=2.13 and p=0.06 (so p>0.05), we concluded that there was no significant difference in the perceptions of employers across the seven program areas about the importance of fractional operations skills to job success. No two groups were significantly different from one another at the 0.05 level.

Table 099: Analysis of Variance of Employers' Perceptions of the Importance of Decimal Operations to Job Success

Source	DF	Sum of	Mean Squares	F. Ratio	F Prob	Sig/Not-Sig
Between	6	14.01	2.34	2.56	0.03	
Within	68	61.91	0.91			Sig
Total	74	75.92				

Significance established at 2.24 at the 0.05 level.

Based on table 099, where F(6, 68)=2.56 and p=0.03 (so p<0.05), we concluded that there was a significant difference in the opinions expressed by employers across the seven program areas about the importance of decimal operations skills to job success. A Scheffe's test shows that no two groups were significantly different from one another at the 0.05 level.[32] We do know that there were differences, but this test did not reveal any two groups that differed significantly from one another. Additional tests were carried out to investigate the differences. The Student-Newman-Kuels comparison (SNK test) revealed that, at the 0.05 level, opinions given in the agricultural and home economics areas were significantly different from one another.

[32] This is one of the complex situations. Because of the conservative nature of the S-method, we do have such cases.

Table 100: Analysis of Variance of Employers' Perceptions of the Importance of Measurement Skills to Job Success

Source	DF	Sum of	Mean Squares	F. Ratio	F. Prob	Sig/Non-Sig
Between	6	33.13	5.52	6.82	0.00	Sig
Within	68	55.06	0.81			
Total	74	88.19				

Significance established at 2.24 at the 0.05 level.

Based on table 100, where $F(6, 68)=6.82$ and $p=0.00$ (so $p<0.05$), we concluded that there was a significant difference in the opinions expressed by employers across the diverse program areas about the importance of measurement skills to success on the job. Post hoc comparison tests revealed that the perceptions of employers in home economics differed significantly from those of employers in the agricultural, technical, trade and industry, and health-related areas.

Table 101: Analysis of Variance of Employers' Perceptions of the Importance of General Mathematics Skills to Job Success

Source	DF	Sum of	Mean Squares	F. Ratio	F Prob	Sig/Non-sig
Between	6	33.51	5.59	7.68	0.00	Sig
Within	68	49.48	0.73			
Total	74	82.99				

Significance established at 2.24 at the 0.05 level.

Based on table 101, where $F(6, 689)=7.68$ and $p=0.00$ (so $p<0.05$), we concluded that there was a significant difference in the opinions expressed by employers across the seven program areas about the importance of general mathematics skills to success on the job. A Scheffe's comparison test indicated that employers in the business and technical areas perceived the importance of general mathematics skills differently. Similarly, employers in fields related to home economics differed significantly in their opinions of the importance of general mathematics skills to job success from those in the technical, health, and agricultural fields.

Table 102: Analysis of Variance of Employers' Perceptions of the Importance of Reading Skills to Job Success

Source	DF	Sum of	Mean Squares	F. Ratio	F Prob	Sig/Not-Sig
Between	6	18.21	3.04	2.38	0.04	Sig.
Within	68	86.67	1.28			
Total	74	104.88				

Significance established at 2.24 at the 0.05 level.

Based on table 102, where F(6, 68)=2.38 and p=0.04 (so $p<0.05$), we concluded that there was a significant difference in the opinions expressed by employers across the seven program areas about the importance of reading skills to job success. A Scheffe's post hoc comparison test indicated that no two groups differed significantly from one another in their perceptions.

Table 103: Analysis of Variance of Employers' Perceptions of the Importance of Writing Skills to Job Success

Source	DF	Sum of	Mean Squares	F. Ratio	F Prob	Sig/Not-Sig
Between	6	3.74	0.62	1.23	0.30	Not-Sig
Within	68	34.45	0.51			
Total	74	38.19				

Significance established at 2.24 at the 0.05 level.

Based on table 103, where F(6, 68)=1.23 and p=0.30 (so p>0.05), we concluded that there was no significant difference in the opinions expressed by employers across the seven program areas about the importance of writing skills to job success. No two groups were significantly different from one another at the 0.05 level.

Additional analyses were carried out to determine the actual ratings given by graduates of each skill across the seven program areas. This enabled us to compare their ratings and further study the variability in ratings across program areas. Tables 104 through 110 present the means and standard deviations of employers' ratings across all program areas. The 95 percent confidence interval for each mean is also provided.

Table 104: Mean Distribution of Employers' Ratings of the Importance of Whole Number Operations to Job Success

Program Areas	$\overline{X}$	Sd	95% Confidence Interval for Mean
Agric. Education	1.00	0.00	1.00 to 1.00
Dist. Education	1.00	0.00	1.00 to 1.00
Health Education	1.00	0.00	1.00 to 1.00
Home Economics	1.10	0.32	0.87 to 1.33
Business Education	1.56	1.33	0.53 to 2.58
Technical Education	1.17	0.41	0.74 to 1.60
Trade & Industry	1.25	0.70	0.98 to 1.52

Table 104 indicates that employees across the seven program areas concur on the significance of whole number operations skills to job success. All the employers in the agricultural, distributive, and health-related areas rated these skills as "very important" for success, while the employers in fields related to home economics, business education, technical education, and trade and industry rated whole number operations skills as either "very important" or "quite important." The absence of significant differences in the perceptions of employers across program areas (as per a variance test) indicates their agreement on the importance of these skills.

Table 105: Mean Distribution of Employers' Ratings of the Importance of Operations with Fractions to Job Success

Program Areas	$\overline{X}$	Sd	95% Confidence Interval for Mean
Agric. Education	1.00	0.00	1.00 to 1.00
Dist. Education	1.00	0.00	1.00 to 1.00
Health Education	1.00	0.00	1.00 to 1.00
Home Economics	1.10	0.32	0.87 to 1.33
Business Education	1.56	1.33	0.53 to 2.58
Technical Education	1.17	0.41	0.74 to 1.60
Trade & Industry	1.25	0.70	0.98 to 1.52

Employers across the seven program areas, as shown in table 105, agreed on the importance of fractional operations skills to job success. Even though there was some variability in their ratings, such was not large enough to amount to a significant difference between any two groups. All employers in fields related to distributive education rated fractional operations skills as "very important," while the average rating given by employers in fields related to agricultural education, health education, home economics, business education, and technical education was in the quite important category.

Table 106: Mean Distribution of Employers' Ratings of the Importance of Decimal Operations to Job Success

Program Areas	$\overline{X}$	Sd	95% Confidence Interval for Mean
Agric.Education	1.44	0.53	1.04 to 1.85
Dist. Education	1.60	0.55	0.92 to 2.28
Health Education	1.50	0.07	0.61 to 2.39
Home Economics	2.80	0.92	2.14 to 3.46
Business Education	1.78	1.30	0.73 to 2.78
Technical Education	1.33	0.82	0.48 to 2.19
Trade & Industry	2.00	0.98	1.62 to 2.38

Table 106 shows the mean ratings given by employers of the importance of decimal operations skills to job success. Their mean ratings ranged from 1.33 (very important—given by employers in technical fields) to 2.80 (moderately important—given by home economics employers). There appears to be wide variability in the ratings across program areas. This could be seen from the 95 percent confidence interval. The standard deviation ranged from 0.53 to 1.30, which is a wide variation. There appear then to be significant differences in the perceptions of employers across program areas of the importance of decimal operations skills. Nevertheless, apart from the observed variability in perceptions, there seems to have been unison in their beliefs. Employers felt that decimal operations skills were important to success on the job.

Table 107: Mean Distribution of Employers' Ratings of the Importance of Measurement Skills to Job Success

Program Areas	$\overline{X}$	Sd	95% Confidence Interval for Mean
Agric. Education	1.78	0.97	1.03 to 2.53
Dist. Education	2.40	1.34	0.73 to 4.07
Health Education	1.88	1.13	0.93 to 2.82
Home Economics	3.80	0.24	3.50 to 4.10
Business Education	3.11	1.27	2.14 to 4.08
Technical Education	1.83	0.41	1.41 to 2.26
Trade & Industry	2.18	0.77	1.88

Table 107 shows the mean ratings given by employers across the seven program areas of the importance of measurement skills to job success. Employers' ratings did not agree. Some groups of employers rated measurement skills as quite important while others rated it as unimportant. There appears to have been wide variation in the ratings. Additional analysis indicated that employers in the diverse program areas did not agree on the importance of specific measurement skills to success on the job.

Table 108: Mean Distribution of Employers' Ratings of the Importance of General Mathematics Skills to Job Success

Program Areas	$\overline{X}$	Sd	95% Confidence Interval for Mean
Agric. Education	2.00	1.00	1.22 to 2.77
Dist. Education	1.80	0.45	1.25 to 2.36
Health Education	1.75	1.04	0.89 to 2.62

Table 108 (Continued)

Home Economics	3.50	0.53	3.12 to 3.88
Business Education	3.00	1.12	2.14 to 3.86
Technical Education	1.00	0.00	1.00 to 1.00
Trade & Industry	2.39	0.88	2.05 to 2.73

Table 108 shows the mean ratings given by employers across the seven program areas of the importance of general mathematics skills to job success. The mean ratings of these skills ranged from “very important” to “unimportant.” There was no agreement in perceptions. Employers across the seven program areas felt differently about the importance of general mathematics skills to success on the job.

Table 109: Mean Distribution of Employers’ Ratings of the Importance of Reading Skills to Job Success

Program Areas	$\overline{X}$	Sd	95% Confidence Interval for Mean
Agric. Education	1.89	0.60	1.43 to 2.35
Dist. Education	1.80	0.84	0.76 to 2.84
Health Education	1.25	0.46	0.86 to 1.64
Horne Economics	1.90	0. 88	1.27 to 2.53
Business Education	1.67	1.12	0.81 to 2.53
Technical Education	2.33	2;80	1.39 to 3.28
Trade & Industry	2.25	0.93	1.89 to 2.61

Table 109 shows the mean ratings given by employers across the seven program areas of the importance of reading skills to job success. With the exception of health-related employers, who rated these skills as very important, all other employer groups rated reading skills as quite important. Even though the ratings were not uniform, all employers agreed that reading skills constitute an important ingredient in job success.

Table 110: Mean Distribution of Employers' Ratings of the Importance of Writing Skills to Job Success

Program Areas	$\overline{X}$	Sd	95% Confidence Interval for Mean
Agric. Education	1.67	0.70	1.12 to 2.21
Dist. Education	1.60	0.89	0.49 to 2.71
Health Education	1.00	0.00	1.00 to 1.00
Home Economics	1.50	0. 71	0.99 to 2.01
Business Education	1.67	1.71	1.12 to 2.21
Technical Education	2.50	2.55	0.93 to 2.08
Trade & Industry	2.75	0.80	1.44 to 2.06

Table 110 shows the mean ratings given by employers across the seven program areas of the significance of writing skills to job success. Even though there was some variability in the ratings across the seven program areas, all employers concurred that these are important skills. Their ratings fell between very important and important. No two groups of employees differed widely in their ratings.

Research Question 7: *Within a given program area, do new employees and their employers agree on the relative importance of the several basic academic skills to job success?*

This research question asks whether there is a fit between employers' and employees' opinions of the skills that are important to job success. To determine the degree of fit, a correlational analysis was conducted.[33] First, we compared the mean ratings of each skill given by employees with those given by their new employees. The comparison was carried out for each program area. We then compared the percentages of employees rating the same skill as essential to success on their jobs. Finally, we presented mean ratings given by all employers and employees for each skill area and compared them with one another. Tables 111 through 126 present our findings.

Table 111: Comparative Analysis of Employers' and Employees' Ratings of the Importance of Selected Skills to Job Success (Agriculture)

Skills	Mean Ratings of Employees	Mean Ratings of Employers
	N = 27	N = 9
Whole No. Operations	1.23	1.00
Operations with Fractions	2.08	2.00
Decimal Operations	1.54	1.44
Measurements	2.15	1.78
General Mathematics	1.77	2.00
Reading	1.85	1.89
Writing	2.00	1.67

Spearman's Rank Order Correlation Coefficient (r = 0.53).

[33] A t-test would also be adequate for investigating the significance of the mean differences between the ratings of skills across program areas, but a t-test would not tell us the direction of the difference.

Table 112: Comparative Analysis of Employers' and Employees' Ratings of the Importance of Selected Skills to Job Success (Distributive Education)

Skills	Mean Ratings of Employees' Opinions	Mean Rating of Employers' Opinions
	N =16	N= 5
Whole No. Operations	1.77	1.00
Operations with Fractions	2.85	1.00
Decimal Operations	1.15	1.60
Measurements	2.15	2.40
General Mathematics	1.54	1.80
Reading	1.15	1.80
Writing	2.08	1.60

Spearman's Rank Order Correlation Coefficient (r = 0.52).

Table 113: Comparative Analysis of Employers' and Employees' Ratings of the Importance of Selected Skills to Job Success (Health)

Skills	Mean Ratings of Employees' Opinions	Mean Rating of Employers' Opinions
	N =17	N=8
Whole No. Operations	1.47	1.00
Operations with Fractions	1.88	1.75
Decimal Operations	2.00	1.50
Measurements	2.65	1.88
General Mathematics	2.06	1.75

Table 113 (Continued)

Reading	1.82	1.25
Wliting	1.65	1.00

Spearman's Rank Order Correlation Coefficient (r = 0.93).

Table 114: Comparative Analysis of Employers' and Employees' Ratings of the Importance of Selected Skills to Job Success (Home Economics)

Skills	Mean Ratings of Employees'	Mean Ratings of Employers'
	N =13	N=5
Whole No. Operations	1.65	1.00
Operations with Fractions	1.77	2.10
Decimal Operations	2.59	2.80
Measurements	3.59	3.80
General Mathematics	3.29	3.50
Reading	2.29	1.90
Writing	3.06	1.50

Spearman's Rank Order Correlation Coefficient (r = 0.75).

Table 115: Comparative Analysis of Employers' and Employees' Ratings of the Importance of Selected Skills to Job Success (Business)

Skills	Mean Ratings of Employees'	Mean Ratings of Employers'
	N =10	N=9
Whole No. Operations	1.40	1.56
Operations with Fractions	2.40	2.33

Table 115 (Continued)

Decimal Operations	1.70	1.78
Measurements	3.40	3.11
General Mathematics	2.30	3.00
Reading	2.00	1.67
Writing	2.30	1.67

Spearman's Rank Order Correlation Coefficient (r = 0.82).

Table 116: Comparative Analysis of Employers' and Employees' Ratings of the Importance of Selected Skills to Job Success (Technical)

Skills	Mean Ratings of Employees'	Mean Ratings of Employers'
	N =13	N=6
Whole No. Operations	1.46	1.17
Operations with Fractions	2.15	1.50
Decimal Operations	1.69	1.33
Measurements	2.69	1.83
General Mathematics	2.08	1.00
Reading	2.39	2.33
Writing	2.69	1.50

Spearman's Rank Order Correlation Coefficient (r = 0.75).

Table 117: Comparative Analysis of Employers' and Employees' Ratings of the Importance of Selected Skills to Job Success (Trade and Industry)

Skills	Mean Ratings of Employees'	Mean Ratings of Employers'
	N =47	N=23
Whole No. Operations	1.79	1.25
Operations with Fractions	2.17	1.39
Decimal Operations	2.53	2.00
Measurements	3.04	2.18
General Mathematics	2.72	2.39
Reading	2.38	2.25
Writing	2.79	1.75

Spearman's Rank Order Correlation Coefficient (r = 0.54).

Based on tables 111 through 117, there appeared to be a varying relationship between the perceptions of employers and those of their new employees of the importance of the several skills to job success. The coefficient of correlation ranges from 0.93 (a very strong relationship) to 0.52 (a weak relationship), with the greatest agreement found between the perceptions in health-related fields, while the least agreement was found in the distributive area. Further discussion will follow in chapter 5. From the percentage distributions of employers' and employees' ratings, tables 118 through 124 indicate that there was perfect agreement in the numbers and percentages of people in agricultural fields. All employers in the distributive area reported that the seven skill areas were important to effective job performance, while there was variability in the ratings given by employees in distributive occupations of the importance of whole number operations skills, as 12, or 92.3 percent of 13, rated skills in decimal operations, general mathematics, and reading as important to successful job performance.

Both employers and employees in health-related occupations rated whole number operations skills as important for efficient job performance. Another highly rated set off skills were those used in reading, followed by writing skills, decimal operations skills, general mathematics skills, and measurement skills (see table 120).

Table 118: Comparative Analysis of Employers' and Employees' Opinions of the Importance of Selected Skills to Job Success (Agriculture)

Skills	% of Employees Rating Skill as	% of Employers Rating Skills
	N=13	N=9
Whole No. Operations	100	100
Operations with Fractions	92.3	88.9
Decimal Operations	100	100
Measurements	92.3	88.9
General Mathematics	92.3	88.0
Reading	100	100
Writing	100	100

Table 119: Comparative Analysis of Employers' and Employees' Opinions of the Importance of Selected Skills to Job Success (Distributive)

kills	% of Employees Rating	% of Employers Rating
	N=13	N=5
Whole No. Operations	100	100

Table 119 (Continued)

Operations with Fractions	77	100
Decimal Operations	92.3	100
Measurements	66.8	80
General Mathematics	92.3	100
Reading	92.3	100
Writing	84.6	100

Table 120: Comparative Analysis of Employers' and Employees' Opinions of the Importance of Selectged Skills to Job Success (Health)

Skills	% of Employees Rating	% of Employers Rating
	N=17	N=8
Whole No. Operations	100	100
Operations with Fractions	94.1	87.5
Decimal Operations	88.3	87.5
Measurements	70.6	87.5
General Mathematics	82.4	87.5
Reading	95.1	100
Writing	88.3	100

Table 121: Comparative Analysis of Employers' and Employees' Opinions of the Importance of Selected Skills to Job Success (Home Economics)

Skills	% of Employees Rating	% of Employers Rating
	N=13	N=5
Whole No. Operations	94.1	100
Operations with Fractions	94.1	90
Decimal Operations	76.4	70
Measurements	30.4	20
General Mathematics	52.9	50
Reading	88.3	90
Writing	64.7	100

Table 122: Comparative Analysis of Employers' and Employees' Opinions of the Importance of Selected Skills to Job Success (Business)

Skills	% of Employees Rating Skill as Important	% of Employers Rating Skill as Important
	N=l0	N=9
Whole No. Operations	100	88.9
Operations with Fractions	90.0	88.9
Decimal Operations	100.0	55.5
Measurements	50.0	77.8
General Mathematics	100.0	88.9
Reading	90.0	100.0

Table 122 (Continued)

Writing	70.0	100.0

Table 123: Comparative Analysis of Employers' and Employees' Opinions of the Importance of Selected Skills to Job Success (Technical)

Skills	% of Employees Rating	% of Employers Rating
	N=13	N=6
Whole No. Operations	100	100
Operations with Fractions	92.3	100
Decimal Operations	100	100
Measurements	87.9	100
General Mathematics	100	100
Reading	100	100
Writing	76.9	100

Table 124: Comparative Analysis of Employers' and Employees' Opinions of the Importance of Selected Skills to Job Success (Trade and Industry)

Skills	% of Employees Rating	% of Employers Rating
	N=47	N=23
Whole No. Operations	89.4	96.4
Operations with Fractions	71.1	100
Decimal Operations	79.4	89.3
Measurements	68.1	96.4

Table 124 (Continued)

General Mathematics	72.3	92.9
Reading	89.4	96.4
Writing	65.9	100.0

Both employers and employees in occupations related to home economics rated whole number operations skills as highly essential to job success. They also agreed on the importance of fractional operations skills, but they disagreed on the importance of writing skills. While all employers rated writing skills as important to success on the job, only 64.7 percent of employees reported similarly. See table 121 for more information.

Table 122 shows the percentages of employers and employees in business-related occupations who rated each skill as important. Ten employees and nine employers responded to our questionnaire. Of these, all nine employers reported that reading and writing skills are the most important for job success, while only eight of them rated skills in whole number operations, fractional operations, and general mathematics as important to success on the job. Only five of the nine employees reported that decimal operations skills were used on their jobs. On the other hand, all ten employees rated skills in whole number operations, decimal operations, and general mathematics as essential to successful job performance. Nine of the ten employees reported that skills in fractional operations and reading were essential to job success. Of the ten employees, seven rated writing skills as important while only half reported that measurement skills were need on their jobs.

Table 123 shows the percentages of the ratings given by employers and employees in technical areas of the importance of each of the seven skill areas to job success. All six employers in technical occupations rated each of the seven skill areas as important to success on the job. The thirteen employees rated skills in whole number operations, decimal operations, general mathematics, and reading as important to successful job performance. Twelve of them rated fractional operations skills as essential, while 87.9 percent rated measurement skills as important and 76.9 percent gave a similar rating to writing skills.

In trade and indutry, 47 employees and 28 employers responded to our questionnaire. All 28 employees rated writing and decimal operations skills as essential to job success. Even though there are variations, it seems as if employers in trade and industry rated all the skill areas as important to effective job performance. The same goes for employees. See table 124.

Table 125: Profile of Employees' Ratings of the Importance of Selected Skills to Job Success

Skills	$\overline{X}$	Sd	95% Confidence Interval for Mean
Whole No. Operations	1.61	0.84	1.46 to 1.75
Operations with Fractions	2.15	1.12	1.96 to 2.35
Decimal Operations	2.19	1.04	2.00 to 2.37
Measurements	2.98	1.04	2.80 to 3.16
General Mathematics	2.50	1.04	2.32 to 2.68
Reading	2.19	0.89	2.04 to 2.35
Writing	2.48	1.31	2.25 to 2.70

Table 125 shows a distribution of employee ratings of the importance of the seven sub-basic academic skills to job success. We conclude on the basis of the data in this table that, in the opinions of employees across all program areas, all the basic skills were important for successful job performance. Even though there is variability in their ratings, there seems to be uniform agreement on the importance of these skills. The mean ratings range from 1.16 (quite important) for whole number operations skills to 2.98 (moderately important) for measurement skills. The 95 percent confidence interval for the mean, which ranged from 1.46 to 3.16, confirms this observation. No skill was rated as unimportant by the new employees.

A similar analysis was carried out for employers, the results of which are shown in table 126.

Table 126: Profile of Employers' Ratings of the Importance of Selected Skills to Job Success

Skills	$\overline{X}$	Sd	95% Confidence Interval for Mean
Whole No.	1.19	0.65	1.04 to 1.33
Operations with	1.69	0.99	1.49 to 1.92
Decimal Operations	1.88	1.01	1.65 to 2.11
Measurements	2.41	1.09	2.16 to 2.67
General	2.35	1.06	2.10 to 2.59
Reading	2.04	1.19	1.77 to 2.31
Writing	1.59	0.72	1.42 to 1.75

Table 126 shows a profile of the mean ratings given by 75 employers of the importance of each skill to job success. There was unanimity in the ratings of skills across the diverse program areas. Employers concurred that all the skills were essential for effective job performance. The average rating of measurement skills given by all 75 employers ranged from 1.19 (very important) to 2.41 (quite important). No skill was rated as unimportant by the employers. The ratings of whole number operations skills exhibited the least variability (with a standard deviation of 0.65). This means that all employers concurred on their importance. The same goes for writing skills. Looking at the 95 percent confidence interval, we have a maximum range of 1.63.

The mean ratings given by all employers and employees were ranked for each group and the Spearman's rank order coefficient of correlation was calculated to determine the extent of agreement in their ratings. The value of (r_s) was +0.78, indicating a high degree of correlation between the two ratings.[34] On the whole, both employers and employees agreed in the directions of their ratings. Even though there were differences in the absolute values of their ratings, none of them rated any skill as unimportant. The 130 employees' mean ratings ranged from 1.61 or quite important to 2.98 or moderately important, while the 74 employers' mean ratings ranged from 1.19 or very important to 2.41 or quite important. Their emphases differed with respect to some of the skills, for example writing and reading. Further discussion will follow in chapter 5.

Research Question 8: *Are the abilities of those employed in relevant job areas significantly different from state norms for successful high school vocational program completers?*

---

[34] The expression "r_s" stands for Spearman's rank order correlation coefficient.

Table 127 presents a distribution of the mean scores of the 1981 seniors and the mean scores of the graduates employed in areas related to their high school majors. Each score is taken out of a maximum of 12 points.

Table 127: Comparison of Graduated Employees' Ability Scores in Areas Related to their High School Majors with State Norms in the Same Areas

Skills	Mean Ability Scores of Graduated	State Norms from 1981 Survey*
	N = 130	N = 1366
Whole No.	11.1	10.9
Operations with	7.3	7.1
Decimal	8.7	8.3
Measurements	7.5	6.8
General	7.5	6.6
Reading	9.0	8.8
Language usage	9.1	8.9
Grammar	8.4	8.3
Mechanics	6.8	7.2

* Maximum score = 12 points.

Graduates who were employed in their areas of training performed consistently better than state norms in most of the skill areas. Both groups had their highest scores in whole number operations, followed by language usage. The employees' worst scores came in mechanics, while the worst state norm was in general mathematics.

Additional analyses (t-tests) were carried out to determine the statistical differences in mean scores across the skill areas, revealing that there was no significant difference at the 0.05 level.

Research Question 9: *Among those in the category of employed in a relevant area, do those with longer stays on the job perceive the importance of skills differently from those whose stays were shorter?*

One of the basic assumptions has been that "a new employee who can keep a job for six months or more probably has the minimum level of skills required for success on the job." With this assumption in mind, it would be interesting to investigate whether, among those employed in relevant jobs, those who stayed more than six months on a job performed differently from those who stayed less than six months. The investigator was also interested in finding out whether the perceptions of the importance of the various skills to job success reported by employees in these two categories differed significantly.

To accomplish these goals, we carried out a distribution of the mean scores on the basic skills test, and a distribution of their mean perceptions. We then followed these with 2-sample t-tests for independent groups to determine the significance of mean differences. Tables 128 and 129 present our findings.

Table 128: Results of t-Tests Applied to Differences in Mean Scores between Short- and Long-Tenured Employees

Skills	Less than six months			More than six months			t	P
	N	$\overline{X}$	Sd	N	$\overline{X}$	Sd		
Reading	13	20.23	2.46	74	18.46	3.34	1.82	N.S.

Table 128 (Continued)

Language	13	19.92	1.85	74	18.12	2.26	2.71	0.05
Grammar	13	7.69	1.25	74	7.03	1.25	1.77	N.S.
Mechanics	13	11.31	1.18	74	10.20	J.66	2.29	0.05

Table 128 indicates that those who kept their jobs for less than six months performed better on reading, language usage, and mechanics. The differences in performance between the two groups were not statistically significant in reading and grammar.

Table 129: Results of t-Tests Applied to Differences in Mean Perceptions between Short- and Long-Tenured Employees

Skills	Less than six months			More than six months			t	p
	N	$\overline{X}$	Sd	N	$\overline{X}$	Sd		
Whole No.	17	1.77	0.93	109	1.57	0.79	0.94	N.S.
Operations	17	2.27	0.99	109	2.15	1.13	0.51	N.S.
Decimal	17	2.29	1.05	1.09	2.17	1.02	0.48	N.S.
Measurement	17	2.94	0.75	109	2.96	1.09	0.08	N.S.
General	17	2.47	0.94	109	2.51	1.06	0.12	N.S.
Reading	17	2.58	0.87	109	2.11	0.86	2.12	0.05
Writing	17	2.29	1.61	109	2.48	1.27	0.55	N.S.

There was no significant difference in the mean perceptions of the long- and short-stayers in all the skill areas except for reading (as shown in table 129). Those who stayed on the job longer than six months rated reading as quite important while those with less than six months job duration reported that reading skills were moderately important. Even though the differences in mean ratings for reading were statistically significant at the 0.05 level, the two groups indicated that reading skills constituted an important ingredient in job success.

We then conducted additional analyses to determine whether there were differences in the mean scores and mean perceptions of those who had not changed jobs and those who had. We carried out a distribution of the means and standard deviations of the scores and perceptions of the two groups across the skill areas. We then followed up with a t-test to determine the significance of the differences in mean scores and mean perceptions between the two groups. Tables 130 and 131 show our findings.

Table 130: Results of t-Tests of Differences in Mean Scores with Respect to Job Change Status

Skills	Change Job (Yes)			Change Job (No)			T	P
	N	$\overline{X}$	Sd	N	$\overline{X}$	Sd		
Reading	9	18.22	3.77	81	18.85	3.24	0.54	N.S.
Language	9	18.56	2.65	81	18.36	2.22	0.25	N.S.
Grammar	9	7.78	1.20	81	7.03	1.25	1.69	N.S.
Mechanics	9	9.89	1.96	81	10.42	1.58	0.93	N.S.

Table 130 suggests that, even though there was a difference in the mean scores of those who changed jobs and those who did not across the skill areas, the differences were not statistically significant.

Table 131: Results of t-Tests of Differences in Mean Perceptions with Respect to Job Change Status

Skills	Change Job (Yes)			Change Job (No)			t	P
	N	$\overline{X}$	Sd	N	$\overline{X}$	Sd		
Whole No.	10	2.00	1.05	118	1.55	0.77	1.72	
Operations	10	2.90	1.10	118	2.09	1.09	2.25	0.05
Decimal	10	2.30	1.06	1.18	2.17	1.02	0.39	N.S.
Measurement	10	3.30	0.82	118	2.92	1.06	1.10	N.S.
General	10	2.70	1.16	118	2.48	1.03	0.66	N.S.
Reading	10	2.30	0.95	118	2.18	0.87	0.42	0.05
Writing	10	1.90	1.45	118	2.49	1.29	1.38	N.S.

Table 131 shows that there was no significant difference in the perceptions of these skills based on whether or not an employee had changed jobs, except in fractional operations, where those who had not changed jobs rated these skills as quite important and those who had changed jobs rated these skills as moderately important. Both groups indicated that fractional operations skills were essential for successful job performance.

Another characteristic of interest to the investigator was gender. We were interested in determining the differences in mean scores and mean perceptions of both male and female graduates. It would be interesting to determine whether they perceived the importance of various skills to job success differently. We were also interested in knowing whether patterns of performance on the Basic Skills Test differed from one gender to the other. We carried out a distribution of the mean scores and mean perceptions across genders. We also followed up each distribution with a t-test to determine the significance of the differences in the means. Tables 132 and 133 present our findings.

Table 132: Results of t-Tests of Differences in Mean Scores by Sex

Skills	Male			Female			t	P
	N	$\overline{X}$	Sd	N	$\overline{X}$	Sd		
Whole No.	76	10.93	1.37	52	11.25	1.03	1.41	N.S.
Operations	76	7.14	3.10	52	8.17	3.24	1.81	0.05
Decimal	76	8.59	3.40	52	9.15	2.65	1.00	N.S
Measurement	76	3.63	1.76	52	3.64	1.70	0.01	N.S.
General	76	14.59	5.24	52	15.40	5.18	0.86	N.S.
Reading	90	18.13	3.71	66	19.00	2.78	1.60	N.S.
Language	90	17.93	2.37	66	18.79	2.17	2.31	0.05
Grammar	90	6.94	1.28	66	7.38	1.12	2.21	0.05
Mechanics	90	10.08	1.67	66	10.58	1.75	1.80	N.S.

Table 132 presents an interesting result. Female graduates in this study performed consistently better in all skill areas than their male counterparts. The differences in scores were statistically significant at the 0.05 level in language usage and grammar.

Table 133: Results of t-Tests of Differences in Mean Perceptions by Sex

Skills	Male			Female			t	P
	N	$\overline{X}$	Sd	N	$\overline{X}$	Sd		
Whole No.	71	1.62	0.83	58	1.60	0.86	0.11	N.S.
Operations	71	2.20	1.20	58	2.10	1.01	0.39	N.S.
Decimal	71	2.13	1.00	58	2.28	1.09	0.81	N.S.
Measurement	71	2.90	1.02	58	3.05	1.07	0.82	N.S.
General	71	2.42	1.02	58	2.62	1.06	1.08	N.S.
Reading	71	2.27	0.81	58	2.12	0.98	0.94	N.S.
Writing	71	2.62	1.26	58	2.33	1.36	1.27	N.S.

Table 133 shows that there was no significant difference in the perceptions of the male and female seniors in this study. Respondents representing both genders reported that the seven basic skills are important to job success.

CHAPTER 5

Summary, Conclusions, Recommendations, and Implications of the Study

Within this chapter, a summary of the study is presented. Conclusions based on both the descriptive and inferential analyses of the data are discussed. A thorough analysis of the implications of the study is presented. The chapter ends with some recommendations for future research studies.

Summary of the Study

Background of the Problem

In recent years the government of the United States has committed itself to the improvement of basic skills education. Evidence of the strong commitment to basic academic skills on the part of the federal government could be seen in recent legislation and funding allocations. Such activity at the federal level is a reflection of public concern and a response to social demand over students' declining test scores on national assessments of communication and computation (reading, writing, and mathematics) skills. The yearly Gallup Polls gauging public attitudes towards education sponsored by Phi Delta Kappa have shown a continuing concern over the need for more instruction in the basics. The National Institute of Education and many other research centers in the United States have been carrying out research on how to improve students' proficiency in the basics.

Interest in basic academic skills in the U.S. has both remote and immediate connotations. Within the last 80 years, there has been a real shift in the ways in which people are employed throughout the United States. America has passed through three primary phases, from the *agricultural* to the *industrial* to the *post-industrial*. The transformation has been primarily from an agriculture-based economy to an information-based economy. People are now engaged in the processing and sharing of information. All these changes demand different kinds of skills. Skills now become highly academic. The shift towards information and service divisions calls for people with stronger academic backgrounds, people who are able to read, communicate, and process information.

The rise in high school enrollment has brought along a lowering of test scores. Within the last 18 years (1963 to 1981), there has been a substantial decline in scores on the Scholastic Aptitude Test (the SAT—again, see appendix, p. 233).

These concerns raise a major question as to whether students in diverse program areas need the same basic academic skills to function effectively and succeed in different job areas.

Statement of the Problem

Research done in different countries in diverse settings has shown that academic pre-occupational training has proceeded as if every occupation had the same academic requirements. It is generally assumed, however (without any substantial research support), that the general emphasis on one area of skill or another varies considerably among occupations; that the specific reading materials, mathematics problems, writing assignments, and oral communication tasks faced by students differ from occupation to occupation; that certain occupations rely heavily on listening and speaking to communicate information, whereas others use reading and writing; and also that the use of mathematics skills shows marked differences in emphasis.

Significantly, students who choose to enter vocational preparatory programs may be informationally disadvantaged. They do not know which basic skills are relevant to their “callings.” It seems, then, that the chasm between related studies in the basics and vocational specialty training has not been effectively bridged.

Purpose and Objectives of the Study

Considering the need for appropriate guidance and curricular relevance in vocational and technical activities, this study set out to analyze and interpret the basic academic skills of communication and computation, skills in reading, writing, and arithmetic that are associated with success in various areas of vocational and technical activities. The objectives of the study have been: (1) to identify the basic academic skills of reading, writing, and mathematical computation that are associated with successful completion of each vocational program, (2) to study the variability in basic academic skill requirements across occupations, (3) to study the level and range of basic academic skills acquired by seniors in the various areas of occupational programs, (4) to analyze the variability in the basic skills score of the 1981 graduates across jobs, (5) to determine the basic academic skills presumably lacked by typical new entrants into the labor market, (6) to determine the variability in the opinions expressed by job holders in various occupations as regards the basic academic skills they believe are important and useful for successful job performance, (7) to determine the variability in the beliefs of employers in the various job areas about the basic academic skills that are important for successful job performance, (8) to analyze the variability in the perceptions of employers and employees on the basic academic skills that are associated with successful job performance, (9) to investigate the relationship of basic academic skills mastery to successful job performance, and (10) to analyze the differences in scores of employees and whole program completers.

Related Research Questions

The study was designed to answer the following research questions:

1. What is the distribution of test scores by area of vocational program and do they differ from one another?

2. Among the skills, are the relative strengths and weaknesses the same for the diverse areas of vocational programs?

3. What variation, if any, exists in the scores of graduates who are attending schools, employed in their areas of training, employed in areas unrelated to their training, or not employed at all?

4. What skills do employers most often say that their new employees do not have?

5. What differences exist in the opinions expressed by new employees who are employed in areas related to their high school programs in the different areas about how important the basic academic skills were for successful job performance?

6. What differences exist in the opinions expressed by employers of new high school graduates in the various occupational programs about how important the basic academic skills were for successful job performance?

7. Within an area, do new employees and employers agree on the relative importance of the several basic academic skills for success on the job?

8. Are the ability scores of those employed in relevant job areas significantly different from the state norms for successful high school vocational program completers?

9. Among those in the employed-in-a-relevant-area category, do those who stay longer on the job score or perceive differently from those who stay on the job for a shorter time?

Methods and Procedures

A longitudinal approach was undertaken in carrying out this investigation. The data for this study came from three major sources: (1) a 1981 Statewide Basics Skills Survey, (2) a 1982 Graduates' Follow-up Survey, and (3) a 1982 Employers' Survey.

In the spring of 1981, a statewide survey of the basic skills of high school seniors was carried out. In all, 2,088 seniors voluntarily participated in the exercise. Nine months later, a Graduates' Follow-up Survey was carried out to determine which basic skills the seniors used on the job. Simultaneously, employers were requested to provide opinions as to which basic skills they felt were essential for job success. The employers were also requested to indicate which basic skills were lacked by their new labor market entrants (employees). In both the employees' and the employers' survey questionnaires, a 5-point Likert scale was used.

The data were coded and analyzed using the Statistical Package for the Social Sciences (SPSS) programs. Both descriptive and inferential analyses were carried out. These included cross-break analyses, mean distributions, one-way ANOVA, MANOVA, t-tests, correlation analyses, and Darlington's tests for assessing the sizes of standard deviations. A series of post hoc comparison tests were conducted when significant differences occurred: Scheffe's multiple comparison tests (the S-method), Tukey's Honestly Significant Difference tests (the T-method), and Student-Newman-Keul's tests (SNK tests).

Summary of Findings

Differences in Test Scores across Program Areas

Evidence presented in tables 008 through 014 indicates that there were differences in the mean scores of employees on the Basic Skills Test across the seven program areas. Further analysis (tables 015 through 023) revealed that the differences were not statistically significant at the 0.05 level for six of the seven skill areas, but there were significant differences in the mean scores of employees across the seven program areas in grammar. Post hoc comparison tests revealed that no two program areas were significantly different at the 0.05 level.

Relative Strengths and Weaknesses of Skills across Areas

Table 024 presents evidence that graduates in the diverse program areas were strong in whole number operations, reading, decimal operations, language usage, and grammar. Their weakest areas were measurement, mechanics (writing skills), and general mathematics. Further analysis revealed that performance on each skill varies from program to program.[35] It would, however, be difficult at this point to say that one particular program area was especially strong or weak in a given skill area. Due to empty cells and few cases in cells, further analysis could not be confidently interpreted.

Differences in Test Score across Job Areas

[35] The multiple comparison tests used were Scheffe's method (S-method) and the Student-Newman Keul's (SNK). Both were tested at the 0.05 level of significance.

There were no differences in the mean scores of graduates who were attending school, employed in areas related to their high school majors, or employed in areas not related to their high school majors. Nevertheless, these three groups performed better in all the skill areas than graduates in the military or those unemployed. Performance levels in whole number operations across the five job categories were uniform. It was also revealed that graduates across the five job categories were weak in measurement and general mathematics skills (see table 043). Additional analysis (ANOVA) revealed no significant differences in test scores (at the 0.05 level) across the five job categories. See tables 035 though 043).

Employers' Perceptions of New Employees' Basic Academic Skills

Tables 044 through 065 present evidence pertaining to employers' perceptions of the skills of their employees. Nearly all the employers reported that their new employees were proficient in whole number operations, while 45.2 percent rated the employees as lacking in fractional operations skills. About two-thirds of all the employers complained about the deficiency of their entry-level employees in measurement skills, while 66.2 percent reported that their new employees were deficient in general mathematics skills. Only 46.6 percent (nearly half) of all the employers reported that their new employees could read well, while 37.7 percent rated their new employees as unskilled in writing areas.

On the whole, it seems as if employers were not happy with the basic skills of their new entrants into the labor market.

To study the nature of variations in ratings across program areas, additional analyses were undertaken. Table 134 presents the ratings of employers across the seven program areas of the skills lacked by their new employees. The table speaks for itself.

Additional analysis (ANOVA) was conducted to determine the statistical significance of the differences in the employers' beliefs. Tables 060 through 067 present the evidence. There were no significant differences at the 0.05 level in the perceptions of employers across the seven program areas of their employees' whole number operations skills. They all reported that their new employees were skilled in whole number operations. There were significant differences in the perceptions of employers of their new employees' skills in fractional operations. Post hoc comparison tests further revealed that employers in the business areas perceived these skills differently from those in home economics.[36] Employers' perceptions of new employees' decimal operations skills were not significantly different, even though at least 20 percent of the employers in each program area reported that their new employees were not proficient enough in this skill area. The ratings given by employers across the seven program areas of their new employees' measurement skills were not significantly different at the 0.05 level. The majority of the employers reported that their new employees were deficient in measurement skills. There were statistically significant differences in the perceptions of employers across the seven program areas of the general mathematics skills of their employees. A very high percentage in each program area reported that their new employees were deficient in general mathematics skills. A post hoc comparison test (Scheffe's test) did not yield any significant differences between any two areas. There were no significant differences in the opinions and beliefs expressed by employers across the seven

[36] Only 11.1 percent of employers in business areas rated their new employees as lacking in fractional operations skills, while 80 percent in home economics reported that their new entrants into the world of work were deficient in fractional operations.

program areas about the reading skills of their new employees, but the differences in the perceptions of employers of writing skills across the seven program areas were statistically significant at the 0.05 level. A post hoc comparison test (Scheffe's test) revealed that the significance was due to the complexity of the situation.

Table 134: Distribution of Mean Employers' Ratings of Selected Skills of Employees

Skills	$\overline{X}$	Sd	95% Confidence Interval for Mean
Whole No.	1.68	0.77	1.50 to 1.86
Operations with	3.43	1.47	3.09 to 3.77
Decimal	2.79	1.17	2.52 to 3.06
Measurement	3.60	1.13	3.35 to 3.87
General	3.52	1.07	3.27 to 3.77
Reading	3.29	1.34	2.98 to 3.60
Writing	3.01	1.29	2.72 to 3.79

Table 134 shows the distribution of the mean ratings given by the 75 employers who responded to our questionnaire across the seven program areas of how skilled their new employees were in the different sub-skills involved in whole number operations, fractional operations, decimal operations, measurement skills, general mathematics skills, reading skills, and writing skills. There was variability in the ratings of these skills. Employers rated their new employees as being proficient in whole number operations, moderately skilled in decimal operations and writing, but below average in fractional operations skills, general mathematics skills, and reading skills. Employees' worst skills according to the employers were in measurement and general mathematics.

Summary

From the tables alluded to, we could deduce that employees (across programs) all felt that their new employees were proficient in whole number operations. This was their main area of agreement. For other skills, employers had varied perceptions across the program areas. Aside from whole number operations, employers in technical areas rated more than 60 percent of their new employees as wanting in the other skill areas. The same problem was encountered in the area of home economics, where employers rated their new employees as being deficient in the computation skills.

All these observations confirm the arguments made in recent years by employers that their new entry-level employees are deficient in some basic enabling skills.

Employees' Opinions of the Importance of Skills

Employees in the seven program areas differ in their perceptions of the importance of all the skill areas for job success. No two groups of employees report identical ratings for any skill area. With respect to some of the skills, though, the differences in ratings are not too large.

Table 135: Percentage Distribution across Program Areas of Employees' Ratings of Selected Skills as Important

Skills	Agricultural	Distribu-	Health Ed	Home	Business Ed.	Technical	Trade &
	N = 13	N= 13	N= 17	N=17	N=10	N = 13	N=47

Table 135 (Continued)

Whole No.	100%	100%	100%	94.1%	100%	100%	89.4%
Oper. with	92.3%	77.0%	94.1%	94.1%	90.0%	22.3%	71.1%
Decimal	100%	92.3%	88.3%	76.4%	100%	100%	79.4%
Measure-	93%	66.8%	70.6%	30.4%	50.0%	87.9%	68.1%
General	92.3%	92.3%	82.4%	52.9%	100%"	100%	72.3%
Reading	100%	92.3%	95.1%	83.3%	90.0%	100%	89.4%
Writing	100%	84.6%	88.3%	64.7%	70.0%	76.9%	65.9%

Table 135 shows that employees across programs indicated that all the skills were essential for successful job performance. Their ratings varied, however, from program to program. Whole number operations had the highest ratings, followed by reading, fractional operations, decimal operations, general mathematics, writing, and measurement. In measurement, 92.3 percent and 87.9 percent of employees in the agricultural and technical areas, respectively, rated the skills as being very important. Aside from employees in home economics, at least 50 percent of employees in each of the other program areas rated measurement as an essential ingredient of effective job performance.

Additional analysis revealed that not all measurement skills are equally important to all the program areas. Table 136 shows that, across the program areas, employees felt that the use of a rule is the most important measurement skill needed for success on their jobs. Employees did not emphasize all the measurement skills equally. Length measurement was also perceived to be very important. In all, about 41 percent of all the employees indicated that the use of a micrometer was not important for job success, while 34.9 percent, 31.8 percent, and 31.3 percent, respectively, rated “measuring angles,” “using geometric figures,” and “working with liquid” as unimportant. For all other measurement skills, at least 75 percent of the employees reported that skills were either very important or moderately important.

The analysis shows that there was variability in the demand made on measurement skills across diverse program areas. All the measurement skills were important for success in the areas of agriculture, health occupations, technical occupations, trade and industry, and distributive education. Length and weight measurements, the use of geometric figures, the use of a micrometer, and angle measurement were not perceived as essential for success in areas related to home economics. The use of a rule was perceived to be highly important to this area, in which 94.1 percent of all the employees rated the skill as very important for job success. In the opinions of business employees, geometric measurement, the use of a micrometer, working with liquids, and angle measurement were considered unimportant for job success. New business employees reported that conversion from decimal to percentages and conversion from percentages to fractions were the most important for job success.

Additional analysis revealed that there were significant differences (at the 0.05 level) in the perceptions of employees on the use of specific skills across the program areas.

Similarly, employers’ opinions of the significance of each skill area for job success vary from program to program. No two groups of employers reported identical skills as very important for job success. Furthermore, table 135 shows that there was variability in the demands made on measurement skills across diverse program areas. All the measurement skills are important to success in agriculture, health occupations, technical occupations, trade and industry, and distributive education. Length and weight measurements, the use of geometric figures, the use of a micrometer, and angle measurement were not perceived as essential for success in areas related to home economics. The use of a rule was perceived to be highly important to this area, where 94.1 percent of all the employees rated the skill as very important to success on the job. In the opinions of business employees, geometric measurement, the use of a micrometer, working with liquid, and angle measurement were considered important to job success. New business employees reported that conversion from decimals to percentages and conversion from percentages to fractions were most important to job success.

Even though there are variations in the perceptions of employees across the diverse program areas of the importance and usefulness of the measurement skills, we cannot say here that such variations are significantly different.

Table 136: Percentages of Employees Rating Selected Measurement Skills as Important to Job Success

Skills \Areas	All Employ-ees	Agri-cultural	Distrib. Ed.	Health Ed.	Home Econ.	Bus. Ed.	Tech Ed.	Trade & Ind.
	N = 130	N= 13	N=13	N=17	N=17	N=l0	N = 13	N =47
Length	80.0%	92.3%	92.3%	82.4%	47.1%	70%	84.4%	87.2%
Weight	75.4%	92.3%	76.9%	76.5%	41.2%	60%	100%	78.7%
Geo-metry	68.2%	92.3%	41.2%	76.5%	41.2%	44.4%	92.3%	72.3%
Decimal to %	73.1%	92.3%	69.2%	94.1%	58.8%	90%	76.9%	66.0%

Table 136 (Continued)

% to Fraction	73.6%	84.6%	66.7%	88.2% .	94.1%	50.0%	92.3%	61.7%
Reading Rule	83.6%	84.6%	76.9%	88.2%	94.1%	50.0%	92.3%	84.4%
Micro-meter	59.1%	92.3%	66.7%	62.5%	11.8%	30.0%	92.3%	60.9%
Measur-ing Liq.	68.8%	100%	61.5%	100%**	70.6%	30.0%	61.5%	61.7%
Meas'ing Angles	65.1%	92.3%	53.9%	64.7%	35.3%	40.0%	84.6%	71.3%

*A case is missing.
**Some cases are missing.

Table 137: Mean Distribution of Employees' Ratings of Measurement Skills

Measurement Skills	$\overline{X}$	Sd
Measuring lengths	2.25	1.35
Measuring weights	2.26	1.31
Working with geometric figures	2.77	2.56
Changing percents to fractions	2.75	1.23
Changing decimals to percents	2.72	1.35
Reading a rule	2.19	1.47
Reading a micrometer	3.19	1.67
Working with liquids	2.68	1.60
Measuring angles	2.89	1.55

Table 137 shows the mean ratings of all 130 employees across the seven program areas of the various measurement skills. Even though the ratings were so close together, it appears that typical employees rated “reading a rule” (2.16) as the most important measurement skill. This is followed by “measuring length,” with an average rating of 2.25. The lowest rated measurement skills was “reading a micrometer,” with an average rating of 3.19.

Analysis revealed that the differences in perceptions of some of the skills were not significant. Employers in occupations related to home economics differ significantly in their opinions of the importance of skills in decimal operations, measurement, general mathematics, and reading. See tables 67 through 74. Employers across the seven program areas rated whole number operations skills as very important for job success. This was their major area of agreement. They also agreed on the importance of skills in fractional operations and writing.

Table 138 shows the numbers and percentages of employers’ ratings of each skill as important, moderately important, or unimportant. All the employers rated writing skills as the most important, followed by skills in whole number operations, reading, and fractional operations. They rated measurement skills as the least important to job success.

Comparing the ratings of employers and employees of the importance of the seven skill areas for successful job performance, it was revealed that employers and employees agree in nearly all of their ratings. More than 75 percent of each group rated each skill as either very important or moderately important. Employees rated whole number operations skills as the most important skill area, while employers rated these skills as the second most important. They agreed that the least important skills were in measurement.

Table 138: Contingency Analysis of Employers' Opinions of the Importance of Selected Skills to Job Success

Rating	Whole	Fractions	Decimals	Measure-	General	Reading	Writing
Important	72 (96%)	63 (84%)	60 (80%)	44	41	57 (77%)	65
Moderately	1 (1.3%)	7 (9.3%)	7 (9.3%)	15 (20%)	23	14	10
Unimportant	2 (2.7%)	5 (6.7%)	8 (10.7%)	16	11	3 (4.1%)	-
Total	75 (100%)	75 (100%)	75 (100%)	75 (100%)	75 (100%)	4*	75 (100%)

*A case is missing here.

Table 139 presents the percentages of employees and employers ratings of the importance of skills for job success. Tables 111 through 117 revealed high correlations between employees' and employers' ratings.

Table 139: Comparative Analysis of Employers' and Employees' Opinions of the Importance of Selected Skills to Job Success

Skills	% of Employees Rating Skill as	% of Employers Rating Skill as
	N = 130	N=74
Whole No. Operations	95.4	97.3
Operations with Fractions	88.5	93.3
Decimal Operations	87.6	89.3
Measurements	65.9	78.7
General Mathematics	80.0	85.4
Reading	92.3	95.9
Writing	75.2	100.0

Relationship between Achievement and Perceptions

Achievement on the Basics Skills Survey was compared with employees' perceptions of the importance of skills. Tables 140 through 147 reveal our findings. The tables appear to show a high correlation between the basic skills scores of employees in areas related to agriculture, distributive education, health, and business, whereas there appears to be a very weak relationship between the mean scores of graduates in the technical area, trade and industry, and home economics.

Additional analysis revealed that the mean scores of all employees did not correlate highly with their perceptions, as r_s=0.45.

Table 140: Relationship between Achievement and Perceptions (All Employees)

Skills	Basic Skill Scores, Employees	Mean Ratings of Opinions,
Whole No. Operations	11.1	1.61
Operations with Fractions	7.3	2.15
Decimal Operations	8.7	2.19
Measurement	7.5	2.98
General Mathematics	7.5	2.50
Reading	9.0	2.19
Writing	6.8	2.48

Spearman's Rank Order Correlation Coefficient (rs = 0.45)

Table 141: Relationship between Achievement and Perceptions (Agricultural Employees)

Skills	Basic Skill Scores, Ag.	Mean Ratings of Ag.
Whole No. Operations	10.8	1.23
Operations with Fractions	8.2	2.08
Decimal Operations	8.8	1.54
Measurement	8.3	2.15
General Mathematics	8.5	1.77
Reading	8.9	1.85
Writing	8.6	1.85

Spearman's Rank Order Correlation Coefficient (rs = 0.79)

Table 142: Relationship between Achievement and Perceptions (Distributive Employees)

Skills	Basic Skill Scores, Dist.	Mean Ratings of Dist.
Whole No. Operations	11.1	1.77
Operations with Fractions	7.5	2.85
Decimal Operations	8.3	2.15
Measurement	6.9	3.15
General Mathematics	6.9	2.54
Reading	9.6	2.15
Writing	7.9	2.08

Spearman's Rank Order Correlation Coefficient (rs = 0.08)

Table 143: Relationship between Achievement and Perceptions (Health Employees)

Skills	Basic Skill Scores, Health	Mean Ratings of Health
Whole No. Operations	11.2	1.47
Operations with Fractions	7.4	1.88
Decimal Operations	8.8	2.00
Measurements	6.2	2.65
General Mathematics	7.4	2.06
Reading	9.4	1.82
Writing	7.9	1.65

Spearman’s Rank Order Correlation Coefficient (rs = 0.80)

Table 144: Relationship between Achievement and Perceptions (HomeEconomics Employees)

Skills	Basic Skill Scores of Home Ec.	Mean Ratings of Home Ec.
Whole No. Operations	11.1	1.65
Fraction Operations	7.4	1.77
Decimal Operations	9.1	2.59
Measurement	7.8	3.59 '
General Mathematics	7.4	3.29
Reading	8.9	2.29
Writing	7.8	3.06

Spearman’s Rank Order Correlation Coefficient (rs = 0.45)

Table 145: Relationship between Achievement and Perceptions (Business Education Employees)

Skills	Basic Skill Scores, Bus.	Mean Ratings of Bus.
Whole No. Operations	11.3	1.40
Operations with Fractions	8.1	2.40
Decimal Operations	9.3	1.70
Measurement	6.3	3.40
General Mathematics	7.1	2.30
Reading	9.7	2.00
Writing	8.7	2.30

Spearman’s Rank Order Correlation Coefficient (rs = 0.91)

Table 146: Relationship between Achievement and Perceptions (Technical Employees)

Skills	Basic Skill Scores, Tech.	Mean Ratings of Tech.
Whole No. Operations	10.8	1.46
Operations with Fractions	5.6	2.15
Decimal Operations	7.0	1.69
Measurement	6.9	2.69
General Mathematics	6.4	2.08
Reading	8.9	2.39
Writing	8.0	2.69

Spearman’s Rank Order Correlation Coefficient (rs = 0.19)

Table 147: Relationship between Achievement and Perceptions (Trade and Industry Employees)

Skills	Basic Skill Scores, T&I	Mean Ratings of T&I
Whole No. Operations	10.9	1.79
Operations with Fractions	7.1	2.17
Decimal Operations	8.7	2.53
Measurement	7.4	3.04
General Mathematics	7.3	2.72
Reading	8.8	2.38
Writing	8.1	2.79

Spearman's Rank Order Correlation Coefficient (rs = 0.36)

Table 148: Comparative Analysis of Employers' and Employees' Ratings of the Importance of Selected Skills to Job Success

Skills	Mean Ratings of Employees'	Mean Ratings of Employers'
	N = 130	N=74
Whole No. Operations	1.61	1.19
Operations with Fractions	2.15	1.69
Decimal Operations	2.19	1.88
Measurement	2.98	2.41
General Mathematics	2.50	2.35
Reading	2.19	2.04
Writing	2.48	1.59

Spearman's Rank Order Correlation Coefficient (rs = 0.60)

Implications of the Study

The findings of this research will have various implications for federal, state, and local policymakers, since vocational programs receive federal funding under the Vocational Education Act (VEA). Some of the findings of the research will have considerable value to researchers attempting to find solutions to problems of pervasive sex segregation in vocational education.

A number of theories attempt to explain the process of choice, but each rests on remarkably little empirical data. The demand for school counselors, government subsidies for the training of counselors, and the introduction of counseling into almost every manpower program illustrate the widespread assumptions that counseling and guidance are key elements of sound occupational preparation and occupational choice. All too often, however, counselors appear to be less available to vocational students than to others. Counselors appear to be better informed about and more strongly oriented towards college preparatory work, and prone to direct minority group members towards traditional minority occupations.

The findings of the research have implications for school counselors in focusing on vocational education. Guidance counselors have been less interested in vocational students in recent years, showing more interest in college-bound students. This work will provide the counselors with adequate information on how best to advise and counsel vocational students. Guidance counselors will find this a working tool in advising students on which programs to follow, which areas or skills need remediation, and which areas should be stressed and emphasized.

The implications of this work for students are innumerable. It should help them to identify the range, scope, and level of basic academic skills associated with their "callings."

The findings of the research have implications for employers of labor. The information gleaned from this study will enable them to further focus on skills that are relevant to the jobs needed to run their businesses. The implications for on-the-job training are readily discernable.

The study has implications for planning in general. The work points out that planning geared towards identifying the variability between and within variables should be directed towards specifics rather than a family of variables. For example, there are no significant differences in the perceptions of employees and employers across the diverse program areas of the importance of mathematics to job success. But in considering the specific skills involved in mathematics, there are significant differences in the perceptions of employers and employees across the diverse program areas. And these are the essential differences.

The findings of this study have various implications for policymaking and policy decisions: It will throw some light on the basic academic skills required for selection of and graduation from vocational programs.

The work has implications for educators in myriad areas, including (1) vocational instructors who are responsible for teaching related basic skills in communication and computation, (2) vocational instructors who see a need to supplement general courses in language and arithmetic with training in specific skills in language and mathematics, (3) specialists charged with teaching job-related skills, and (4) curriculum specialists charged with developing job-related curricula in the basic academic skills of reading, writing, and computation.

This study provides educators with empirical information that can be diffused in many ways. Vocational teachers or counselors, for example, can compare their perceptions of basic skill needs with those of employers and employees identified in this work. Through such comparison they will be able to see the relationship between their opinions and the opinions of others. This will enable teachers and counselors to better assist students in understanding the basic academic skills pertinent to their “callings.”

This study also paves the way for an urgent promotion of diagnostic skills tests for vocational students, to be passed for admission into programs or for graduation.

Using the information provided in this dissertation will lead to a generation of more relevant course experiences and exercises for effective mastery of the basic academic skills in vocational activities.

The findings of this work pave the way for vocational teachers to organize remedial activities (and experiences) for those students found deficient or wanting in any of the basic academic skills.

This work has implications for program planning and improvement: Curriculum builders, administrators, program planners and developers, including departmental heads, might be better equipped to create more relevant course experiences and exercises. Such a revisionary approach might provide a closer union between basic academic skills courses and vocational specialty training.

This research will yield payoffs in both information and materials. First, it will increase knowledge of some of the basic skills that are associated with success in each area of occupational preparation. The results of the investigation will also amount to an evaluation of the cognitive success of two-year, half-day, off-site occupational programs in New York State. It will thus inform program planners at the state level about the present state of basic academic skills in occupational preparation.

The findings of this research will have implications in two major areas of educational programs: (1) planning instruction and (2) administering and organizing programs. It can easily be seen how the information disseminated in this study will help in reporting student progress, in admissions, in planning remedial work, and for graduation. All these are pertinent to successful vocational preparation.

In conclusion, this study (1) provides information to assist students in making wise selections of basic mathematics or English courses in pursuit of their vocational goals, (2) provides information that will assist teachers in becoming aware of the mathematics/English courses needed by students in their vocational areas, (3) provides examples for mathematics/English instructors to use in teaching these related concepts, (4) helps facilitate individual student learning, and (5) interrelates the disciplines of mathematics and English with vocational education.

Implications for Secondary Education in Nigeria

Before discussing the implications of this work for the improvement of secondary education in Nigeria, the author would like to discuss the development of the formal education system in Nigeria. Early formal educators in Nigeria were Christian missionaries. In order to carry out their work of evangelism, it was necessary to have a crop of educated people to catechize and to act as interpreters. Later on, European businessmen arrived on the Nigerian historical scene looking for effective business transactions with the local people, and local men were trained as clerks and interpreters. Still later, a government had to be established to maintain law and order and junior civil servants had to be trained and produced.

From all these developments, we could see that the aims of early formal education in Nigeria were to train people in the art of communication and computation, giving them the ability to read, write and communicate as well as to carry out elementary arithmetic. This mode of training went on for many years before the first secondary high school was established.[37] This has caused problems that persist today. Our education was not focused; it is still too general.

The curriculum was geared for liberal arts—the teaching of the British Constitution, British history, geography (especially of Great Britain), scripture, the English language, English literature, Latin, and Greek. There were no vocational or technical subjects. It was much later that a few technical schools were established and not until recently was commercial education given any sort of recognition in the curriculum.

Emphasis on training in classical education continued until Nigerian independence in 1960. Our secondary education was a direct transplantation of the British grammar school, and it provided education for a small elite group. This elite group was not necessarily based on any social stratum, but mainly on the ability of students' parents to pay the fees charged. The textbooks and other school materials were imported, and so were the first teachers. In a situation like this, it is not

[37] The first secondary school in Nigeria was established in 1859 by the Church Missionary Society (CMS). It was called the CMS Grammar School. The purpose of the school was to train Christian boys and equip them with the education that would fit them as clerks in the commercial houses and later in the civil administration.

surprising that no attempt was made to adapt the school material to local needs. It has been proclaimed "interim interique" that every educational system is a product of the economic, social, and political situation of the country of which it is a part. The Nigerian educational system had its roots in the colonial era and has grown to meet these economic, social, and political challenges. These challenges themselves have interacted with and remolded the educational system.

After our independence in 1960, there was a proliferation of technical and vocational institutions all over the country. All efforts were directed towards the training of middle-level manpower.[38] By 1978, there were 101 such institutions, of which 100 were operated by the Federal Education Department. These institutions had varying levels of intake, course length, and final examinations. Some institutions operated different courses on the same premises (and therefore the total number of courses is higher than the number of institutions). Total enrollment was 35,160 students (945 part time). There were 1,799 teachers in the state institutions (19.2 students per teacher) and 62 teachers in the federal institution (18.2 students per teacher). Tables 150 through 152 present some basic facts about vocational and technical education across Nigeria. No attention was paid to training in the basic academic skills of reading, writing, and mathematics.

[38] There was an acute shortage of middle-level manpower at the time of independence in 1960.

Table 149: Nigerian Institutions Offering Technical-Vocational Training at the Secondary School Level and Types of Courses Conducted, by State, 1977–1978

	Number of Course by Type				
States	No Institution 1–2 Years	Artisan 3 Years	Lower Secondary 3–4 Years	Upper Secondary 5 Years	Full Secondary
Anambra	4	0	1	3	0
Bauchi	3	3	0	0	0
Bendel	10	0	2	2	8
Benue	4	0	2	1	3
Borno	14	13	0	1	0
Cross River	12	0	7	0	5
Gongola	8	6	0	0	5
Imo	7	0	4	3	2
Kaduna	3	0	0	1	2
Kano	4	0	2	2	0
Kwara	7	0	4	3	1
Lagos	1	0	0	0	1
Niger	3	0	3	0	2
Ogun	2	0	0	2	0
Ondo	7	0	0	5	2
Oyo	4	0	1	3	0
Pleteau	1	0	0	1	0
Rivers	4	0	4	4	0

Table 149 (Continued)

Sokoto	2	0	0	0	2
Total State Institutions	100	22	30	31	29
Federal Institutions	1	0	0	1	0
Total Nigerian Institutions	101	22	30	32	29

Source: Federal Ministry of Education

Table 150: Numbers of Students and Teachers in Nigerian Institutions Offering Technical-Vocational Training at the Secondary School Level, by State, 1977–1978*

	Number of Students		Number of Teachers	Student/Teacher
States	Total	Lower Secondary		
Anambra	3,410	774	235	14.5
Bauchi	132	132	11	12.0
Bendel	3,888	2,219	223	17.4
Benue	1,195	132	55	21,7
Borno	860	650	107	8.0
Cross River	6,292	3,362	227	27.7
Gongola	948	300	63	15.0
Imo	2,766	1,011	114	24.3
Kaduna	2,196	0	89	24.7
Kano	2,094	1,205	113	18.5

Table 150 (Continued)

Kwara	2,766	1,428	73	24.2
Lagos	-	-	-	-
Niger	770	420	52	14.8
Ogun	781	0	28	27.9
Ondo	1,467	0	94	15.6
Oyo	1,933	471	76	25.4
Pleteau	434	0	43	10.1
Rivers	2,724	2,228	154	17.7
Sokoto	826	0	42	19.7
Total in all State	34,482	14,332	1,799	19.2
In Federal	1,128[#]	0	62	18.2
Total in Nigeria	35,610	14,332	1,861	19.1

Source: Federal Ministry of Education
* Excluding Lagos State.
# Includes 945 part-time students as 472 full-time-equivalent students.

Table 151: Enrollment in Nigerian Secondary-Level Technical-Vocational Schools, by Trade, 1977–1978*

State	A	B	C	D	E	F	G	H	I	J	K	Total
Anambra	1,129	306	475	609	512	216	45	118	-	-	-	3,410
Bauchi	-	36	-	84	12	-	-	-	-	-	-	132
Bendel	1,477	170	439	193	305	70	34	171	929	100	-	3,888

Table 151 (Continued)

Benue	-	-	-	-	-	-	-	-	-	-	1,195	1,195
Barno	-	271	75	435	36	21	-	-	-	-	21	860
Cross River	961	145	986	201	701	214	-	457	768#	40	1,819	6,292
Gongola	-	120	-	180	-	-	-	-	648	-	-	948
Imo	968	112	154	383	120	-	295	452	-	282	-	2,766
Kaduna	-	47	131	57	158	43	-	-	1,760	-	-	2,196
Kana	-	208	124	332	215	60	-	-	-	-	1,156	2,094
Kwara	1,428	64	164	44	66	-	-	-	-	-	-	1,766
Lagos	-	-	-	-	-	-	-	-	-	-	-	-
Niger	290	85	87	101	32	-	-	-	-	-	175	770
Ogun	-	147	-	317	-	-	277	-	-	40	-	781
Ondo	-	158	353	89	416	110	59	19	211	37	15	1,467
Oyo	-	40	343	98	253	162	66	500	-	-	471	1,933
Pleteau	-	48	172	77	100	37	-	-	-	-	-	434
Rivers	460	265	767	513	225	113	45	-	-	336	-	2,724
Sakata	-	82	33	-	80	53	-	-	578	-	-	826
Federal	-	116	171	168	115	56	-	-	-	-	30	656
Total	6,713	2,421	4,474	3,880	3,346	1,155	821	1,717	4,894	835	4,882	35,138

Source: FME Survey
* Excluding Lagos State
# Includes 395 WASC General students.
A = General courses

B = Woodworking
C = Mechanics
D = Construction
E = Electrical
F = Metalworking
G = Home economics/catering
H = Commercial
I = WASC technical
J = Others
K = Unspecified

Implications of the Study for Nigeria

With all these developments, employers of labor across the country continue to complain that their new entry-level employees do not have adequate basic skills in communication and computation, skills in reading, writing, and arithmetic.

A review of current literature on Nigerian education revealed that basic academic skills were not taught as integral parts of vocational training. Basics skills development was considered general education and not vocational, avocational, or technical.

This research has implications for both technical and vocational education in Nigeria. The present methodology is transferable in structure with little modification of the content. A longitudinal investigation could be undertaken whereby teachers, vocational or technical seniors, employers of labor, and employees are requested to report on the skills required for effective and efficient job performance. Basic skills tests should be administered to high school seniors in their last month at school to determine what skills they have on graduation. The result of this could be useful in planning for graduation.

Such an investigation could be done at the state level, since educational development varies from state to state. Teacher educators should be involved in identifying skills and program areas.

The triangular approach proposed for assessing basic skills needs has implications for research efforts in Nigeria.[39] Far too little is done by way of educational research in Nigeria. People's opinions are not sought before decisions are taken. The general public does not always participate in planning and decision-making.

The identification of skills associated with success both at school and on the job is yet another important area of this study, and it has implications for Nigeria and many other developing countries. Identification of the essential skills for job success has implications for program planning and program development.

Nigeria is a budding country. With proper direction and guidance, its wealth could be used to bring about vocational and technological development.

It would also be interesting to find out the relationship between the perceptions of employers in Nigeria and those of employers in the U.S. of the skills needed for effective and successful job performance in the different program areas.

Even though this work has focused on the teaching of basics in formal institutions, it has been suggested that the teaching of the basics could be facilitated in informal settings. Extension agents could incorporate this into discussions with farmers. Through learning how to improve their crop yields, the farmers could learn other things; through planting they could learn to measure; and through informal

---

[39] The 'triangle' consists of teachers, employers, and new employees.

meetings, farmers could learn to read and write. It is true that such may take some time, but when the skills are acquired, they are worth the efforts expended.

Technical education has been defined in various ways by academicians and educators. Each definition points towards the “aspect of education which leads to the acquisition of practical and applied skills as well as basic scientific knowledge” (National Policy on Education, 1981). Technical education in Nigeria has many aims to accomplish. Among these aims are:

(1) Providing trained manpower in applied science, technology, and commerce, particularly at sub-professional grades

(2) Providing the technical knowledge and vocational skills necessary for agricultural, industrial, commercial, and economic development

(3) Providing a workforce that can apply scientific knowledge to the improvement and solution of environmental problems for people’s use and convenience

(4) Introducing professional studies in engineering and technology

(5) Providing training and imparting the necessary skills leading to the production of craftsmen

(6) Enabling our young men and women to have an intelligent understanding of the increasing complexity of technology

As striking as these aims are, achieving them is contingent upon an adequate understanding of the three R’s. Nigeria is moving from an agricultural to an industrial economy. People need to disseminate information, read labels, communicate with others on new developments and discoveries, and process information. All these require the use of basic academic skills.

The implications of this study for extension are invaluable. At present in Nigeria, there is no adequate communication going on between research centers and the extension area. Research centers claim that their only assignment is to do research and that the dissemination of their findings lies wholly with extension. Farmers, in turn, complain bitterly that research centers do not contribute to agricultural improvement. The International Institute of Tropical Agriculture (IITA), a multimillion-dollar establishment, with other research centers in Nigeria, claimed on many occasions that they had discovered new ways of growing certain crops. But going to the farms and looking at the farmers finds them still using the old methods used for generations.

To be sure, the IITA with other research centers have made a lot of inventions, but their work is confined to reputable journals and World Bank publications. They do not get to the peasant farmer who needs them most. There is no communication between the two groups. The farmers are not involved. Their participation has been reduced to zero. The unfinished task continues in Nigeria.

The skills identified in this project are selective and defined within the context of this work. It is recognized by the author that the skills herein identified are *not* the only skills of communication and computation, nor are they the only areas of vocational preparation that exist. Their use and definitions are subject to individual interpretation.

Conclusion

Even though there were differences in the mean scores of seniors across the diverse program areas on each skill, it was found that in most cases the specific reading, mathematics, and writing skills required for success in each program area do not differ significantly from program to program. The results point out that the *basic academic skills* needed for effective job performance across the diverse program areas are fairly identical. People should be able to read, write, and do elementary mathematics so as to be able to cope with what goes on in the world of work. Nearly all the employers and new employees in each program area see a need for mastery of basic academic skills for effective job performance.

The higher you go in the aggregate of specific skills into a family of skills, the less variability you observe in the demands of such skills across program areas. For example, there were variations in the perceptions of employees and employers of the importance of some specific skills for success on the job. Nevertheless, when the specific skills were regrouped into families of skills, there appeared to be no significant differences in the perceptions of employers and employees. This investigation was carried even further by conducting ANOVA to determine the variability in the perceptions of employees and employers on the use of language arts and mathematics for job success. On both we found no significant differences at the 0.05 level.

All these findings have implications for policy and program planning. Most planners tend to consider global factors and look for variations. In most cases there tend to be no significant variations.

Recommendations and Implications for Future Research

As global as this research may look, it is a beginning point for further research. The study does not claim to have spanned all the problem areas of basic academic skills and vocational activities in New York State, but rather the author hopes it serves as an eye-opener for further research in the various areas. A replication of this research in other modes of vocational preparation is hereby encouraged.[40]

This study has identified the basic academic skills that are associated with success both at school and on the job, in various areas that are required for success. Such investigation requires a completely different sampling procedure.

There is yet another area of investigation. The identification of the basic skills possessed by juniors in two-year, off-site vocational programs is an important area of investigation. Earlier research has shown that students tend to forget those skills that are not directly relevant to their "callings." Are the basic academic skills possessed by sophomores in their last month greater or lesser than are those possessed by seniors in their last month at school? This calls for a longitudinal investigation.

Taking a participatory approach to this investigation is yet another area in need of further research. Often only teachers, curriculum planners and developers, and policy analysts are involved in identifying skills to be taught. This research has, however, made use of the actual people involved in the practice and execution of the skills, the employees and the employers. Their survey responses enabled us to identify their needs, their wants, and their likes. People should be involved in identifying their

[40] There are three major sources of secondary occupational education in New York: (1) comprehensive occupational/technical schools, (2) home (i.e., academic) high schools, and (3) Boards of Cooperative Extension Services (BOCES).

problems rather than having ideas forced on them. Research should be done in this area.

The findings of this research have been limited by the design. Sub-skills rather than specific skills were analyzed. The approach looked general. A lot of information might have been lost through that process. Similar research should be carried out using specific basic academic skills. A qualitative rather than a quantitative approach for carrying out this research is called for.

Education becomes boring when irrelevancies are forced on people. Many drop out of programs because of this—not because of lack of knowledge to cope with the mastery of essential skills pertinent to their "callings" but because of the introduction of irrelevant but not usable ideas and concepts. The specific skills needed for success in the diverse program areas should be researched and taught to students.

Even though this study has identified basic academic skills that are associated with success both at school and on the job, the investigator refrains from recommending a drastic change in our mode of instruction or in the curriculum. A drastic change will be very expensive. However, a gradual incorporation of the ideas and information gleaned from this work will go a long way towards improving our teaching and program planning techniques.

The consistency of basic academic skills demanded by each occupation, that is the fit between the program that is preparing students and the jobs that are out there for the students, is yet another area worthy of investigation. It is the feeling of many people that the academic demands of any program of occupational education are by far higher than the academic demands of the occupations themselves, or that the demands of school are greater than the demands of work. The present investigation suggests otherwise. Even though the graduates performed very well on the 1981 Basic Skills Survey, their employers complained bitterly about the skills of their new entry-level workers (the 1981 high school graduates). Maybe what employees need in order to be successful is more than the so-called basic academic skills. Further research is hereby solicited to determine other essentials for success at school and on the job.

This research has implications for both developing and developed nations of the world. The participatory approach used in this study is an important area of study. Participatory democracy is a budding area of educational literature. Its approach turns over a new leaf for carrying out research. This research could be considered an investigation of "needs assessment." Employees and employers were asked which skills they use and which ones they need for successful job performance. The study involved the people concerned and takes into consideration their perceived needs.

A replication of this study in other settings is hereby called for. A word of caution is indeed necessary here. Merely transferring the methods and design to developing countries will not be adequate. The approach to use varies from country to country depending on the level of technological development of each country.

The particular approach adopted in this work will help resolve some of the unmet problems concerning the dissemination of information and research findings in developing countries. This study has implications for agricultural extension and research centers.

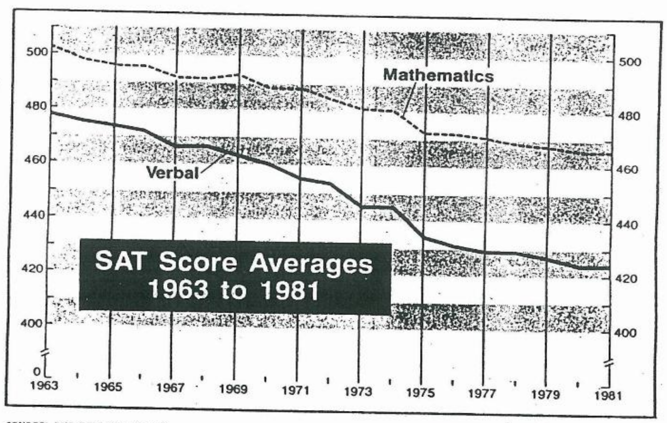
My home country, Nigeria, like many other developing countries in the world, needs to focus on basic skills (including basic academic skills) that are essential and needed for success both at school and in the world of work. This focus should replace the traditional universal primary education that has lost its concentration on mass literacy. There is a need for research to identify the essential basic skills associated with success in a developing economy. As it is now, Universal Primary Education (UPE) is geared towards preparation for secondary education and not for a preparation for the world of work.

The idea of basic skills management for effective performance is universal, not for just the basic academic skills, but rather for all the essential and enabling skills that are associated with success at school and at work. There is a need for all youth and adults alike to be proficient in communication, computation, and to be able to read and write with understanding. The basic skills are essential for survival in this complex world.

Every country of the world should embark on a vigorous and aggressive pursuit of basic education for all its citizenry. There should be a set target for the attainment of mass literacy. This is essential for development.

DECLINE IN PERFORMANCE

18-Year Decline in Aptitude-Test Scores



SOURCE: THE COLLEGE BOARD

CHRONICLE CHART BY PETER H. STAFFORD

Figure 01

CHANGING EDUCATIONAL RESPONSE

GROWTH OF NY COLLEGE ENROLLMENTS

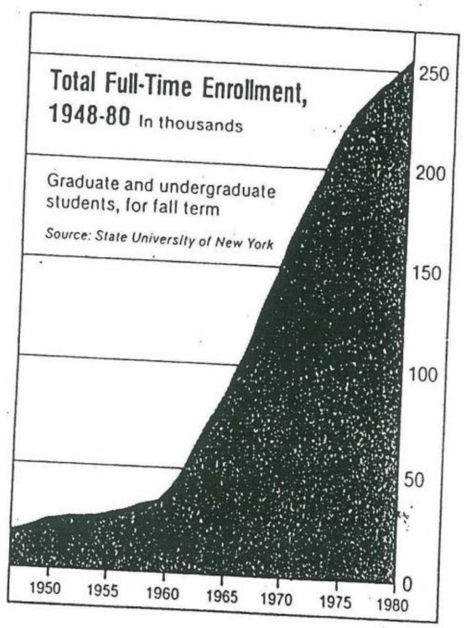
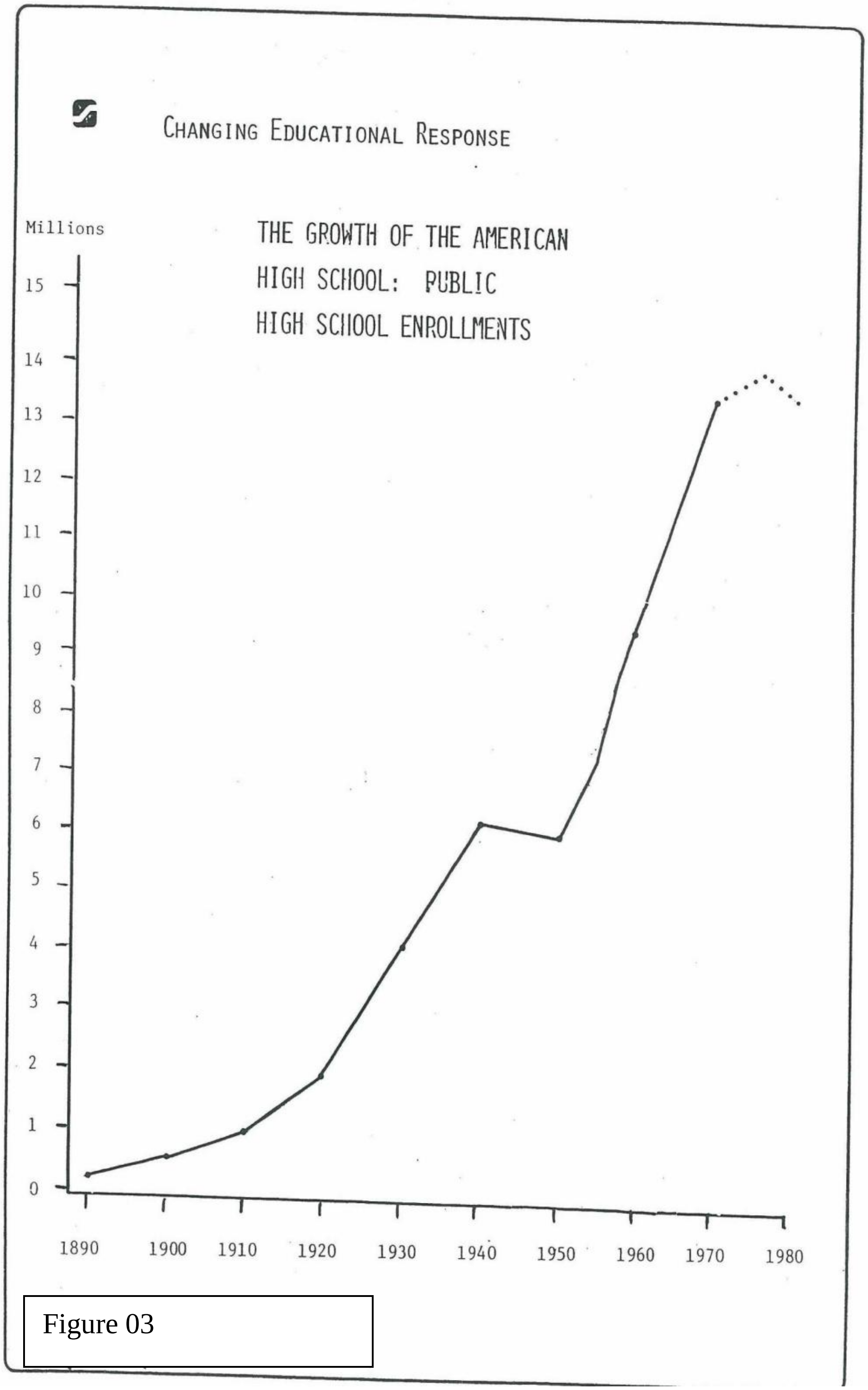


Figure 02



Changing Educational Response
Millions
THE GROWTH OF THE AMERICAN
HIGH SCHOOL: PUBLIC
HIGH SCHOOL ENROLLMENTS
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980

Figure 03

CHANGING ECONOMY

SUCCESSIVE BASES OF U.S. ECONOMY

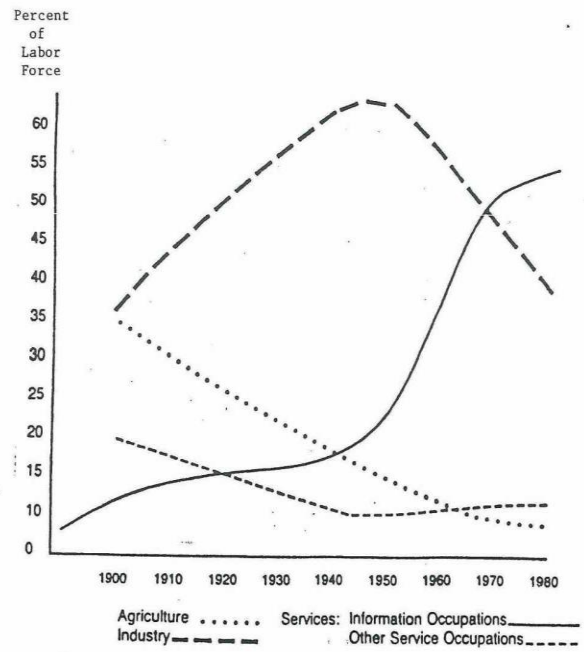


Figure 04

CHANGING ECONOMY

EVOLUTION OF AMERICAN LIFE

1900 1920 1940 1960 1980

37% - AGRICULTURE
34% - BUSINESS/INDUSTRY
No - PLUMBING
RUNNING WATER
ELECTRICITY
AUTOMOBILE
3% - H. S. DIPLOMA

7% - AGRICULTURE
65% - INDUSTRY
50% - H. S. DIPLOMA

3% - AGRICULTURE
35% - INDUSTRY
55% - INFORMATION
75% - H. S. DIPLOMA

Figure 05

24,745 City Pupils Held Back for Reading Deficiencies

By GENE I. MAEROFF

A total of 24,745 pupils, including at least one of every five seventh graders, are being held back this year under a new program in New York City's public schools that denies promotion to pupils with reading deficiencies.

The policy blocks the promotion of pupils in the fourth grade who read more than a year below grade level and those in the seventh grade who read more than a year and a half below grade level.

At least half the pupils are expected to attend an intensive summer session that begins Monday and ends Aug. 14. They will then be given a reading test to see if they have raised their scores to a mark acceptable for promotion in September. Those whose scores remain below the required level, as well as youngsters who do not take the summer classes, will repeat their grades in the fall.

The new policy, promulgated by Frank J. Macchiarola, the Schools Chancellor, is a cornerstone of the school system's effort to improve reading achievement, putting New York City in the forefront of a national movement to set minimum standards. Until now, the decision on whether to fail a child was arbitrary, and most pupils were permitted to continue to the next grade even if their performance was seriously lagging.

As a result, some pupils fell further and further below grade level as they advanced through the grades, and many of those now in junior and senior high school are trailing badly.

This year, 10,851, or 17 percent, of the fourth graders, and 13,894, or 21 percent, of the seventh graders are being held back. The percentages are more than twice as great as those for pupils denied promotion in the 1970's. The reading

Continued on Page B4, Column 3

THE NEW YORK TIMES, TUESDAY, JUNE 30, 1981

24,745 City Pupils Are Held Back Because of Reading Deficiencies

Continued From Page A1

scores of the pupils involved are in the lowest 25 percent nationally.

The fewest holdbacks are in District 26 in northeastern Queens, where 29 fourth graders and 48 seventh graders are being held back. The greatest number not being promoted are in District 9 in the Concourse section of the Bronx, where 870 fourth graders and 1,078 seventh graders are being held back.

Figures for all districts may change slightly, because the scores of some students who took the reading test late are not yet available.

The number of failures would have been even higher if the school system had gone ahead with its original plan, which called for seventh graders to be held back if they were reading more than a year below grade level instead of the more generous year and a half that is being used.

In addition, students were to be held back if their scores on the mathematics test were more than two years below grade level. School officials say the mathematics requirement will go into effect next June.

The more stringent guidelines were not applied this year, apparently because of the difficulty and the cost of accommodating so many more pupils.

Three Hours a Day

About 12,000 pupils are expected for this summer session, and at least one or two schools in each of the city's 32 community school districts will be kept open for the classes.

The program will generally last three hours each morning, with an hour and a half of reading instruction and an hour and a half of recreation. Breakfast and lunch will be provided at the schools as part of the Federal Government's Summer Food Service Program.

Enrollment in each class will be limited to 15 children, about half the size of a regular class. At least 400 veteran teachers have been hired for the summer, and they will form the core of the staff that will teach the holdovers in special, separate classes during the regular school year.

A handbook being provided by the school system for the summer session calls for instruction not only in reading, but also in the accompanying communications skills — listening, speaking and writing.

Journals to Encourage Writing

"You can't just teach reading in isolation," said Charlotte Frank, the school system's curriculum director. "Reading has to be taught in the framework of the whole language acquisition effort."

Students will keep daily journals to encourage them to write, and will also discuss articles in the newspaper each day to develop oral skills.

During the summer session, the bulk of each day will be devoted to a literature lesson by the teacher, followed by silent reading and reading aloud in small groups.

ATTENDANCE RATES

FOR EVERY 100 PUPILS WHO GRADUATED FROM HIGH SCHOOL IN 1980 (75% OF THE AGE COHORT) 61% ENTERED COLLEGE IN FALL 1980.

FOR EVERY 100 PUPILS WHO ENTERED COLLEGE IN THE FALL OF 1980, 50% ARE LIKELY TO EARN A BACHELORS DEGREE IN 1984.

THUS, FOR THE 1980 18 YEAR OLD AGE COHORT:

25% ARE HIGH SCHOOL DROPOUTS

29% WILL HAVE ONLY A HIGH SCHOOL DIPLOMA

23% WILL HAVE SOME COLLEGE TRAINING

23% ARE LIKELY TO RECEIVE A BACHELORS DEGREE BY 1984

Source: National Center for Educational Statistics

THE NEW YORK TIMES, THURSDAY, NOVEMBER 12, 1981

READING ANALYSIS IS CALLED LACKING

Study Finds Students Failing to Go Beyond a Superficial Assessment of Content

By EDWARD B. FISKE

A federally financed study has concluded that while American schoolchildren are learning to read a wide range of materials, the vast majority do not develop adequate thinking skills or the ability to interpret what they read beyond a superficial level.

In a report released yesterday, the National Assessment of Educational Progress found that more than 100,000 students tested last year demonstrated "very few skills for examining the nature of the ideas that they take away from their reading."

Moreover, students today are less skillful than their counterparts of a decade ago in analyzing literary selections and less knowledgeable about such literary classics as "Tom Sawyer" and the story of Robin Hood.

The National Assessment urged schools around the country to put more emphasis on writing, structured discussions and "problem solving" exercises in order to prepare students to function in a society in which the management of information has become "the fastest growing sector of the economy."

Crucial Need Is Seen

"In a world overloaded with information, both a business and a personal advantage will go to those individuals who can sort the wheat from the chaff, the important information from the trivial," it declared. "A society in which habits of disciplined reading, analysis, interpretation and discourse are not sufficiently cultivated has much to fear."

The National Assessment, which is financed by the Department of Education and administered by the Education Commission of the States in Denver, is the Federal Government's program for monitoring school performance. It issues periodic reports based on the testing of 9-, 13- and 17-year-olds in reading, mathematics and other basic subjects.

In the 1979-80 academic year researchers surveyed the reading and study skills, as well as the ability to analyze literary selections, of 106,000 young people around the country. Similar assessments of literarure had been conducted in 1970-71 and of reading in 1970-71 and 1974-75.

The students who were tested were asked to read short prose passages and poems and then to respond to multiple-choice questions and to write short essays about what they had read.

Drop in Reasoning Ability

Last spring the National Assessment reported results of the reading section of the study and found that the overall "inferential reasoning" ability of 13- and 17-year-olds had declined in the 1970's. It noted, however, that the performance of black students had improved, apparently as a result of Title I and other compensatory education programs.

In the report released yesterday, titled "Reading, Thinking and Writing," the researchers said that American schools have been "reasonably successful" in teaching students to comprehend a wide variety of materials and to make relatively superficial "preliminary" interpretations.

"By age 17, most of the students assessed are able to answer multiple choice questions requiring either literal or inferential skills," the researchers said. "Most are also able to summarize passages and demonstrate the mechanical and grammatical writing skills they would need if they learned how to write more extended answers."

But they said the majority lacked "problem-solving strategies" and "critical-thinking skills" that would enable them to go beyond simple, often personal, reactions to literary passages.

Supporting Initial Judgment

"They do not appear to have learned how to look for evidence for their judgments, whether by systematically analyzing some aspect of the passage or by referring to their own ideas and value systems," they declared.

In one exercise, for example, students were asked to a read a poem titled, "I was you" by Dory Previn. It begins:

i smiled / your smile / till my mouth /
was set / and my face / was tight /
and it wasn't right / it was wrong / i
was you baby / i was you too long.

One superficial response ran, in part: "I did not like it cause no one can be someone else. I thought it was stupid cause I don't think it had any purpose at all for me or maybe anyone else."

On the other hand, a high rating was given to a much longer response that began, "The important idea of this poem is that when we aren't ourselves and try to be someone else, that someone else has power over us. I think that the [author] doesn't believe he is his own self. That's why small I's are used instead of capital I's."

'Drastic Decline' Is Found

The researchers found a "drastic decline" over the last decade in the ability of older students to write an "open-ended" analysis of two poems. "In 1971, 51.2 percent of the 17-year-olds wrote adequate analyses, while in 1980, 41.2 percent did so," they stated. In the earlier study 11.1 percent wrote "inadequate" analyses, but in 1980 this figure rose to 16.6 percent.

"Quite clearly, students did fairly well on multiple-choice inferential items," the report declared, "but they did not go much beyond these tasks to the more complex, yet fundamental, tasks that asked them to explain and substantiate their inferences."

The researchers also found that students' knowledge of literary classics had declined. Among 13-year-olds, the mean percentage of those "recognizing literary works and characters" such as Rip Van Winkle, Noah and Robin Hood fell to 59.2 percent from 66.2 percent, while among 17-year-olds figure dropped to 64.7 percent from 70.5 percent.

New York State College of Agriculture and Life Sciences
a Statutory College of the State University
Cornell University

Department of Education
Stone Hall
Ithaca, N. Y. 14853

Cornell Institute for
Occupational Educati
Telephone 607-256-6515

April 8, 1982

Dear Graduate:

As you may remember, in May 1981 you participated in a Vocational Education Survey conducted by the Cornell Institute for Occupational Education. We are now completing Part II of that Survey. We would like to learn what skills you use on your job and how important and easy such skills are for you.

This survey is one of the efforts being made by the Cornell Institute for Occupational Education, the Association of Vocational Education Administrators, and the New York State Department of Education to improve the teaching of basic skills in Vocational Institutions.

Your help is needed to make this effort a success. The information you provide will enable us to improve our vocational programs.

Your responses will be entirely confidential. You need not give your name if you don't want to.

Please complete the attached questionnaire and return it today in the enclosed self-addressed envelop.

Thank you for your time and cooperation.

Yours sincerely,

JOA Akinwumiju

Julius Akinwumiju
Research Associate

JA :rbm
4/7/82

P. S. Please give the enclosed green form to your supervisor and request him to complete it and return in the attached envelop.

BASIC ACADEMIC SKILLS AND THE WORLD OF WORK

Name (Optional).............................. Sex............ Birth Date.........................

Date of High School Graduation.................. Vocational Major in High School................

* Type of Job you Currently Hold.................. Date Employed.................................

Name/Address of your Employer...

....

Have you Changed Jobs since Graduation?....... If Yes, Why?.......................................

....

Directions

Please indicate how you feel about each of the following. Circle the choice which best describes your feeling. Please rate each item TWICE, once on the left and once on the right. Please complete both sides of the questionnaire.

IMPORTANCE — How IMPORTANT is this skill for success on your job?

EASE — How EASY is this skill for you?

1 Very Important	2 Somewhat Important	3 Neutral	4 Somewhat Unimportant	5 Very Unimportant		1 Very Easy	2 Somewhat Easy	3 Neutral	4 Somewhat Difficult	5 very difficult
					WHOLE NUMBERS					
1	2	3	4	5	Addition of	1	2	3	4	5
1	2	3	4	5	Subtraction of	1	2	3	4	5
1	2	3	4	5	Multiplication of	1	2	3	4	5
1	2	3	4	5	Division of	1	2	3	4	5
					FRACTIONS					
1	2	3	4	5	Addition of	1	2	3	4	5
1	2	3	4	5	Subtraction of	1	2	3	4	5
1	2	3	4	5	Multiplication of	1	2	3	4	5
1	2	3	4	5	Division of	1	2	3	4	5
					DECIMALS					
1	2	3	4	5	Addition of	1	2	3	4	5
1	2	3	4	5	Subtraction of	1	2	3	4	5
1	2	3	4	5	Multiplication of	1	2	3	4	5
1	2	3	4	5	Division of	1	2	3	4	5
					MEASUREMENTS					
1	2	3	4	5	Measuring lengths	1	2	3	4	5
1	2	3	4	5	Measuring weights	1	2	3	4	5
1	2	3	4	5	Working with geometric figures	1	2	3	4	5
1	2	3	4	5	Changing decimals to percents	1	2	3	4	5
1	2	3	4	5	Changing percents to fractions	1	2	3	4	5
1	2	3	4	5	Reading a rule	1	2	3	4	5
1	2	3	4	5	Reading a micrometer	1	2	3	4	5
1	2	3	4	5	Working with liquid measures	1	2	3	4	5
1	2	3	4	5	Measuring angles	1	2	3	4	5

IMPORTANCE — How IMPORTANT is this skill for success on your job?

EASE — How EASY is this skill for you?

1 Very Important	2 Somewhat Important	3 Neutral	4 Somewhat Unimportant	5 Very Unimportant		1 Very Easy	2 Somewhat Easy	3 Neutral	4 Somewhat Difficult	5 very difficult
					GENERAL MATH					
1	2	3	4	5	Solving simple equations	1	2	3	4	5
1	2	3	4	5	Working with percentages	1	2	3	4	5
1	2	3	4	5	Reading charts and graphs	1	2	3	4	5
1	2	3	4	5	Estimating answers to problems	1	2	3	4	5
1	2	3	4	5	Working with ratios and proportions	1	2	3	4	5
1	2	3	4	5	Rounding numbers	1	2	3	4	5
1	2	3	4	5	Reducing fractions to lowest terms	1	2	3	4	5
1	2	3	4	5	Changing common fractions to decimals & vice versa	1	2	3	4	5
					READING					
1	2	3	4	5	Reading facts	1	2	3	4	5
1	2	3	4	5	Reading for instructions	1	2	3	4	5
1	2	3	4	5	Reading for new ideas	1	2	3	4	5
1	2	3	4	5	Reading to infer meanings	1	2	3	4	5
1	2	3	4	5	Reading to detect fallacy	1	2	3	4	5
1	2	3	4	5	Reading to detect persuasive intent	1	2	3	4	5
					WRITING					
1	2	3	4	5	Using good grammar	1	2	3	4	5
1	2	3	4	5	Spelling correctly	1	2	3	4	5
1	2	3	4	5	Using good punctuations	1	2	3	4	5
1	2	3	4	5	Writing complete sentences correctly	1	2	3	4	5

** If you are not employed full time, what is your major activity?

1. Attending School
2. Unemployed - Looking for job
3. Military
4. Others (indicate)________________

THANK YOU FOR YOUR TIME AND COOPERATION

New York State College of Agriculture and Life Sciences
a Statutory College of the State University
Cornell University

Department of Education
Stone Hall
Ithaca, N. Y. 14853

Cornell Institute for
Occupational Education
Telephone 607-256-6515

April 8, 1982

The Cornell Institute for Occupational Education (CIOE) in conjunction with the New York State Department of Education and the Association of Vocational Education Administrators (AVEA) is conducting a survey of the basic academic skills of mathematics and reading that are essential for effective and efficient job performance in various business, trade, and specialty areas.

We believe employers are in the best position to know, and advise, on which basic academic skills are essential for successful and efficient job performance and which skills are lacked by typical high school graduates who are just beginning their career in the world of work.

Would you please take a few moments to complete the enclosed one-page questionnaire and return it in the enclosed self-addressed envelope today. We realize how important your time is to you, but your advice is important if we are to improve New York education.

Your responses will be strictly confidential. You need not give your name, if you so desire.

Your cooperation will be sincerely appreciated. With the information you provide, we hope to be able to better plan basic academic skill remedial programs for your future workers.

Sincerely yours,

JOA Akinwumiju

Julius Akinwumiju
Research Associate

Ps. See reverse side for questionnaire.

JA :rbm
4/7/82

CORNELL INSTITUTE FOR OCCUPATIONAL EDUCATION

EMPLOYER SURVEY

BASIC ACADEMIC SKILLS AND THE WORLD OF WORK

Name of Business .... Name of Respondent..............................

Business Address ....

Directions

For each of the basic academic skills listed below please indicate whether you consider the skill essential for new entry-level employee success in the type of job indicated; and whether the skills are missing in typical new employees, especially recent High School graduates. Please mark each skill on both dimensions i.e. TWICE, once on the left and once on the right. Circle the choice which best describes your feeling.

How IMPORTANT are the following skills for success here in ....

In your opinion how SKILLED are your new High School graduate employees?

1 Very Important	2 Somewhat Important	3 Of Moderate Importance	4 Somewhat Unimportant	5 Very Unimportant		1 Highly Skilled	2 Quite Skilled	3 Of Moderate Skill	4 Not Quite Skilled	5 Not Skilled At All
					WHOLE NUMBERS					
1	2	3	4	5	Addition of	1	2	3	4	5
1	2	3	4	5	Subtraction of	1	2	3	4	5
1	2	3	4	5	Multiplication of	1	2	3	4	5
1	2	3	4	5	Division of	1	2	3	4	5
					FRACTIONS					
1	2	3	4	5	Addition of	1	2	3	4	5
1	2	3	4	5	Subtraction of	1	2	3	4	5
1	2	3	4	5	Multiplication of	1	2	3	4	5
1	2	3	4	5	Division of	1	2	3	4	5
					DECIMALS					
1	2	3	4	5	Addition of	1	2	3	4	5
1	2	3	4	5	Subtraction of	1	2	3	4	5
1	2	3	4	5	Multiplication of	1	2	3	4	5
1	2	3	4	5	Division of	1	2	3	4	5
					MEASUREMENTS					
1	2	3	4	5	Measuring lengths	1	2	3	4	5
1	2	3	4	5	Measuring weights	1	2	3	4	5
1	2	3	4	5	Working with geometric figures	1	2	3	4	5
1	2	3	4	5	Changing percents to fractions	1	2	3	4	5
1	2	3	4	5	Changing decimals to percents	1	2	3	4	5
1	2	3	4	5	Reading a rule	1	2	3	4	5
1	2	3	4	5	Reading a micrometer	1	2	3	4	5
1	2	3	4	5	Working with liquid measures	1	2	3	4	5
1	2	3	4	5	Measuring angles	1	2	3	4	5

How IMPORTANT are the following skills for success here in ....

In your opinion how SKILLED are your new High School graduate employees?

1 Very Important	2 Somewhat Important	3 Of Moderate Importance	4 Somewhat Unimportant	5 Very Unimportant		1 Highly Skilled	2 Quite Skilled	3 Of Moderate Skill	4 Not Quite Skilled	5 Not Skilled At All
					GENERAL MATH					
1	2	3	4	5	Solving simple equations	1	2	3	4	5
1	2	3	4	5	Working with percentages	1	2	3	4	5
1	2	3	4	5	Estimating answers to problems	1	2	3	4	5
1	2	3	4	5	Reading charts and graphs	1	2	3	4	5
1	2	3	4	5	Working with ratios and proportions	1	2	3	4	5
1	2	3	4	5	Rounding numbers	1	2	3	4	5
1	2	3	4	5	Reducing fractions to lowest terms	1	2	3	4	5
1	2	3	4	5	Changing common fractions to decimals and vice versa	1	2	3	4	5
					READING					
1	2	3	4	5	Reading for facts	1	2	3	4	5
1	2	3	4	5	Reading for instructions	1	2	3	4	5
1	2	3	4	5	Reading for ideas	1	2	3	4	5
1	2	3	4	5	Reading to infer meanings	1	2	3	4	5
1	2	3	4	5	Reading to detect fallacy	1	2	3	4	5
1	2	3	4	5	Reading to detect persuasive intent	1	2	3	4	5
					WRITING					
1	2	3	4	5	Using good grammar	1	2	3	4	5
1	2	3	4	5	Spelling correctly	1	2	3	4	5
1	2	3	4	5	Writing complete sentences correctly	1	2	3	4	5

THANK YOU FOR YOUR TIME AND COOPERATION

MATHEMATICS CURRICULUM

A. ARITHEMATIC COMPUTATION

PERFORMANCE CRITERIA

I. *Whole Number Operations*

Given appropriate whole number problem sets, the student will be able to solve problems involving:

1. addition of whole numbers without and with carrying
2. subtraction of whole numbers without and with borrowing
3. multiplication of whole numbers without and with carrying
4. division of whole numbers with quotients expressed, if necessary with whole number remainders
5. division of whole numbers with quotients expressed, if necessary, with fractional or decimal remainders.

II. *Fraction Operations*

Given appropriate fraction and/or mixed number problem sets, the student will be able to solve problems involving:

1. addition of common and mixed fractions with like and unlike denominators
2. subtraction of common and mixed fractions with like and unlike denominators
3. multiplication of common and mixed fractions
4. division of common and mixed fractions

III. *Decimal Operations*

Given appropriate decimal number problem sets, the student will be able to solve problems involving:

1. addition of simple and complex decimals
2. subtraction of simple and complex decimals
3. multiplication of simple and mixed decimals
4. division of simple and mixed decimals

B. MEASUREMENT

PERFORMANCE CRITERIA

I. *U.S. Customary (English) and Metric Measurement*

Given appropriate U.S. Customary (English) or metric unit measurement problem sets, the student will solve problems involving:

1. linear measurement with accuracy to the nearest unit necessary
2. area measurement, of figures, with accuracy to the nearest unit necessary
3. volume and capacity measurement of objects with accuracy to the nearest cubic, fuid, or dry unit necessary
4. mass or weight measurement of objects with accuracy to the nearest unit necessary

C. MATHEMATICAL REASONING

PERFORMANCE CRITERIA

I. *Numeric Relationships*

Given appropriate problem sets, the student will solve problems involving the conversion, in either direction of:

1. common fractions and decimal fractions
2. common fractions and percents
3. decimal fractions and percents
4. U.S. Customary measurement units and equivalent metric units

II. *Simple Linear Equations and Other Problem Solving Skills*

Given appropriate problem sets, the student will solve problems involving:

1. Estimation and approximation
2. one- and two-step linear equations
3. the identification of the information and operations necessary for, and the solution of, applied problems

READING CURRICULUM

A. Informational Reading	*PERFORMANCE CRITERIA*
I. *READING FOR FACTS*	***Given appropriate reading material, either prose or abbreviated sources*, the student will be able to obtain needed factual information.***
II. *READING FOR INSTRUCTION*	***Given appropriate reading material, either prose or abbreviated sources*, the student will:*** 1. identify and follow procedures and directions to follow to achieve some specific end
III. *READING FOR IDEAS*	***Given appropriate reading material, either prose or abbreviated sources*, the student will be able to read and subsequently demonstrate adequate understanding of:*** 1. cause and effect relationships 2. sequential and temporal relationships 3. general and technical concepts 4. physical and social principles

B. Critical Reading	*PERFORMANCE CRITERIA*
I. *READING TO INFER MEANING*	***Given appropriate reading material, either prose or abbreviated source*, the student will:*** 1. use context clues to determine the meaning of unfamiliar words (e.g., experience clues, synonym clues, association clues, previous contact clues) 2. examine the structure of unfamiliar words to determine if there are recognizable parts tht give clues to their meaning (e.g., syllables, afixes, compound words)
II. *READING TO GENERALIZE*	***Given appropriate reading material, either prose or abbreviated sources*, the student will:*** 1. extrapolate meaning beyond the facts given 2. predict future events based on the facts given 3. extend applications from the facts given
III. *READING TO DETECT FALLACY AND PERSUASIVE INTENT*	***Given appropriate reading material the student will identify:*** 1. fallacious arguments 2. inconsistent facts 3. illogical conclusions 4. author bias tone emotional words selective choice of information

*Abbreviated sources of reading material include tables of contents, glossaries, indexes, outlines, forms, and graphic presentations such as charts, schedules, tables, graphs, maps, figures, and diagrams.

ORAL COMMUNICATION CURRICULUM

A. LISTENING SKILLS	*PERFORMANCE CRITERIA*
I. *Listening to Comprehend the Literal Meaning of a Message*	*Given appropriate listening situations, the student will listen to:* 1. obtain specific information 2. identify procedures and directions to follow to achieve some specific end 3. understand general and technical concepts 4. understand sequential and temporal relationships, including cause and effect relationships
II. *Listening to Infer Meaning or to Generalize*	*Given appropriate listening situations, the student will listen to:* 1. use context clues to infer the meaning of unknown words 2. extrapolate meaning beyond the facts given 3. predict future events based on the facts given 4. extend applications from the facts given
III. *Listening to Detect Inconsistency, Fallacy or Persuasive Intent*	*Given appropriate listening situations, the student will identify:* 1. inconsistent facts 2. fallacious arguments 3. illogical conclusions 4. inappropriate body movements 5. inconsistent tone of voice 6. emotional words 7. figurative language 8. selective use of information

B. SPEAKING SKILLS	*PERFORMANCE CRITERIA*
I. *Selecting Words*	*Given an appropriate speaking situation, the student will choose appropriate words, that is, will:* 1. avoid using inappropriate emotional words 2. choose between technical and lay terms depending on the audience. 3. use slang only as appropriate
II. *Speaking Face to Face*	*Given a speaking situation, the students will initiate, maintain, or conclude a conversation by:* 1. pronouncing words correctly and clearly given the constraints of the local dialect 2. using appropriate cadence and inflection 3. using appropriate body movements and tone of voice
III. *Speaking Over the Telephone*	*Given a speaking situation where a telephone is used, the student will:* 1. use associated services such as operator assistance, directory assistance, and the local directory 2. use the correct technique for placing calls 3. use proper protocol in identifying oneself and one's place of work and addressing the caller

WRITING CURRICULUM

A. STRUCTURE OF WRITTEN MESSAGES

PERFORMANCE CRITERIA

I. *Key Words and Brief Notes*

Given an appropriate writing assignment, the student will:

1. use key vocabulary words from the occupational area
2. write brief messages using key words

II. *Phrases, Sentences, and Paragraphs*

Given an appropriate writing assignment, the student will:

1. place modifiers correctly
2. complete sentences
3. avoid nonparallel structure
4. avoid run on sentences
5. use an effective sequence of sentences to form paragraphs

III. *Letters and Other Formal Messages*

Given an appropriate writing assignment the student will construct messages using appropriate format and length for his or her occupation area.

B. MECHANICS

PERFORMANCE CRITERIA

I. *Capitalization*

Given a writing assignment which calls for capitalizing appropriate words, the student will:

1. identify the words in sentences that should be capitalized

II. *Spelling*

Given a writing assignment, the student will:

1. spell common words correctly

III. *Punctuation*

Given a writing assignment which calls for punctuation, the student will correctly use:

1. commas
2. end marks
3. the singular, plural, singular possive, or plural possessive forms of nouns

IV. *Handwriting*

Given a writing assingment, the student's:

1. penmanship will be legible enough to be read

V. *Alphabetization*

Given a writing assignment which calls for alphabetizing, the student will:

1. alphabetize by the first, second, and third letters as is appropriate

WORD SELECTION

PERFORMANCE CRITERIA

I. *Grammar*

Given an appropriate writing assignment, the student will use:

1. regular and irregular verbs accurately in context with reference to tense and number
2. positive, comparative, and superlative adjectives in context correctly

II. *Diction*

Given an appropriate writing assignment, the student will choose:

1. appropriate technical vocabulary
2. lay vocabulary as is appropriate

LANGUAGE ARTS RESPONSE PATTERNS BY ITEMS

ITEM #	SCHOOL # BOCES N= 1366 NUMBER OF VALID RESPONSES	% RESPONDING	PERCENTAGE OF RESPONDENTS PASSING				
1	1340	98.1	73.1	Reading for Instructions		READING	BASIC SKILLS-LANGUAGE ARTS
2	1338	98.0	79.7				
3	1317	96.4	56.1				
4	1339	98.0	87.7				
5	1331	97.4	71.6				
6	1331	97.4	81.9				
7	1299	95.1	82.0	Reading for Concepts			
8	1292	94.6	63.8				
9	1294	94.7	64.1				
10	1302	95.3	79.3				
11	1301	95.2	88.2				
12	1286	94.1	56.9				
13	1307	95.7	82.9	Reading to Detect Persuasive Intent			
14	1303	95.4	72.0				
15	1296	94.9	53.8				
16	1298	95.0	28.3				
17	1286	94.1	50.8				
18	1294	94.7	84.7				
49	1323	96.9	75.7	Reading Graphic Materials			
50	1325	97.0	84.6				
51	1312	96.0	66.5				
52	1323	96.9	94.8				
53	1320	96.6	97.8				
54	1309	95.8	91.5				
19	1341	98.2	66.2	Possessives	GRAMMAR	LANGUAGE USAGE	
20	1331	97.4	31.7				
21	1337	97.9	63.1				
22	1332	97.5	43.1	Adj. Use			
23	1337	97.9	14.3				
24	1336	97.8	90.6				
25	1336	97.8	95.5	Verb Tense			
26	1335	97.7	96.3				
27	1338	98.0	94.5				
28	1335	97.7	89.1				
29	1303	95.4	-				
30	1144	83.7	-				
31	1300	95.2	96.3	Punctuation	MECHANICS		
32	1258	92.1	5.6				
33	1228	89.9	7.7				
34	1184	86.7	82.0				
35	1132	82.9	62.4				
36	1220	89.3	89.3				
37	1231	90.1	73.9				
38	1226	89.8	72.0				
39	1189	87.0	40.6				
40	1263	92.5	81.2	Capitalization			
41	1280	93.7	95.1				
42	1267	92.8	92.7				
43	1292	94.6	84.4	Sent. Completion			
44	1283	93.9	90.8				
45	1278	93.6	54.6				
46	1305	95.5	-	Alphabetization			
47	1300	95.2	-				
48	1297	94.9	69.5				

BOCES MATHEMATICS POPULATION

ALL BOCES MATHEMATICS
N=1332

ITEM #	NUMBER OF VALID RESPONSES	% RESPONDING	% PASSING	
1	1322	99.2	98.9	WHOLE NUMBER OPERATIONS
2	1323	99.3	95.5	
3	1321	99.1	96.3	
4	1304	97.9	93.3	
5	1309	98.3	91.3	
6	1310	98.3	94.4	
7	1309	98.3	94.6	
8	1304	97.9	92.3	
9	1299	97.5	95.8	
10	1281	96.2	52.1	
11	1282	96.2	92.6	
12	1260	94.6	86.7	
13	1248	93.7	53.3	FRACTIONAL OPERATIONS
14	1244	93.4	63.0	
15	1211	90.9	55.7	
16	1156	86.8	44.3	
17	1180	88.6	74.7	
18	1153	86.6	66.2	
19	1182	88.7	86.7	
20	1127	84.6	30.2	
21	1151	86.4	75.9	
22	1117	83.9	47.6	
23	1100	82.6	40.6	
24	1100	82.6	51.5	
25	1207	90.6	78.5	DECIMAL OPERATIONS
26	1205	90.5	86.2	
27	1204	90.4	89.4	
28	1180	88.6	76.0	
29	1150	86.3	69.8	
30	1150	86.3	76.8	
31	1156	86.8	54.3	
32	1155	86.7	63.7	
33	1134	85.1	57.5	
34	1120	84.1	75.0	
35	1071	80.4	51.4	
36	1070	80.3	67.3	
37	1111	83.4	21.7	DECIMAL, FRACTION, PERCENT CONVERSIONS
38	1119	84.0	78.6	
39	1119	84.0	85.6	
40	1100	82.6	73.2	
41	1105	83.0	78.5	
42	1099	82.5	46.6	
43	1058	79.4	47.3	PERCENTAGE MULTIPLICATION
44	1068	80.2	39.9	
45	1015	76.2	45.5	
46	1051	78.9	42.3	
47	1062	79.7	31.3	
48	1096	82.3	7.3	
49	1138	85.4	96.5	MEASUREMENT AND GEOMETRY
50	1099	82.5	46.7	
51	1094	82.1	58.8	
52	1099	82.5	70.3	
53	1075	80.7	40.9	
54	993	74.5	42.4	
55	1059	79.5	75.6	EQUATIONS AND STORY PROBLEMS
56	1066	80.0	91.6	
57	1030	77.3	66.6	
58	1037	77.9	78.9	
59	1042	78.2	32.1	
60	1007	75.6	43.2	

ARITHMETIC COMPUTATIONS (WHOLE NUMBER OPERATIONS, FRACTIONAL OPERATIONS, DECIMAL OPERATIONS)

GENERAL MATHEMATICS (DECIMAL, FRACTION, PERCENT CONVERSIONS; PERCENTAGE MULTIPLICATION; MEASUREMENT AND GEOMETRY; EQUATIONS AND STORY PROBLEMS)

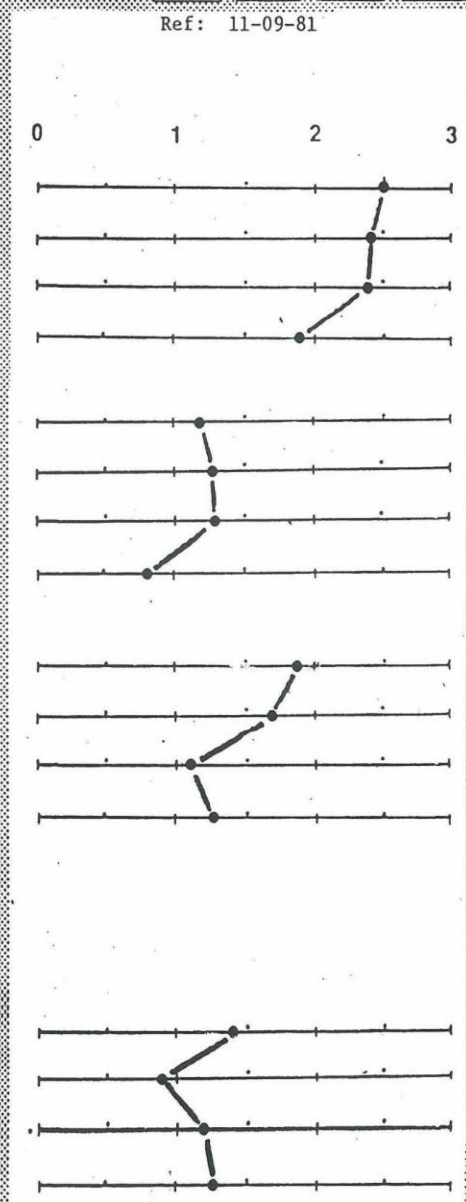
BASIC SKILLS-MATHEMATICS (ARITHMETIC COMPUTATIONS, GENERAL MATHEMATICS)

AGRICULTURAL EDUCATION
MATHEMATICS

SENIORS, MAY 1981

TEACHING
BASIC SKILLS
THROUGH
VOCATIONAL
EDUCATION

MATHEMATICS	$\bar{x}$
ARITHMETIC COMPUTATION	
Whole Number Operations	
ADDITION	2.5
SUBTRACTION	2.4
MULTIPLICATION	2.4
DIVISION	1.9
Fractional Operations	
ADDITION	1.2
SUBTRACTION	1.3
MULTIPLICATION	1.3
DIVISION	.8
Decimal Operations	
ADDITION	1.9
SUBTRACTION	1.7
MULTIPLICATION	1.1
DIVISION	1.3
GENERAL MATHEMATICS	
DECIMAL, FRACTION, PERCENT CONVERSIONS	1.4
PERCENT MULTIPLICATION	.9
MEASUREMENT/ GEOMETRY	1.2
STORY PROBLEMS	1.3

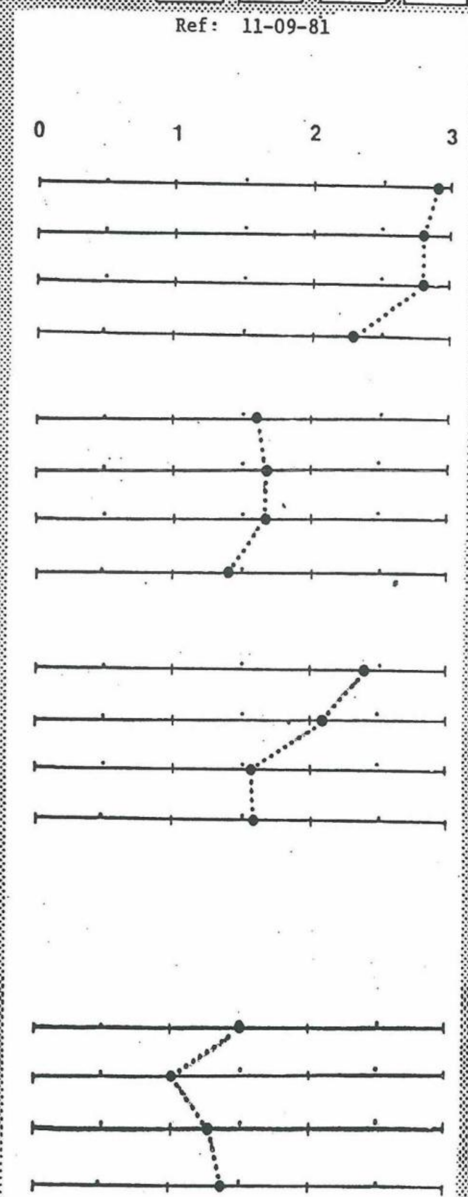


Cornell Institute for Occupational Education

NURSING
MATHEMATICS
SENIORS, MAY 1981

TEACHING BASIC SKILLS THROUGH VOCATIONAL EDUCATION

MATHEMATICS	$\overline{X}$
ARITHMETIC COMPUTATION	
Whole Number Operations	
ADDITION	2.9
SUBTRACTION	2.8
MULTIPLICATION	2.8
DIVISION	2.3
Fractional Operations	
ADDITION	1.6
SUBTRACTION	1.7
MULTIPLICATION	1.7
DIVISION	1.4
Decimal Operations	
ADDITION	2.4
SUBTRACTION	2.1
MULTIPLICATION	1.6
DIVISION	1.6
GENERAL MATHEMATICS	
DECIMAL, FRACTION, PERCENT CONVERSIONS	1.5
PERCENT MULTIPLICATION	1.0
MEASUREMENT/ GEOMETRY	1.3
STORY PROBLEMS	1.4



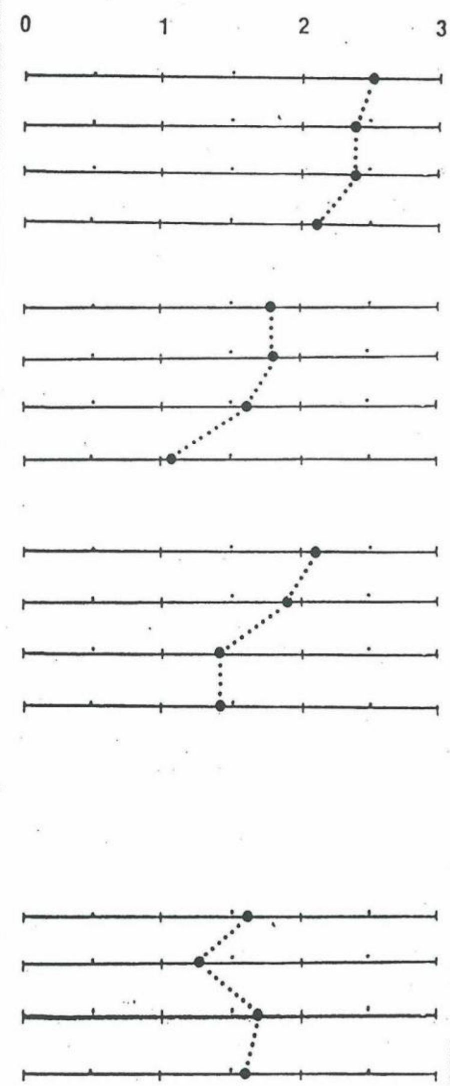
TECHNICAL
MATHEMATICS

SENIORS, MAY 1981

TEACHING BASIC SKILLS THROUGH VOCATIONAL EDUCATION

MATHEMATICS	$\bar{x}$
ARITHMETIC COMPUTATION	
Whole Number Operations	
ADDITION	2.5
SUBTRACTION	2.4
MULTIPLICATION	2.4
DIVISION	2.1
Fractional Operations	
ADDITION	1.8
SUBTRACTION	1.8
MULTIPLICATION	1.6
DIVISION	1.1
Decimal Operations	
ADDITION	2.1
SUBTRACTION	1.9
MULTIPLICATION	1.4
DIVISION	1.4
GENERAL MATHEMATICS	
DECIMAL, FRACTION, PERCENT CONVERSIONS	1.6
PERCENT MULTIPLICATION	1.3
MEASUREMENT/ GEOMETRY	1.7
STORY PROBLEMS	1.6

Ref: 11-09-81



Cornell Institute for Occupational Education

AGRICULTURAL EDUCATION

LANGUAGE ARTS

SENIORS, MAY 1981

BASIC SKILLS
THROUGH
VOCATIONAL
EDUCATION

LANGUAGE ARTS

All scores converted to 6-point scale

READING

Reading For Instructions	3.8
Reading For Concepts	4.1
Reading To Detect Persuasive Intent	3.3
Reading Graphic Material	4.6

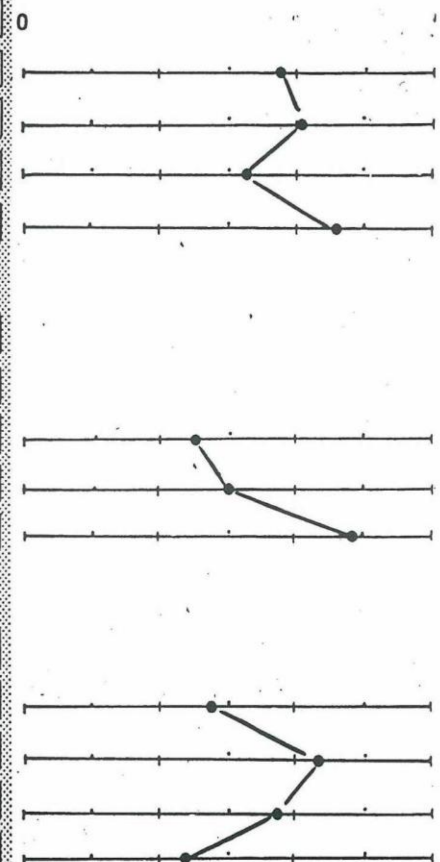
LANGUAGE USAGE

Grammar

POSSESSIVES	2.6
ALPHABETIZATION	3.0
VERB TENSE	4.9

Mechanics

PUNCTATION	2.8
CAPITALIZATION	4.4
SENTENCE COMPLETION	3.8
ADJECTIVES	2.4



Cornell Institute for Occupational Education

LANGUAGE ARTS

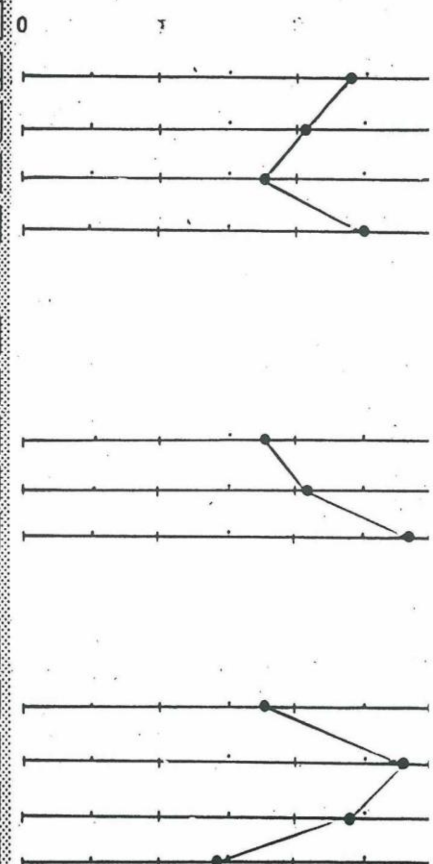
SENIORS, MAY 1981

BASIC SKILL
THROUG
VOCATIONA
EDUCATIO

LANGUAGE ARTS

All scores converted to 6-point scal

READING	
Reading For Instructions	4.8
Reading For Concepts	4.1
Reading To Detect Persuasive Intent	3.6
Reading Graphic Material	5.0
LANGUAGE USAGE	
Grammar	
POSSESSIVES	3.6
ALPHABETIZATION	4.2
VERB TENSE	5.7
Mechanics	
PUNCTATION	3.6
CAPITALIZATION	5.6
SENTENCE COMPLETION	4.8
ADJECTIVES	2.8



Cornell Institute for Occupational Education

TECHNICAL
LANGUAGE ARTS

SENIORS, MAY 1981

TEACHI...
BASIC SKIL...
THROU...
VOCATION...
EDUCATI...

LANGUAGE ARTS

All scores converted to 6-point sca...

READING

Reading For Instructions	4.0
Reading For Concepts	4.0
Reading To Detect Persuasive Intent	3.2
Reading Graphic Material	4.7

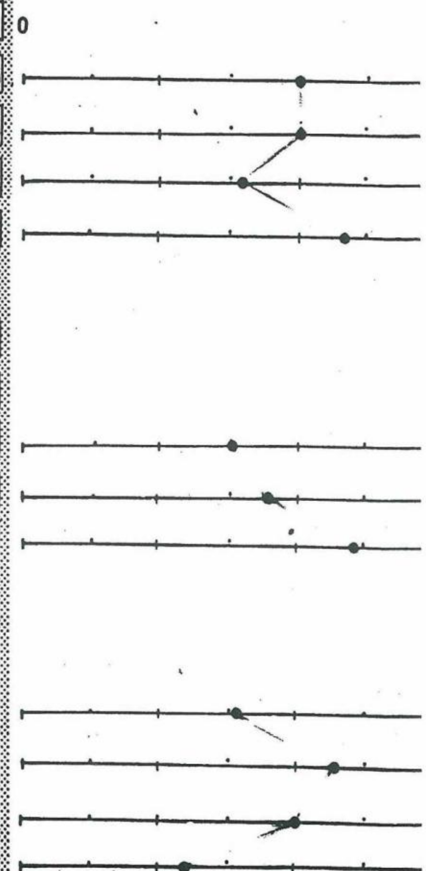
LANGUAGE USAGE

Grammar

POSSESSIVES	3.0
ALPHABETIZATION	3.6
VERB TENSE	4.9

Mechanics

PUNCTATION	3.1
CAPITALIZATION	4.6
SENTENCE COMPLETION	4.0
ADJECTIVES	2.4



1. Agricultural education

_____ A. Prevocational studies in agriculture
_____ B. Agriculture production
_____ C. Agriculture mechanics, farm mechanics
_____ D. Ornamental horticulture
_____ E. Conservation
_____ F. Agriculture technology
_____ G. Other agriculture program

2. Distributive education

_____ A. Prevocational studies in distributive education
_____ B. Advertising services and sales
_____ C. Apparel, fasion merchandising
_____ D. Automotive, petroleum, service station management
_____ E. Food distribution and marketing
_____ F. General merchandising and sales, wholesaling
_____ G. Real estate
_____ H. Other distributive education program

3. Health occupations education

_____ A. Prevocational studies in health education
_____ B. Dental assisting
_____ C. Dental lab technology, dental lab assisting
_____ D. Medical lab assisting
_____ E. Nursing, licensed practical
_____ F. Nurse assisting, nurse aide
_____ G. Home health assisting
_____ H. Medical assisting (office)
_____ I. Other health occupation program

4. Home economics education

_____ A. Prevocational studies in home economics
_____ B. Care and guidance of children
_____ C. Clothing and textiles, clothing management, dry cleaning, upholstering, textile production and fabrication
_____ D. Food services, food management, quantity food occupations
_____ E. Other home economics program

5. Business and office education

_____ A. Prevocational studies in business and office education
_____ B. Bookkeeping and accounting
_____ C. Data processing, xeroxing
_____ D. General office, typing, filing, clerical
_____ E. Stenographic and secretarial
_____ F. Supervision, business administration
_____ G. Office-related technology
_____ H. Other business or office education program

6. Technical education

_____ A. Prevocational studies in technical fields
_____ B. Architectural technology, drafting
_____ C. Chemical technology, industrial chemistry
_____ D. Civil technology, structure drafting
_____ E. Electrical technology
_____ F. Electronic technology, computer circuitry
_____ G. Electro-mechanical technology
_____ H. Mechanical technology, mechanical design
_____ I. Other technical education program

7. Trade, industrial, or service occupations

_____ A. Prevocational studies in this area
_____ B. Air conditioning, refrigeration, heating
_____ C. Appliance repair
_____ D. Auto body and fender repair
_____ E. Auto mechanics, diesel
_____ F. Aviation operations, mechanics, and services
_____ G. Commercial arts, advertising, interior decorating
_____ H. Commercial photography
_____ I. Carpentry, building construction
_____ J. Masonry, bricklaying
_____ K. Plumbing and pipefitting
_____ L. Glazing, glass repair or replacement
_____ M. Building maintenance, custodial services
_____ N. Drafting (architectural, electrical, or mechanical)
_____ O. Electrical occupations, commercial or residential
_____ P. Electronics, radio-tv service, industrial electronics
_____ Q. Graphic arts, offset litho, printing
_____ R. Maritime occupations, fisheries, boat building
_____ S. Machine shop, machine tool operator
_____ T. Sheet metal
_____ U. Welding and cutting metals
_____ V. Metalworking, pattern making
_____ W. Cosmetology
_____ X. Other trade, industrial, or service occupation

BASIC SKILL COMPETENCY PROFILES

BASIC SKILL COMPETENCY AREAS*	AGRICULTURAL EDUCATION PROGRAM	BUSINESS EDUCATION PROGRAM
WHOLE NUMBER OPERATIONS	9.1	9.7
DECIMAL OPERATIONS	6.0	7.7
FRACTIONAL OPERATIONS	4.5	6.4
GENERAL OPERATIONS	5.0	6.0
READING	7.4	7.8
GRAMMAR, PUNCTUATION AND WRITING SKILLS	6.4	7.4

* MAXIMUM SCORE, 12

BASIC SKILLS DIFFERENCES - BY PROGRAM AREA*

PROGRAM AREA	MATHEMATICS	READING
AGRICULTURAL EDUCATION	29.4	15.7
HOME ECONOMICS	32.1	16.8
TRADE AND INDUSTRIAL	34.1	16.8
TECHNICAL	35.0	16.0
NURSING	35.3	17.5
BUSINESS EDUCATION	35.8	16.4

* SPRING, 1981 SENIOR SURVEY

KEY ELEMENTS IN AN ATTACK ON THE BASIC SKILLS PROBLEM

INDIVIDUAL GUIDANCE AND PLANNING SYSTEM

- CAREER CHOICE CONFIRMATION
- STUDENT NEEDS ASSESSMENT
- INDIVIDUAL PROGRAM PLANNING

INSTRUCTIONAL DELIVERY SYSTEM

- MATERIALS SELECTION AND TASK ASSIGNMENTS
- MONITORING AND REPORTING STUDENT PROGRESS

PROGRAM MANAGEMENT SYSTEM

- MANAGEMENT INFORMATION SYSTEM
- STAFF DEVELOPMENT SYSTEM

PARTICIPANT PROFILE

N = 189

YEARS EXPERIENCE	11 YEARS AVERAGE
EDUCATION LEVEL ATTAINED	72% B.A. +
LICENSES/CERTIFICATES	73%
VOCATIONAL AREAS REPRESENTED	
AGRICULTURE	8%
OFFICE	20%
DISTRIBUTIVE	8%
HEALTH	10%
HOME ECONOMICS	15%
TECHNICAL	1%
TRADE & INDUSTRIAL	38%

TEACHER COMMITMENT TO BASIC SKILLS

78% AGREED THAT VOCATIONAL EDUCATION TEACHERS MUST BE SURE GRADUATES HAVE BASIC SKILLS

97% AGREED THAT COMBINING VOCATIONAL EDUCATION AND BASIC SKILLS MOTIVATES STUDENTS TO LEARN BASIC SKILLS

96% AGREED THAT COMBINING VOCATIONAL EDUCATION AND BASIC SKILLS GIVES STUDENTS CONFIDENCE

97% AGREED THAT TEACHING BASIC SKILLS TO VOCATIONAL STUDENTS WILL MAKE THEM MORE EMPLOYABLE

90% AGREED THAT VOCATIONAL TEACHERS WOULD WELCOME HELP IN TEACHING BASIC SKILLS

REFERENCES

Abramowitz, J. A. et al. (1978). *Survey of Secondary School Principals*. An NIE Publication (December).

Adams, S. B., and Taylor, S. P. (1980). “Vocational Education for Students with Limited English Proficiency: Research and Program Development in Kentucky.” Report. Bowling Green, KY: Western Kentucky University, Center for Career and Vocational Teacher Education.

Adesua, A. (1980). “Education in Two Nigerian Secondary Schools: A Case Study.” ED 226754. *Journal of Negro Education* **49**(2), Spring, 215–219.

Ahmann, J. S., and Glock, D. M. (1971). *Measuring and Evaluating Educational Achievement*. Boston: Allyn & Bacon, Inc.

Akinwumiju, J. A. (1979). “Evaluation and the Mathematics Teacher.” Paper presented at the Annual Meeting of the Mathematics Association of Nigeria, Akure, Ondo State, Nigeria, March 17.

Akinwumiju, J. A. (1978). “An Innovative Approach for Evaluating Mathematics Methodology at the University of Ibadan.” Unpublished Master’s Thesis. Ibadan, Nigeria: University of Ibadan.

Allen, E. K. (1979). “A Study of the Relationship of Teacher Enthusiasm to Salient Selected Variables Influencing Achievement in the Vocational Laboratory.” Final report. ED 179781.

Asher, H. B. (1976). *Causal Modelling*. Sage University Paper Series on Quantitative Application in the Social Sciences No. 3. Beverly Hills, CA: Sage Publications.

Aukerman, R. C. (1972). *Reading in the Secondary School Classroom*. New York: McGraw-Hill.

Baird, L. L., ed. (1979). *Assessing Student Academic and Social Programs*. San Francisco: Jossey-Bass, Inc.

Barlow, M. L., and Schill, W. J. (1962). “The Role of Mathematics in Electrical-Electronic Technology.” ED 020327. Los Angeles, CA: University of California Division of Vocational Education.

Bauman, E. (1973). “Group IQ Scores as Predictors of Success in Secondary Schools: A Re-evaluation.” *Canadian Counselor* **7**(3), June, 175–183. EJ 097626.

Beach, D. P. (1979). “Effects of Evaluation Feedback on Student Achievement.” *Journal of Voational Research* **4**(3), Summer, 1–13.

Bentley, R. R., and Strouse, J. P. (1969). “Achievement in College and Vocational Agriculture.” *Agricultural Education Magazine* **42**(2), August, 42–43. EJ 006633.

Bergstrand, J. (1979). *Impacts of Secondary Vocational Education on Later Performance in Wisconsin’s Post-Secondary VTAE System*.Stout, WI: University of Wisconsin Center for Vocational, Technical, and Adult Education.

Best, J. W. (1977). *Research on Education* (Third Edition). Englewood Cliffs, NJ: Prentice-Hall, Inc.

Blue, J. L., Breslin, A. G., Buchanan, A. S., and Leingang, R. L. (1976). *Occupational Communications Skills Analysis*. Final report. Olympia, WA: Washington State Commission of Vocational Education.

Bogdany, M. (1976). “Mathematics for the Baker” New Brunswick, NJ: Rutgers University. ED 120553.

Bookhammer, B. J. (1974). *Mathematics Utilized in Job Performance as Reported by Graduates of Altoona Area Vocational Technical School and Williamsport Area Vocational Technical School Electronics Technology Programs*. Master’s Thesis. University Park, PA: The Pennsylvania State University.

Bower, G. L., Lewis, J. R., and Krockover, B. J. (1975). “A Concurrent Validity Study Relating the Armed Services Vocational Aptitude Battery to Success in High School Vocational-Technical Courses.” Final report. AFVTG Technical Research Report Number 74-5. Universal City, TX: Randolph Airforce Base.

Boyer, J., Waters, R. E., and Harris, F. M. (1978). “Justice, Society, and the Individual.” In J.J. Jelenik (ed.). *A Curricular Response to Critical Realities*. Washington, DC: Association for Supervision and Curriculum Development.

Branca, N. A. (1975). “Basic Mathematical Skills and Learning.” The NIE Conference on Basic Mathematical Skills and Learning (Euclid, Ohio, October 4-6). Volume I: Contributed Position Papers. Washington, DC: The National Institute of Education.

Brandon, G. L. (1971). “Hangups and Hangovers in Vocational Research.” In G. F. Law (ed.). *Contemporary Concepts in Vocational Education*. Washington, DC: The American Vocational Association.

Brantner, S. T., and Enderlein, T. E. (1973). “Identification of Potential Vocational High School Dropouts.” *Journal of Industrial Teacher Education* **11**, 44–52.

Braunfield, P. (1975). “Basic Skills and Learning Mathematics.” Paper contributed to the Conference on Basic Mathematical Skills and Learning, Volume I. Washington, DC: The National Institute of Education.

Brightman, R. W. (1973). “Attitude, Persistence, and Performance of Cooperative Work Experience Students.” Unpublished paper, May.

Brouse, K. S. (1977). *A Comparison of the Basic Mathematics Skills of Senior Cooperative Extension Students with the Skills that Teachers Feel are Necessary for Success in their Specialty and the Skills the Teachers Feel are Lacking in Beginning Students*. Master’s Thesis. University Park, PA: The Pennsylvania State University.

Brown, G. W., and Kinney, L. B. (1975). “Let Us Look Again at General Mathematics.” *School Science and Mathematics* **75**(655), 615–620.

Butts, R. F. (1975). “The Search for Purpose in American Education.” In Jordan, B. (ed.), *Education Tomorrow: For Whom? Why?* Addesses given in the plenary sessions at the 1975 national forum, October 26-28. New York: College Entrance Examination Board.

Byrum, H. M., Wenrich, R. C., and Woellner, R. C. (1974). *Vocational Education and Practical Arts in Community Schools*. New York: Macmillan Co.

Byus, R. F. et al. (1979). *Competencies Common to All Occupations*. Student Manual. Wheeling, WV: Ohio County Board of Education.

Byus, R. F. et al. (1979). *Competencies Common to All Occupations*. Teacher Manual. Wheeling, WV: Ohio County Board of Education.

Canada Employment and Immigration Commission. (1977). *Generic Skills: Key to Job Performance*. Ottawa, ON: Canada Employment and Immigration Commission.

Carmines, E. G., and Zeller, R. A. (1979). "Reliability and Validity Assessment." University Paper No. 17. Beverly Hills, CA: Sage Publications.

Carnegie Council on Policy Studies in Higher Education. (1979). *A Summary of Reports and Recommendations*. San Francisco: Jossey-Bass, Inc.

Carpenter, T. P., Coburn, T. G., Reys, R. E., and Wilson, J. W. (1975a). "Results and Implications of the NAEP Mathematics Assessment: Elementary School." *The Arithmetic Teacher* **22**, 438–450.

Carpenter, T. P., Coburn, T. G., Reys, R. E., and Wilson, J. W. (1975b). "Results and Implications of the NAEP Mathematics Association Assessment: Secondary School." *The Mathematics Teacher* **68**, 453–470.

Caruso, F. L. (1975). *A Comparison of the Basic Mathematics Skills of Beginning Vocational Students with the Skills that Teachers Feel are Essential for Success in their Specialty and Skills the Teachers Feel are Lacking in Beginning Students*. Unpublished Master's Thesis. University Park, PA: The Pennsylvania State University.

Charles, A. R., et al. (1981). *Vocational Education in a Democracy*. New York: The Century Company.

Collett, D. (1978). *Curriculum Evaluation Project*. Final Report. Edmonton, AB: Alberta Department of Education, Planning and Research Branch.

Compton, J.L. (1979). “Participative Education Programming: An Essay Review of the Literature and Annotated Bibliography.” Technical Report, May. Washington, DC: United States Agency for International Development.

Conroy, W. G. (1979). “Some Historical Effects of Vocational Education at the Secondary Level.” *Phi Delta Kappan,* December, 267–271.

Coombs, P. H., and Ahmed, M. (1974). *Building New Educational Strategies to Serve Rural Youth Children and Youth*. Report. Essex, CT: .International Council for Educational Development.

Cooperman, P. C. (1979). “The Achievement Decline of the 1970s.” *Phi Delta Kappan* **60**, 736–739.

COPA/Center for Occupational and Professional Assessment. (1981). “Assessing Occupational Competence.” Pamphlet. Princeton, NJ: Educational Testing Service.

Corman, L. (1980). “Basic Skills Proficiencies of Secondary Vocational Education Students.” Vocational Education Study Publication No. 4, November. Washington, DC: National Institute of Education.

Cronbach, L. J. *Essentials of Psychological Testing*. Third edition. New York: Harper & Row Publishers.

Crohbach, L. J., and Gleser, G. (1953). “Assessing Similarity between Profiles.” *Psychological Bulletin,* 456–473.

Cross, A. A. (1975). “Goals and Rules of Vocational Education.” In M. E. Strong (ed.) *Developing the Nation’s Work Force*. Washington, DC: The American Vocational Association.

Curtis, J. B. et al. (1980). "Gifted and Talented Students in Vocational Education: Review and Synthesis of the Literature." *Journal of Vocational Education Research* **5**(3), Summer, 55–65. EJ 238047.

Davis, L. N., and McCallong, E. (1974). *Planning, Conducting and Evaluating Workshops*." Austin, TX: Learning Concepts.

Derby, T. (1975). "Informal Testing in Vocational Education Reading." *Journal of Reading* **18**(7), April, 541-43. RJ 115668.

Diel, W. (1980). *Functional Literacy as a Variable Construct: An Examination of Attitudes, Behavior, and Strategies Related to Occupational Literacy*. Unpublished doctoral dissertation. Bloomington, IN: Indiana University.

Dunn, J. A. (1981a). "State Dissemination Plan for Vocational Education Instructional Materials: Technical Proposal." Unpublished proposal, submitted to United States Office of Education in response to RFP 81-061, July 16. Cornell University Industrial and Labor Relations Library Archives File #5878, Box 4. Ithaca, NY: Cornell Institute for Occupational Education.

Dunn, J. A. (1981b). "Survey of Basic Skills in Language Arts." Unpublished research report for New York State Department of Education. Ithaca, NY: Cornell Institute for Occupational Education.

Dunn, J. A. (1981c). "Survey of Basic Skills in Mathematics." Unpublished research report for New York State Department of Education. Ithaca, NY: Cornell Institute for Occupational Education.

Dunn, J. A. (1981d). "Survey of Students' Attitudes." Unpublished research report for New York State Department of Education. Ithaca, NY: Cornell Institute for Occupational Education.

Dunn, J. A. (1981e, April). "Planning for Future Vocational Education Delivery Systems." Unpublished RCU Conference Presentation. Personal communication. San Antonio, TX.

Dunn, J. A. (1980a). *Teaching Basic Skills through Vocational Education. (Teacher's Guide)*. Monograph. Cornell University Industrial and Labor Relations Library File #5878. Ithaca, NY: Cornell Institute for Occupational Education.

Dunn, J. A. (1980b). *Teaching Basic Skills through Vocational Education. (Resource Guide)*. Monograph. Cornell University Industrial and Labor Relations Library File #5878. Ithaca, NY: Cornell Institute for Occupational Education.

Dunn, J. A. (1980c). *Teaching Basic Skills through Vocational Education (Mathematics Skills).* Monograph. Cornell University Industrial and Labor Relations Library File #5878. Ithaca, NY: Cornell Institute for Occupational Education.

Dunn, J. A. (1980d). *Teaching Basic Skills through Vocational Education (Oral; Communication Skills).* Monograph. Cornell University Industrial and Labor Relations Library File #5878. Ithaca, NY: Cornell Institute for Occupational Education.

Dunn, J. A. (1980e). *Teaching Basic Skills through Vocational Education (Reading Skills).* Monograph. Cornell University Industrial and Labor Relations Library File #5878. Ithaca, NY: Cornell Institute for Occupational Education.

Dunn, J. A. (1980f). *Teaching Basic Skills through Vocational Education (Writing Skills).* Monograph. Cornell University Industrial and Labor Relations Library File #5878. Ithaca, NY: Cornell Institute for Occupational Education.

Dunn, J. A. (1979). "Basic Skills Development through Vocational Education: Best and Final Addendum." Unpublished technical report submitted to United States Department of Education in response to RFP 79-15. Cornell University Industrial and Labor Relations Library File #5878, Box 4. Ithaca, NY: Cornell Institute for Occupational Education.

Dunn, J. A. Grey, P., et al. (1980). "Outcomes of Occupational Education." Annual Report, 1979-1980. In *Teaching Basic Skills through Vocational Education: Progress Reports*.United States Department of Education Contract #300-79-0744. Ithaca, NY: Cornell Institute for Occupational Education.

Dunn, J. A., Grey, P., et al. (1981). "Outcomes of Occupational Education." Annual Report, 1980-1981. In *Teaching Basic Skills through Vocational Education: Progress Reports*.United States Department of Education Contract #300-79-0744. Ithaca, NY: Cornell Institute for Occupational Education.

Dunn, J. A., Grey. P., et al. (1982). "Outcomes of Occupational Education." Final Report, 1982. In *Teaching Basic Skills through Vocational Education: Progress Reports*.United States Department of Education Contract #300-79-0744. Ithaca, NY: Cornell Institute for Occupational Education.

Dunn, J. A. et al. (1980). "Teaching Basic Skills through Vocational Education (Teacher's Guide)." Cornell University Industrial and Labor Relations Library File #5878, Box 9. Ithaca, NY: Cornell Institute for Occupational Education.

Editorial Panel. (1976). “Where Do You Stand? Career Education as a Priority Objective of Public Education.” *The Mathematics Teacher* **69**, 98–102.

Educational Testing Service. (1980). *Looking Ahead: Education, Opportunity, and Technology*. Annual Report.

Evans, R. N. (1971). *Foundations of Vocational Education*. Columbus, OH: Charles E. Merrill Publishing Company.

Evans, R. N., and Galloway, J. D. (1973). “Verbal Ability and Socioeconomic Status of the 9^{th} and 12^{th} Grade College Preparatory, General, and Vocational Students.” *Journal of Human Resources* **8**(1), 24–36.

Fetlers, W. B. *National Longitudinal Study of the High School Class of 1972: Student Questionnaire and Test Results by Sex, High School Program, Ethnic Category, and Father’s Education*. Washington, DC: United States Government Printing Office.

Fey, J. T. (1975). “Remarks on Basic Skills and Learning in Mathematics.” Paper presented at the Conference on Basic Mathematical Skills and Learning, Volume 1. Washington, DC: The National Institute of Education.

Finn, P, and Brown, J. (1977). “Career Education and the Mathematics Classroom.” *The Mathematics Teacher* **71**, 489–496.

Fishman, J. (1971). “Mathematics in Secondary School Vocational Educational Programs.” *The Mathematics Teacher* **64**, 261–268.

Fitzgerald, A. (1976). “Mathematical Knowledge and Skills Required by Pupils Entering Industry at the 16+ Level.” *Mathematics in School* **5**, 22–23.

Flanegan, J. C., Shaycoft, M. F., Orr, D. B., and Goldberg, I. (1962). “Project Talent: A Survey and Follow-up Study of Educational Plans and Decisions in Relation to Aptitude Patterns.” Studies of the American High School. Pittsburgh: University of Pittsburgh.

Foster, R. M., and Kahler, A. A. (1979). “Importance of Including Language Arts Instruction as Part of the Vocational Agriculture Program of Study.” *Journal of Vocational Education Research* **4**(4), Fall, EJ 235801, 13–33.

Focher, E. J. (1977). *A Comparison of the Basic Mathematics Skills of Male and Female Beginning Vocational Students with Skills Deemed Essential and Skills Perceived as Lacking by a Composite Group of Vocational Teachers*. Master’s Thesis. State College, PA: The Pennsylvania State University.

Gallup, G. H. (1981). “The Thirteenth Annual Gallup Poll of the Public’s Attitudes toward the Public Schools.” *The Phi Delta Kappan* **63**(1), 33–47.

Gallup, G. H. (1980). “The Twelfth Annual Gallup Poll of the Public’s Attitudes toward the Public Schools.” *The Phi Delta Kappan* **62**, 33–45.

Gallup, G. H. (1979). “The Eleventh Annual Gallup Poll of the Public’s Attitudes toward the Public Schools.” *The Phi Delta Kappan* **61**, 33–45.

Gallup, G. H. (1978). “The Tenth Annual Gallup Poll of the Public’s Attitudes toward the Public Schools.” *The Phi Delta Kappan* **60**, 33–45.

Gallup, G. H. (1977). “The Ninth Annual Gallup Poll of the Public’s Attitudes toward the Public Schools.” *The Phi Delta Kappan* **59**, 33-48.

Gallup, G. H. (1976). “The Eighth Annual Gallup Poll of the Public’s Attitudes toward the Public Schools.” *The Phi Delta Kappan* **58**, 187–200.

Gallup, G. H. (1975). "The Seventh Annual Gallup Poll of the Public's Attitudes toward the Public Schools." *The Phi Delta Kappan* **57**, 227–241.

Gallup, G. H. (1974). "The Sixth Annual Gallup Poll of the Public's Attitudes toward the Public Schools." *The Phi Delta Kappan* **56**, 20–32.

Gegle, E. G. (1975). "Basic Skills in Mathematics." Paper contributed to the Conference on Basic Mathematical Skills and Learning, Volume I. Washington, DC: The National Institute of Education.

Gere, A. R., and Corrigan, R. (1978). "Vocational-Technical English: Practise into Theory." *English Journal* **5**, 84–86.

Gibb, E. G. (1975). "Response to Questions for Discussion at the Conference on Basic Mathematical Skills and Learning." Paper contributed to the Conference on Basic Mathematics Skills and Learning, Volume I. Washington, DC: The National Institute of Education.

Gillie, A. C. (1973). *Principles of Post-Secondary Vocational Education*. Columbus, OH: Charles E. Merrill Publishing Company.

Glenn, N. D. (1977). *Cohort Analysis*. University Paper No. 5. Beverly Hills, CA: Sage Publications.

Gowin, D. B. (1981). *Educating*. Ithaca, NY: Cornell University Press.

Grant, G. et al. (1979). *On Competence: A Critical Analysis of Competence-Based Reform in Higher Education*. San Francisco: Jossey-Bass Publishers

Grasso, J. T., and Shea, J. R. (1979). *Vocational Education and Training: Impact on Youth*. Berkeley, CA: Carnegie Council on Policy Studies in Higher Education.

Grasso, J. T. et al. (1977). *Review and Discussion for Planning the NIE Vocational Education Study*. November 18. Washington, DC: National Institute for Education.

Gregoire, R. (1967). *Vocational Education*. Paris: Organization for Economic Cooperation and Development Publication.

Harman, D. (1970). “Illiteracy: An Overview.” *Harvard Educational Review* **40**(2), 226–237.

Hawkins, V. J. (1974) “Some Changes in Shop Mathematics Due to Metrication.” *The Mathematics Teacher* **67**, 601–603.

Heimer, R. T. “Conditions of Learning in Mathematics: Sequence Theory Development.” *Review of Educational Research* **39**, 493–508.

Henkel, R. E. (1976). *Tests of Significance*. Beverly Hills, CA: Sage Publications.

Hershkowitz, M., Shami, M. A. A., and Rowan, T. E. (1975). “Mathematics Goals: What Does the Public Want?” *School Science and Mathematics* **666**, 723–728.

Hiatt, A. A. (1979). “Basic Skills: What Are They?” *The Mathematics Teacher* **72**, 141–144.

Hilton, P., and Rising, G. R. (1975). “Thoughts on the State of Mathematics Today.” Working Group Reports, Volume II. Conference on Basic Mathematical Skills and Learning. Washington, DC: The National Institute of Education.

Hilton, T. L. (1971). “A Study of Intellectual Growth and Vocational Development: Final Report to the United States Department of Health, Education, and Welfare.” Office of Education Grant No. oeg-1-6-061830-0650. Princeton, NJ: Educational Testing Service.

Holmes, M. B. W. (1980). “Pride, Hope and Success.” *Voed* **55**(1), January, 39–42. EJ 219307.

Hoyt, K. B. (1976). *K-12 Classroom Teachers and Career Education: The Beautiful People*. Monographs for Career Education. Washington, DC: United States Government Printing Office.

Jencks, C. (1972). *Inequality: A Reassessment of the Effect of Family on Schooling in America*. New York: Basic Books.

Johnson, J. N. (1978).*The Work Ethic and American Schools: The Roots of Change*. San Francisco: Far West Laboratory for Educational Research and Development.

Johnston, J. A., and Davidson, T. N. (1972). “Vocational Education—Its Place in Public Schools.” Working Paper 8. Ann Arbor, MI: University of Michigan, Institute for Social Research, Survey Research Center.

Judy, S. N. (1974). *Explorations in the Teaching of Secondary English: A Source Book for Experimental Teaching*. New York: Dodd, Mead, and Co.

Kaufman, J., Schaefer, C. J., Lewis, M. V., Stevens, D. W., and House, E. W. (1967). *The Role of Secondary Schools in the Preparation of Youth for Employment: A Comparative Study of the Vocational, Academic, and General Curricula*. Report. University Park, PA: The Pennsylvania State University, Institute for Research on Human Resources.

Krumboltz, J. D. (1982). “Tests and Guidance: What Students Need.” Paper presented at the Educational Testing Service Invitational Conference, October 31, 1981.

Forthcoming in W. B. Schrader (ed.). *New Directions for Testing and Measurement*. San Francisco: Jossey-Bass Publishing.

Krumboltz, J. D. (1980). *Decision-making Behaviors Associated with "Good" and "Poor" Outcomes in a Simulated Career Decision*. Unpublished manuscript. Stanford, CA: Stanford University School of Education.

Larson, M. E. (1969). "Review and Synthesis of Research: Analysis for Curriculum Development in Vocational Education." Research Series No. 46. Columbus, OH: Center in Vocational and Technical Education, The Ohio State University.

Levitan, S. et al. (1972). *Human Resources and Labor Markets: Labor and Manpower in the American Economy*. New York: Harper & Row Publishers.

Lohnes, P. R. (1981, November). "A Comparison of Factorial and Canonical Modeling as Causal Analysis Methods." Paper presented at the annual meeting of the Eric F. Gardner Conference. Buffalo, NY: State University of New York at Buffalo.

Long, T. E. (1979). "Employment Supervisors' Perceptions of the Basic Mathematics Competencies Needed in Vocational Education." University Park, PA: The Pennsylvania State University, College of Education, Division of Occupational and Vocational Studies.

Long, T. E. et al. (1976). "Linking Mathematics Education to Career Education." In G. I. Maugum, J. W. Becker, G. Coombs, and P. Marshall (eds.). *Career Education in the Academic Classroom*. Salt Lake City, UT: Olympus Publishing Company.

Long, T. E., and Herr, E. C. (1973). “Teacher Perceptions of Basic Mathematics Skill Needs in Secondary Vocational Education.” *The Mathematics Teacher* **66**, 61–66.

Long, T. E., and King, E. D. (1975). “Teacher Perceptions of the Basic Mathematics Skill Need in Business Education.” *The Delta Pi Epsilon Journal* **17**, 37–42.

Loran, C. (1977). *An Analysis of Reading Ability and its Relationship to Selected Student Variables in Industrial and Technical Education*. Unpublished doctoral dissertation. Marshall, TX: East Texas Baptist University.

Ludeman, I., and Schneiderman, R. M. (1976). *Statewide Mathematics Performance Related to Career and Vocational Education*. Final Report. St. Paul, MN: Minnesota Department of Education, Division of Vocational and Technical Education.

Lusterman, S. (1977). *Education in Industry*. New York: The Conference Board, Inc.

Maffei, A. C. (1978). “The Math Score Decline: A National Survey of High School Math Teachers.” *Phi Delta Kappan* **60**, 250.

Mager, R. F., and Beach, K. M. (1967). *Developing Vocational Instruction*. Belmont, CA: Fearon Publishers.

Maley, D. (1975). *Cluster Concept in Vocational Education*. Chicago: American Technical Society.

Mikulecky, L. (1979). “Job Literacy: The Relationship between School Preparation and Workplace Activity.” Grant proposal NIE G79-0168. Washington, DC: National Institute of Education.

Mikulecky, L, and Diehl, L. (1979, June). "An Examination of Work-Related Literacy and Reading Attitudes." Presented paper, Functional Literacy Conference, Indiana University.

Mikulecky, L., and Diehl, W. (1979). *Literacy Requirements in Business and Industry*. Bloomington, IN: Indiana University School of Education, Reading Research Center.

Mikulecky, L., and Diehl, W. (1980). *Job Literacy: A Study of Literacy Demands, Attitudes and Strategies in a Cross-Section of Occupations*. Bloomington, IN: School of Education, Reading Education Department, Indiana University.

Miller, D. C. (1977). *Handbook of Research Design and Social Measurement*. Third Edition. New York: David McKay Company, Inc.

Mitchell, L. K., and Krumboltz, J. D. (1981, August). "The Effect of Training in Cognitive Restructuring on the Inability to Make Career Decisions." Paper presented to the Annual Convention of the American Psychological Association, Los Angeles, CA.

Mote, P. M. (1976). "Academics: The Mind Expanders." *American Vocational Journal* **51**, 58–59.

Mrachek, L. A. (1975). "Don't Tell Me How, Just Show Me How." *Technical Education News* **34**(3), 11.

Mueller, C. W. and Kim, J-O. (1978). *Introduction to Factor Analysis: What It Is and How to Do It.* University Paper No. 14. Beverly Hills, CA: Sage Publications.

Munday, L. A. (1979). "Changing Test Scores: Basic Skills Development in 1977 Compared with 1970." *Phi Delta Kappan* **61**, 670–671.

National Institute of Education. (1976). *Databook: The Status of Education Research and Development in the United States*. Washington, DC: Department of Health, Education, and Welfare.

National Technical Information Service. (1973). *Manpower and Education Needs in Selected Professional Fields*. Pamphlet. Springfield, VA: United States Department of Commerce.

Norpoth, H., and Iversen, G. (1976). *Analysis of Variance*. University Paper No. 1. Beverly Hills, CA: Sage Publications.

Nunnally, J. (1967). *Psychometric Theory*. New York: McGraw-Hill.

Nunnally, J. (1962). “Analysis of Profile Data.” *Psychological Bulletin* **59**, 312–319.

Perkins, C. D. (1976). “Educational Quality.” *Journal of Teacher Education* **27**, 296–302.

Peterson, J. C. (1976). “Foreword to the Special Issue.” *School Science and Mathematics* **76** (Whole No. 670), 273–275.

Peterson, R. M. (1978). *Work Concepts in the Schools: A Survey of Educators’ Opinions about Work*. San Francisco: Far West Laboratory for Educational Research and Development.

Peterson, R. M., and Johnson, J. N. (1977). *The Work Ethic in Career Education Materials*. San Francisco: The Far West Laboratory for Educational Research and Development.

Spears, H. (1973). “Kappans Ponder the Goals of Education.” *The Phi Delta Kappan* **55**(1), September, 29–32.

Pincus, F. L. (1980). “The False Promises of Community Colleges: Class Conflict and Vocational Education.” *Harvard Educational Review* **50**(3), August, 332–361.

Pratzner, F. C. (1978). *Occupational Adaptability and Transferable Skills*. Final Report. Contract No. NIE-C-00-3-0078. Washington, DC: National Institute of Education.

Rauff, J. V. (1979). “Minimum Mathematical Skills: A Subjective Evaluation.” *The Mathematics Teacher* **72**, 50–51.

Rhodes, J. A. (1969). *Alternative to a Decadent Society*. Indianapolis, IN: Howard W. Sams & Company.

Rising, G. R. (1975, October). “What Are the Basics of Mathematics?” In *Contributed Position Papers, Vol. I*, Conference on Mathematical Skills and Learning. Washington, DC: The National Institute of Education.

Romberg, T. A. (1969). “Current Research on Mathematics Education.” *Review of Educational Research* **39**, 473–491.

Runkle, R. A. (1978). “A Comparison of the Basic Mathematics Skills of Beginning Trade and Industrial and Technical Education Students with the Skills that Teachers Feel are Essential for Success in their Specialty and the Skills that Teachers Perceive are Lacking in Beginning Students.” Master’s Thesis. University Park, PA: The Pennsylvania State University.

Selz, N., Jones. J. S., and Ashley, W. L. (1980). *Functional Competencies for Adapting to the World of Work*. Report. Columbus, OH: The Ohio State University, National Center for Research in Vocational Education.

Shaycoft, M. F. (1967). *Project Talent. The High School Years: Growth in Cognitive Skills*. Pittsburgh, PA: American Institutes for Research and University of Pittsburgh School of Education.

Sheehan, G., and Hopkins, M. (1979). *Basic Needs Performance: An Analysis of Some International Data*. Geneva, Switzerland: International Labor Office Publication.

Shuman, R. B. (ed.). (1981). *Education in the 80s*. Washington, DC: National Education Association.

Sticht, T. G. (1978). *Literacy and Vocational Competence*. Columbus, OH: The Ohio State University, National Center for Research in Vocational Education.

Suydam, M. N. (1969). "Teachers, Pupils, and Computer-Assisted Instruction." *The Arithmetic Teacher* **16**, 173–176.

Swanson, G. I., ed. (1959). Vocational Education for Rural America. Washington, DC: National Education Association of the United States, Department of Rural Education.

Taylor, K. M. (1981, August). "Applications of Self-efficacy Theory to Career Decision-making and Vocational Indecision in College Women and Men." Presented paper, Annual Convention of the American Psychological Association, Los Angeles, CA.

Thornton, L. J. (1980). *Review and Synthesis on Reading in Post-Secondary Occupational Education*. University Park, PA: The Pennsylvania State University, Division of Education Administration Policy Studies, Division of Occupational and Vocational Studies.

Thurow, L. C. (1979). *Vocational Education as a Strategy for Eliminating Poverty*. Planning Paper Volume 1, Vocational Education Study. Washington, DC: United States Government Printing Office.

Torrey, J. W. (1970). "Illiteracy in the Ghetto." *Harvard Education Review* **40**(2), May, 253–259.

Trafton, P. R., and Suydam, N. (1975). "Computational Skills: A Point of View." *The Arithmetic Teacher* **22**, 528–537.

Ward. B. (1979). *Changes in Mathematical Achievement (1973–78): Results from the Second Assessment of Mathematics.* Denver, CO: National Assessment of Educational Progress, Education Commission of the States.

Watkins, B. (1980). "Verbal Average Falls to 424, Math to 466, As Decline in SAT Scores Persists for Thirteenth Year." *Chronicle of Higher Education*, October 6, 4.

Wenrich, R. C., and Wenrich, J. W. (1974). *Leadership in Administration of Vocational and Technical Education*. Columbus, OH: Charles E. Merrill Publishing Company.

Wentling, T. L. (1980). *Evaluating Occupational Education and Training Programs*. Second Edition. Boston: Allyn and Bacon, Inc.

Willdt, A. R., and Ahtola, O. T. (1978). *Analysis of Covariance*. University Paper No. 12. Beverly Hills, CA: Sage Publications.

Williams, R. T. et al. (1975). "Dealing with Learning Difficulties before They Become Liabilities." *American Vocational Journal* **50**(9), December, 50–51. EJ 132197.

Williams, T. (1979). *Curriculum Model for Occupational Preparations*. Unpublished manuscript. Richmond, VA: Virginia Commonwealth University.

Whitehead, A. N. (1949). *The Aim of Education and Other Essays*. New York: New American Library.