

1989

## A Study to Determine the Reading Ability of Electronics Technology Students

Franklin Wayne Pond  
*Old Dominion University*

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**A STUDY TO DETERMINE THE READING  
ABILITY OF ELECTRONICS  
TECHNOLOGY STUDENTS**

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**A RESEARCH PROJECT  
PRESENTED TO  
THE FACULTY OF THE GRADUATE SCHOOL  
OLD DOMINION UNIVERSITY**

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**IN PARTIAL FULFILLMENT  
OF THE REQUIREMENTS FOR THE DEGREE  
MASTER OF SCIENCE IN EDUCATION**

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**By  
Franklin Wayne Pond, M.S.**

**August, 1989**

**A STUDY TO DETERMINE THE READING  
ABILITY OF ELECTRONICS  
TECHNOLOGY STUDENTS**

This project was prepared by Franklin Wayne Pond under the direction of Dr. John M. Ritz in VTE 636, Problems in Education. It was submitted to the Graduate Program Director as partial fulfillment of the requirements for the Master of Science in Education degree .

APPROVED BY:

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Dr. John M. Ritz  
Advisor

Date \_\_\_\_\_

---

Dr. John M. Ritz  
Graduate Program Director

Date \_\_\_\_\_

**ACKNOWLEDGEMENTS**

The author extends his thanks to Dr. John Ritz for his patience and guidance in completing this study.

Appreciation is also extended to Barbara Hale, reading specialist, for her expert assistance in administering the tests and evaluating the results.

Special thanks is extended to my wife, Becky China, and my daughters, Jessica and Lindsay, for their support and patience in the completion of my Masters Degree.

F. Wayne Pond

**TABLE OF CONTENTS**

	<b>Page</b>
<b>Acknowledgements . . . . .</b>	IV
<b>List of Tables . . . . .</b>	VI
 <b>CHAPTER</b>	
<b>I. Introduction</b>	
A. Statement of the Problem . . . . .	2
B. Research Goals . . . . .	3
C. Background and Significance . . . . .	3
D. Limitations . . . . .	5
E. Assumptions . . . . .	5
F. Procedures . . . . .	5
G. Definition of Terms . . . . .	6
H. Summary . . . . .	7
 <b>II. REVIEW OF LITERATURE</b>	
A. Reading Ability . . . . .	8
B. Text Readability . . . . .	9
C. Summary . . . . .	11
 <b>III. METHODS AND PROCEDURES</b>	
A. Population . . . . .	12
B. Instrument . . . . .	13
C. Classroom Procedures . . . . .	13
D. Procedures for Treating Data . . . . .	14
E. Statistical Analysis . . . . .	14
F. Summary . . . . .	14
 <b>IV. FINDINGS</b>	
A. Section One Electronics II . . . . .	17
B. Section Two Electronics Technology . . . . .	18
C. Section Three Electronics Technology . . . . .	19
D. Section Four Electronics Technology . . . . .	20
E. Summary . . . . .	22
 <b>V. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS</b>	
A. Summary . . . . .	24
B. Conclusions . . . . .	25
C. Recommendations . . . . .	26
 <b>BIBLIOGRAPHY . . . . .</b>	 27

## LIST OF TABLES

TABLE	PAGE
ONE. Academic Grade Level . . . . .	.17
TWO. Vocabulary and Comprehension-Section One . . .	.18
TWO. Vocabulary and Comprehension-Section Two . . .	.19
TWO. Vocabulary and Comprehension-Section Three . . .	.20
TWO. Vocabulary and Comprehension-Section Four . . .	.22
THREE. Fry Readability Analysis . . . . .	.23

## CHAPTER I

### INTRODUCTION

The late 1800's saw the birth of a new type of education. The Industrial Revolution required a new worker with training in the industrial arts. This worker had to perform more than one task but would not be a craftsman in any one trade. Industry needed skilled labor that possessed certain basic skills which allowed them to move around from task to task as the work load dictated. Time would not permit the use of a traditional apprenticeship training for all jobs. This created an area of education called vocational education. The basic skills for industrial jobs were taught using a "hands-on" technique with theoretical lessons to reinforce the learning.

One of the most difficult areas in vocational education has been the development of ability and motivation in the learner. Vocational education has traditionally been a place where the unmotivated or slow learner could pick up skills. The amount of technical information to which the student must be exposed has increased dramatically. For example, the average auto mechanic circa 1965 had 5,000 pages of technical material for reference. That same mechanic in 1988 had 465,000 pages of reference material (Whitman, 1989, p 46). He had to demonstrate proficiency in many sections of this material to efficiently perform his job. The information explosion had created a crisis.



Vocational educators face a difficult task. How can we best serve the students, when the information we present is constantly changing and growing in quantity? The classroom teacher must work with students in areas targeted as a weakness by industry such as reading ability (Derby, 1987, p 308).

A vocational educator has access to a constantly changing library of new texts and workbooks. The evaluation of materials for a lesson can be a time consuming task. The motivation and skill of each student must be assessed as each text is considered. The wide range of student ability makes the task more difficult.

One way to increase learning is to have access to the average reading ability score for a group of students. Many school systems test reading ability each year for statistical analysis. This measure would give any teacher a way to assess the reading ability of a class. In vocational education, it would insure the presentation of technical information written on the appropriate level.

#### **STATEMENT OF THE PROBLEM**

The problem of this study was to examine the reading ability of the electronics technology students at Floyd E. Kellam High School, Virginia Beach, Virginia.

## RESEARCH GOALS

The goals of this research study were as follows:

1. What is the average grade level of the students in electronics technology?
2. What is the average reading ability of electronics technology students?
3. What is the readability level of the approved textbooks for the courses?

## BACKGROUND AND SIGNIFICANCE

The problem of reading ability is not new to vocational education. The problem was addressed as a concern of educators as far back as 1957. The concern was improving technical vocabulary and providing lessons designed to improve the reading ability of students (Laughton, 1957, p 240). Assessment of textbook readability became a focus during the 1970's. Formulas were developed for assigning readability levels (Culhave, 1973, p 191). This emphasis developed a new generation of vocational textbooks written on a lower grade level.

There was a shift in education on the national and state levels in the past five years. With the release of the document, "A Nation at Risk," educational policy created an increased academic load for students. This procedure lowered the number of students who have time for vocational courses. The ones who can take vocational subjects are of

varied ability. This created a need for vocational courses tailored to meet the special needs of these students.

The selection of text material written on the proper grade level can increase learning for the limited number of students. The benefit to a program can be a gradual increase in enrollment as students tell peers of their success. Some recent studies indicated a renewed interest in the problem of textbook readability for vocational education. The movement from the 1970's concerning textbook readability may be returning as new texts are written for vocational subjects. More emphasis was placed on reaching the student at their level (Derby, 1987, p 308).

The selection of text material requires a knowledge of the reading level of the student. This study assessed the electronics technology student. Reading ability of electronics students was studied as a part of vocational education (McKell,1970). However, the needs and abilities of electronics students are not well documented in current research. The data from this study can be used by local educators in the selection of texts. For example, electronics technology texts are due for adoption in Virginia Beach public schools within the next few years. The evaluators could use the results of this study to screen new texts.

### **LIMITATIONS**

The study was limited to the electronics technology students at Floyd E. Kellam High School in Virginia Beach, Virginia. The data was gathered by administering a Gates-MacGinitie reading test adopted by local reading specialists and the State Board of Education.

### **ASSUMPTIONS**

It was assumed that the average reading level for electronics technology students would be below the average academic grade level. It was assumed that comprehension scores would be at a lower grade level than the average academic grade level.

### **PROCEDURES**

The students were given a standardized reading test approved by the State Board of Education to determine their individual reading levels. The test was administered in the classroom on two consecutive days. An analysis of the data provided an average reading level by class.

The test contained two sections. The first half was forty-five vocabulary words to be matched with words of similar meaning. The second half tested reading comprehension which took more time to administer. The reading comprehension had forty-three content questions from fourteen selected readings. The number of questions from

each selection varied from two to five per selection. The answers were recorded on an optical scanning answer sheet. This allowed the results to be machine scored.

Text material was evaluated for readability level by using the Fry Readability Scale. Measurement was done by selecting three 100 word passages from the beginning, middle and end of a text. Each passage was evaluated by counting the total number of syllables. Results of the three passages were combined to obtain an average number of syllables per 100 words. The second step was counting the number of sentences in each 100 word passage. Results of the three passages were combined to obtain an average number of sentences per 100 word passage. These two values were plotted on a special scale to determine the approximate readability level of the passages.

#### DEFINITION OF TERMS

The following terms are defined so that the reader might understand their use throughout the document.

Average academic level - an indication of the academic level of those tested, calculated by adding all their current academic levels and dividing by the total number of students.

Average reading level - a grade level measure calculated by adding all individual grade equivalent scores on vocabulary and comprehension for a sample, then dividing by the number of subjects.

Textbook readability scale - a comparison of the average number of sentences per 100 word passage to the average number of syllables per 100 word passage, developed by Edward Fry for computing the approximate reading grade level.

## SUMMARY

The selection of materials for vocational courses has become quite difficult. The classes usually contain some students with above-average reading ability. However, the data of earlier studies shows most vocational students do not read on grade level. Their scores are even lower on comprehension. The task of selecting materials or providing lessons on reading development can be made easier. With the increased emphasis on the use of technology in industry, you must know what grade level the material cannot exceed. This could diminish the time lost from presenting material written above the average reading level.

The following chapters will gather data, draw conclusions and make recommendations on the reading level of electronics technology students. Chapter II will review the current literature on reading ability and text readability level in vocational courses.

## CHAPTER II

### REVIEW OF LITERATURE

The literature on reading ability and vocational education is divided among two topics: reading ability of the students and readability level of the textbooks used. The amount of research was limited. The articles dealt with many different vocational subjects from practical nursing to machine tools.

### READING ABILITY

The misconception that vocational courses required limited reading ability has been with us for many years. A vocational course, because of its technical background, required extensive use of reference texts.

Many of the students directed to vocational education achieved poor on standardized testing. The study of 267 students in grades 10-12 at several Missouri vocational schools yielded typical results (Sherrell, 1981, p 140). A statistical analysis of the results placed student scores at the 50th percentile on vocabulary and at the 38th percentile on comprehension compared to the national norm.

When Sherrell interviewed the instructors, he found that 30 percent of classroom time was devoted to reading. The other 70 percent involved lecture/demonstrations from the teacher. The textbooks assigned for most of the courses exceeded the average reading ability by 3 to 6 grade levels.

This created a problem in having effective reading assignments.

Despite the fact that grades earned for the classes were high, 41 percent B, Sherrell stressed a need for training in reading. He felt that vocational teachers need special training in reading to upgrade their lesson content.

Another study yielded similar results in Utah. A study of 388 vocational students from Granite School District was conducted by William McKell in 1970. The mean reading ability for all students was 11.0 (Mckell, 1970). The electronics students tested at a 12.4 reading ability. Despite the apparent high reading ability, McKell discovered that approximately 57 percent of the students studied were reading below their academic grade level.

McKell went on to examine the relationship between IQ scores and academic records. He found no correlation between IQ and grades earned, nor did he find any correlation between reading ability and grades. He also found no correlation between geographic area and reading ability. However, he did find a significant correlation between IQ and reading ability.

#### **TEXT READABILITY**

There was a surge of research into reading during the 1970's. Out of this research, much work was done to develop reading materials geared to the student's reading ability. The textbooks of vocational education have not always



followed this trend.

According to Sherrell, the students tested were reading three to six levels below the textbooks assigned (Sherrell, 1981). Similar data lead McKell to conclude that student reading ability was more significant to text selection than text readability was to the grade level of assigned students. Sherrell also concluded that a majority of the students were not at a level where they could benefit from the current assigned text.

Another study concluded that vocational textbooks in Pontiac, Michigan tested at the 11th grade readability level in 1973 (Derby, 1987). The students average reading ability was several grade levels below 11th grade. His study emphasized that much progress was made after 1973. The textbooks surveyed in his current study showed more concern for readability. Numerous examples were cited of recent texts for vocational education that are written on a 6th or 7th grade readability level. One group of reference books, the service manual, was still quite difficult. Their physical size, assumptions of prior knowledge and increasingly technical nature made these important manuals difficult for anyone who needed them.

Derby made an observation in his article, which may be of some consequence to vocational education in the near future. He stated that Public Law 98-524, Carl Perkins Vocational Education Act of 1984, may provide funding for the development of textbooks and other resource materials

for vocational education. These funds may provide new vocational education material written on an appropriate readability level.

#### SUMMARY

The articles reviewed dealt with both student ability and textbook readability in the same content areas. The articles pointed out that most vocational students were low achievers in academics. The students were counseled that vocational courses did not rely heavily on academic concepts of reading, writing, math and science. This misconception was not supported by teacher statements that 30 percent of classroom time was spent on reading assignments. Despite a high percentage of good grades, the articles pointed out that much time was spent elaborating or explaining the material from available textbooks.

Measures of reading ability and textbook readability indicated that students were reading 3 to 6 levels below their textbook. They showed a poor rating of 38th percentile on reading comprehension among those tested. Recent research indicated a more realistic readability level in new textbooks at the 7th or 8th grade level. There was a need for more extensive research covering all available vocational education textbooks (Derby, 1987, p 316). Chapter III will describe the methods and procedures used in this study of reading ability.

#### CHAPTER III

## METHODS AND PROCEDURES

This chapter will cover the methods and procedures used to conduct this study. Within it is information on the population involved in this study, the type of instrument used for testing, and the method of administration and data treatment.

### POPULATION

The students for this study were enrolled in Electronics Technology at Floyd E. Kellam High School in Virginia Beach, Virginia. There were four classes of students. The first section was an Electronics II class with four students. There were three seniors and one junior. The other three classes were Electronics Technology classes. Section two had sixteen students. The section had eight sophomores, four juniors, and four seniors. Section three had fourteen students. The section had eight sophomores, five juniors and one senior. Section four had fifteen students. The section had five sophomores, five juniors, and five seniors. Overall, there was a total of forty-nine students, comprised of one female and forty-eight males.

### INSTRUMENT

The reading test used was the Gates-MacGinitie Reading Tests, Second Edition, Level F, Form 2, Copyright 1978. The first section of the two part test contained forty-five

vocabulary words. This section had a twenty minute time limit for completion. The second section was on comprehension. It contained fourteen excerpts from notable authors which one reads silently. The forty-three questions were worded to test on content. This was a timed section with a greater degree of difficulty. The test was given on two consecutive days in December, 1988.

Textbook readability was done with the Fry Readability Scale, Copyright 1978. Three 100 word passages were selected from the beginning, middle and end of the book. Each passage was evaluated for the number of sentences per 100 words and the number of syllables per 100 words. The two values from each passage were combined with the result from the other passages to obtain an average number of syllables per 100 words and an average number of sentences per 100 words. The two values were plotted on a special scale to obtain an approximate readability level.

#### **CLASSROOM PROCEDURES**

The students were given prior instruction on the purpose of the test. They were told this was an evaluation of their reading ability only, it would not count as a class grade. They were instructed to bring a number two or HB pencil to each class.

The booklets were passed out along with the answer sheets at the beginning of a fifty minute class. Special

instructions were given at the start of each section on how to answer the questions. Students were instructed to begin a twenty minute timed period for section one. At the end of the timed period, instructions were given for section two. A timed period of thirty minutes began. At the end of the test, all answer sheets and materials were collected. Students were informed when results of the test would be available.

#### **PROCEDURES FOR TREATING DATA**

The answer sheets from the reading test were machine scored on a Scan-Tron visual grader. The raw scores were converted mathematically to grade equivalent scores.

#### **STATISTICAL ANALYSIS**

The raw and grade equivalent scores were tabulated by section to begin analysis. A calculation of the mean score of the measures was made. This was done by section and by the entire sample.

#### **SUMMARY**

The study was limited to Electronics Technology students. The forty nine subjects took a Gates-MacGinite Reading Test within two fifty minute periods. After the tests were collected, the answer sheets were machine scored. The conversion to percentile or grade equivalent was done

mathematically. A statistical analysis yielded the average reading ability score by section and for the entire sample for further study. The next chapter, Chapter IV, will present the findings of the study as well as the statistical analysis of the data collected.

## CHAPTER IV

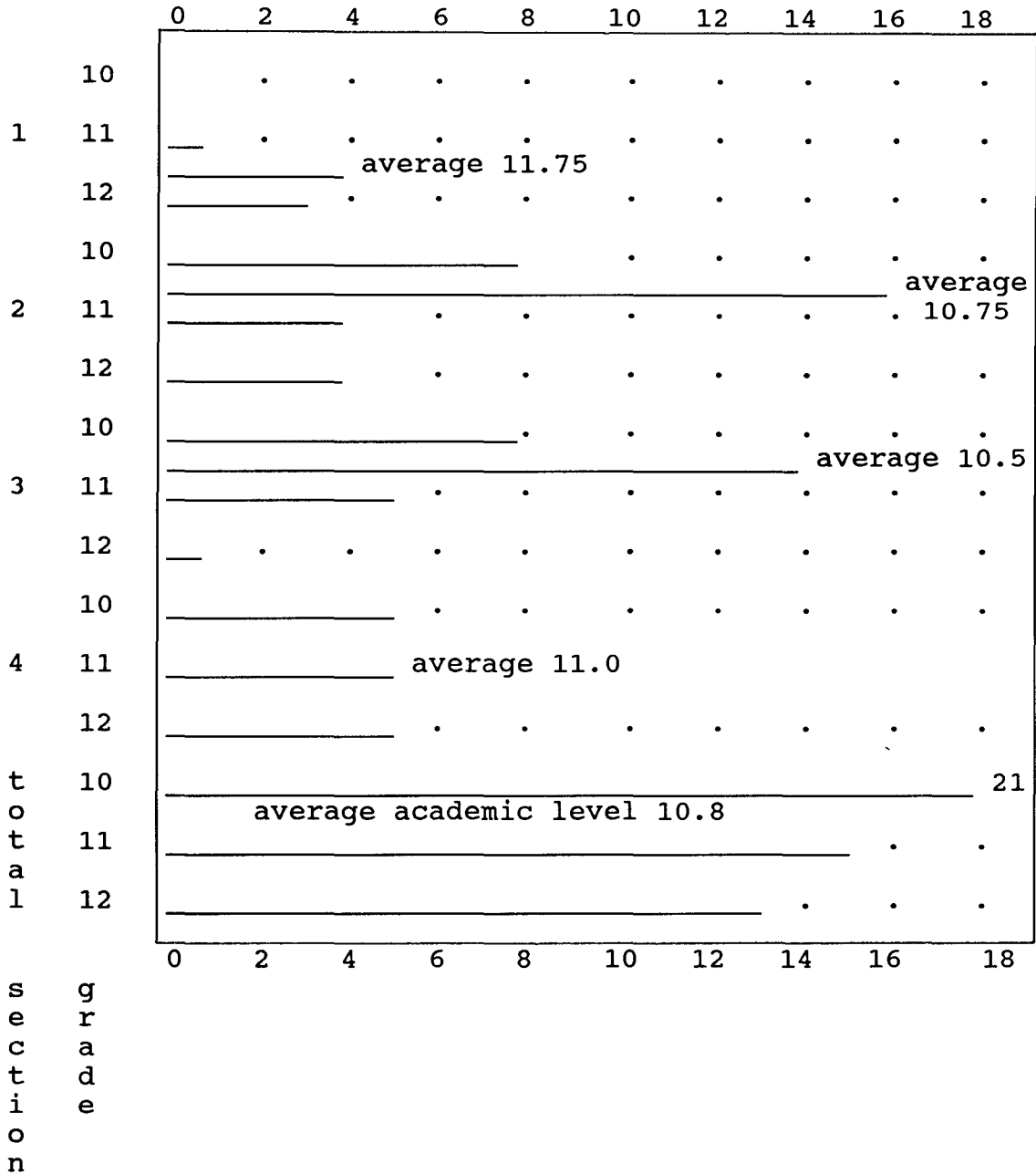
### FINDINGS

This chapter will present the findings of the study. Within this chapter you will find data from the reading ability testing and the Fry Readability Scale analysis of the textbook for each course. The tables will depict in graphic form the results of each measure.

The problem of this study was to examine the reading ability of electronics technology students. The study was limited to electronics technology students at F.E. Kellam High School in Virginia Beach, Virginia. The goals of the study were to determine the average academic level of electronics technology students, their average reading ability and the readability level of the approved textbooks for the courses.

The findings are depicted in six tables which accompany this discussion. The findings depicted in Table One indicated the average academic level of all members of each section and for the entire sample. The findings depicted by Table Two indicated the vocabulary and comprehension ability of each student and the average reading ability of the section. The findings depicted by Table Three are the results of the Fry Readability Scale analysis of the approved textbooks for the courses.

**TABLE ONE**  
**ACADEMIC GRADE LEVEL**  
 Number of Students



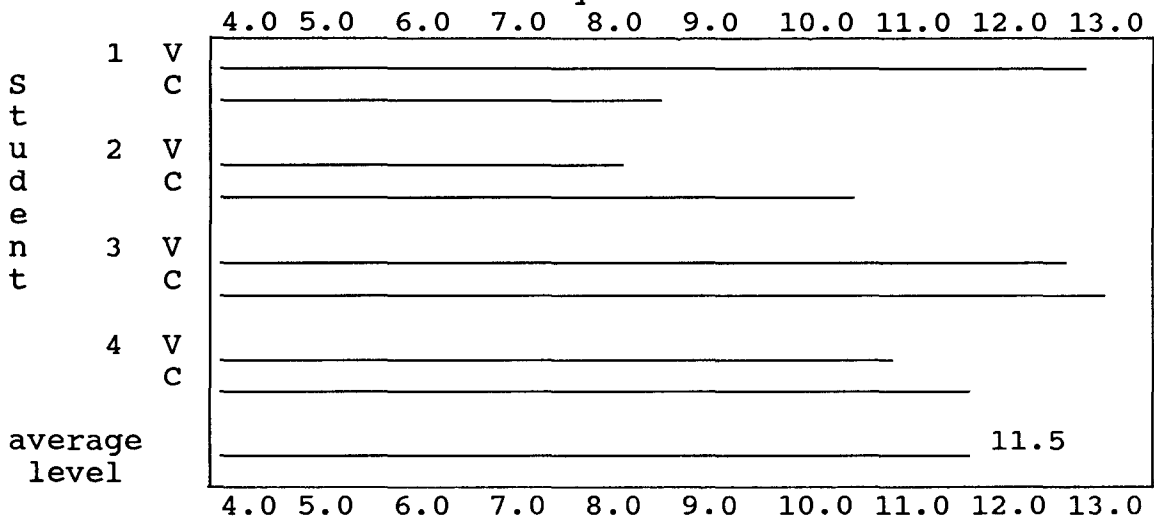
**SECTION ONE ELECTRONICS II**

This small class of four students contained a wide range of reading ability. The average academic level was 11.75. The average reading ability was 11.5 with a range of



8.0 to 12.9+. As the findings indicated in Table 1, there was a wide range between vocabulary and comprehension results in one students score. The findings of textbook readability level indicated a 17+ readability level for Transistor Electronics, Third Edition, Gerrish & Duger, McGraw-Hill, 1983.

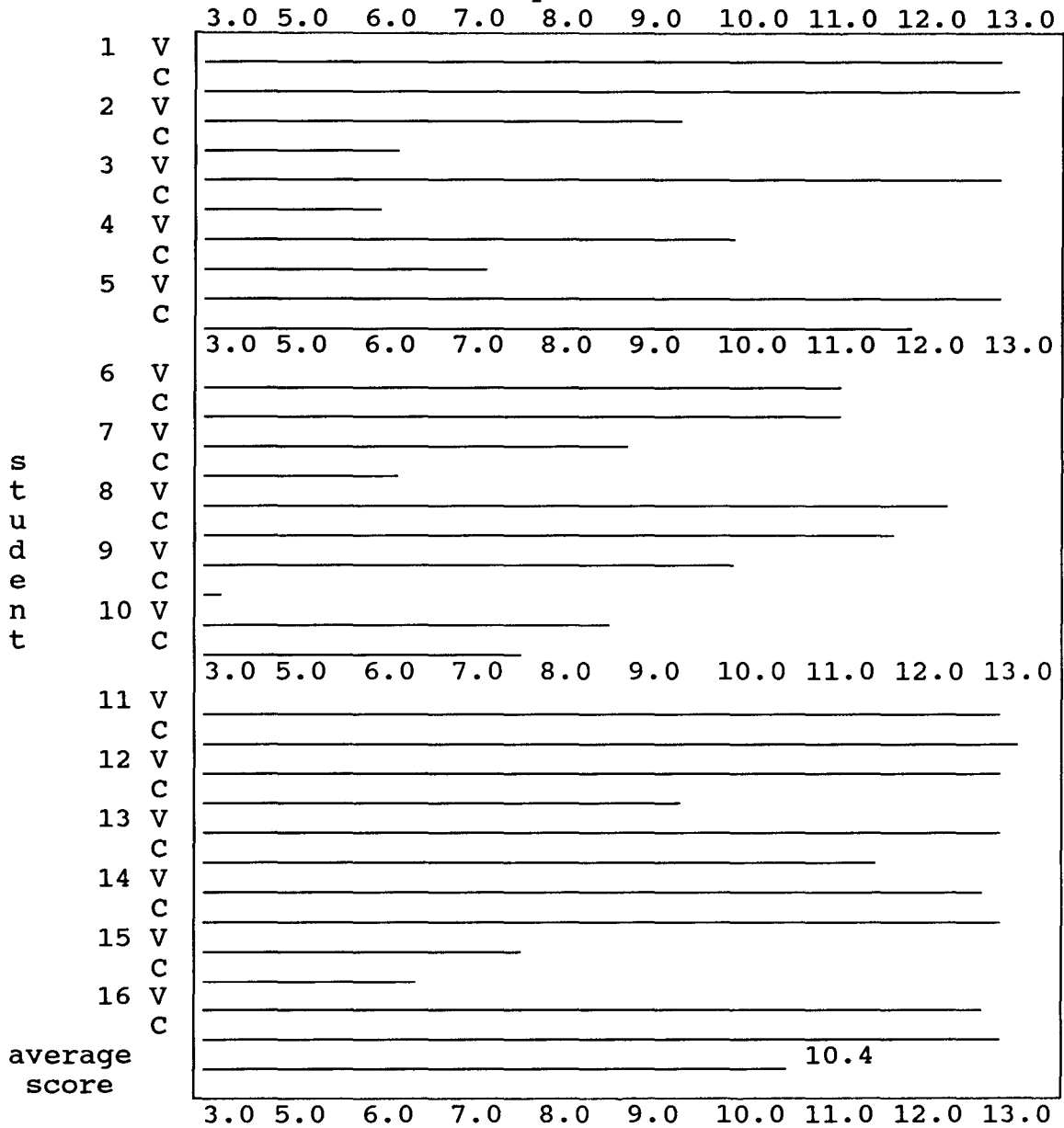
**TABLE TWO**  
**VOCABULARY AND COMPREHENSION SCORES**  
 Section One  
 Grade Equivalent



**SECTION TWO ELECTRONICS TECHNOLOGY**

This class contained 16 male students. Their average academic level was 10.75. Average reading ability was 10.4 with a range of 3.1 to 12.9. Two students had a wide range of 12.8 vocabulary to 9.2 comprehension. Textbook readability level was 16 for Understanding Electricity and Electronics, Fourth Edition, Buban & Schmitt, McGraw-Hill, 1982.

**TABLE TWO**  
**VOCABULARY AND COMPREHENSION SCORES**  
 Section Two  
 Grade Equivalent

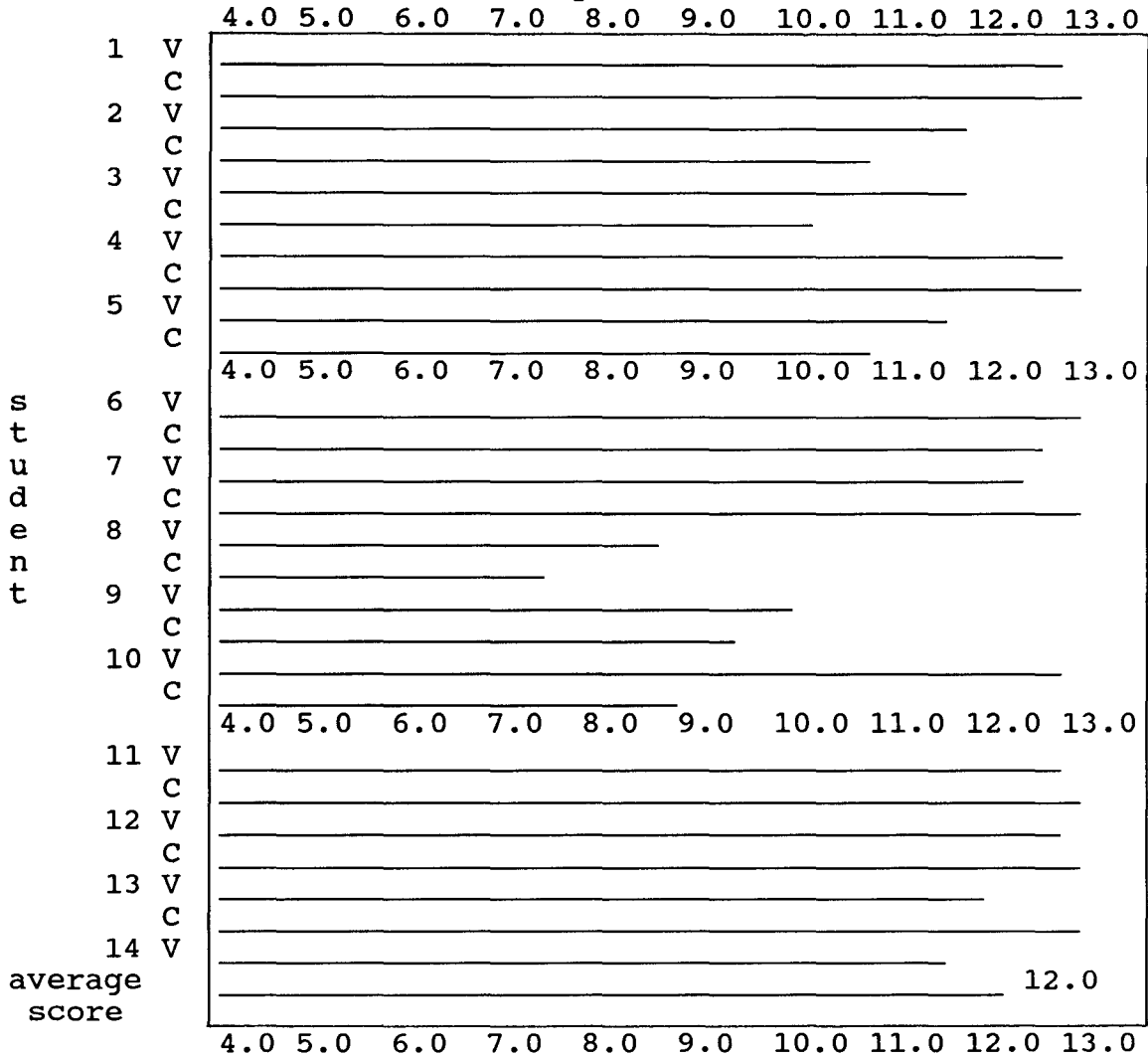


**SECTION THREE ELECTRONICS TECHNOLOGY**

This section had 14 students, 13 males and 1 female. Average reading ability was 12.0 with a range of 7.3 to 12.9+. Average academic level was 10.5. One student had a

wide range of 12.8+ vocabulary to 8.7 comprehension. This class used the same text as section two.

**TABLE TWO**  
**VOCABULARY AND COMPREHENSION SCORES**  
 Section Three  
 Grade Equivalent

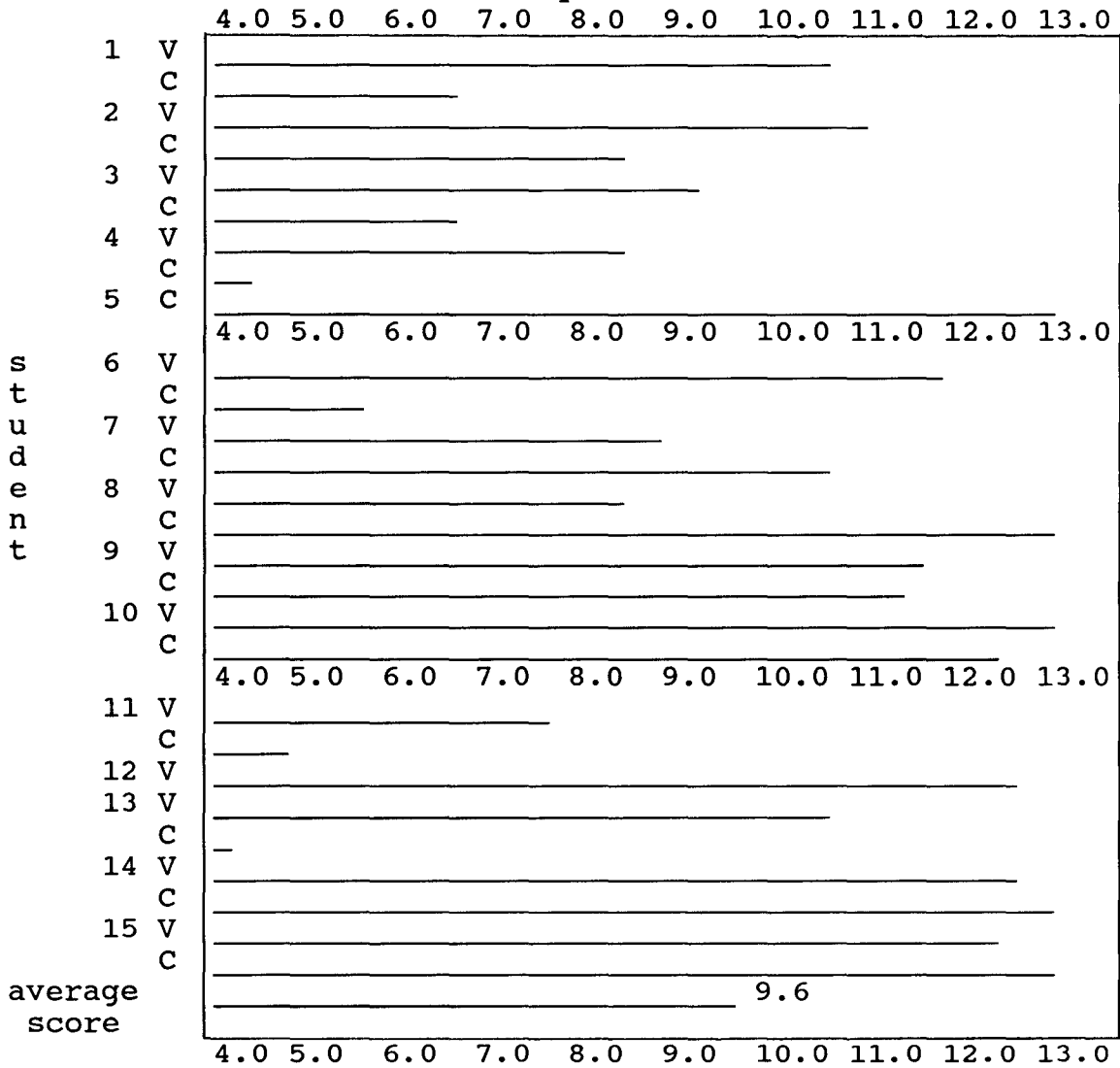


**SECTION FOUR ELECTRONICS TECHNOLOGY**

The last class of the day usually had a wide ability range. Scheduling of advanced or required classes in the morning seemed to create this situation. Quite often the

last class had superior students as well as below average students. Average academic level for section four was 10.3. Their average reading ability was 9.6 with a range of 3.1 to 12.9+. Several students had a wide range between vocabulary and comprehension scores. The widest range was a 10.5 vocabulary to 3.1 comprehension. There were 15 male students. Textbook readability was the same as section two and three since they all use the same text. The findings for section four followed the pattern of superior mixed with low ability.

**TABLE TWO**  
**VOCABULARY AND COMPREHENSION SCORES**  
 Section Four  
 Grade Equivalent



**SUMMARY**

Chapter IV presented the findings of the study. The findings indicated the students were above average academic level on vocabulary. The combined average academic level for all sections was 10.8 while the combined average vocabulary ability was 11.5. The same was not true for

combined comprehension scores. Most sections tested below average academic level on comprehension. The combined average comprehension ability was 10.2 while the average academic level was 10.8. One section tested higher than average on comprehension. This same class had a combined score 1.5 grade levels above their average academic grade level (10.5). The other classes had a combined score on level or slightly below level.

**TABLE THREE**  
**FRY READABILITY SCALE ANALYSIS**

Textbook	Readability Level
<u>Understanding Electricity and Electronics</u> . . . . .	.16
<u>Transistor Electronics</u> . . . . .	.17+

The Fry Readability Scale indicated a 17+ level for Transistor Electronics, the Electronics II text. The Electronics Technology text, Understanding Electricity and Electronics, tested at grade level 16. Their combined readability level was 16.5.

Chapter V will contain a summary of the research study, conclusions of the researcher and recommendations based on the findings of the study.

## CHAPTER V

### SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Chapter V will summarize the study, draw conclusions from the findings and make recommendations for possible use.

#### SUMMARY

The problem of the study was to establish the reading ability level of electronics technology students. Goals of the study were to establish the average academic level of each section, test for the average reading ability of each section and perform a readability measure on the assigned textbooks. Prior research had dealt with reading ability in vocational subjects as far back as 1957. Most research tested electronics as part of a major research effort. Little work had been done on reading ability of only electronics students. For this research study, participation was limited to students in the electronics technology program at F. E. Kellam High School.

Changes in graduation criteria created a crisis in vocational education. The above average student, who really needed exposure to vocational skills, did not have the elective credits available. This was due to additional math, science or fine arts credits. Those students who took vocational subjects in the past often had limited academic ability. Vocational educators found it difficult to present material written on the appropriate level. At the same

time, the amount of material had increased dramatically in quantity and complexity. Educators needed more help in material selection.

Prior research found reading ability of most vocational students was 3 to 6 grade levels below the readability level of the assigned text. Reading comprehension scores were below grade level in most cases also.

The research study was limited to electronics technology students at F. E. Kellam High School in Virginia Beach, Virginia. Subjects were given a two part reading test by Gates-MacGinitie. Testing was done in the classroom over a two day period. Answers were recorded on optical scanning forms for machine scoring. Results were converted to grade equivalents mathematically.

Findings were tabulated by section. Three tables were used to display results. Table One displayed the average academic level of each section. It also contained the overall academic level of electronics technology students at Kellam High School. Table Two displayed the vocabulary and comprehension scores by section. It also displayed the average reading ability of each section. Table Three displayed the readability level of each assigned textbook.

### **CONCLUSIONS**

After analyzing the findings, the researcher concluded that slightly less than half of the students tested (42%) read on or below the average academic level (10.8). Some



students (32%) read 2 grade levels above average (12+). The average reading ability level for Kellam students was 10.8. Readability levels for the assigned textbooks were approximately six grade levels above average or 16.5.

### RECOMMENDATIONS

Vocational educators still face the recurrent problem of reading ability. The textbooks are still 3 to 6 grade levels above the average student. Findings of this research study indicated that more effort must be spent on bringing the student ability up to the textbook readability level. The reference material for industry is more technical now than ever. These students with poor reading skills will not do well unless they can improve those skills enough to read on the level of their technical manuals.

These findings could also be used in a textbook evaluation process. Readability measures must be done on each electronics technology text to insure an appropriate level closer to the students ability. The City of Virginia Beach will be going through an evaluation process for electronics textbooks this academic year, 1989-1990. Results of this study could be of significant value in performing an exhaustive evaluation of the potential texts. That would provide texts written at a reading level closer to the average reading ability of electronics technology students (10.8).

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