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## A Comparative Study of Employment Offers Made to Pre-Employment Trainees

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**A Comparative Study of Employment Offers  
Made to Pre-Employment Trainees**

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

In Partial Fulfillment of the  
Requirements for the Degree of  
Master of Science in Occupational and Technical Studies


By  
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## SIGNATURE PAGE

Charles A. Bartocci prepared this research paper under the direction of Dr. John M. Ritz in OTED 636, Problems in Occupational and Technical Studies. It was submitted to the Graduate Program Director as partial fulfillment of the requirements for the Degree of Master of Science in Occupational and Technical Studies.

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## CHAPTER I

### INTRODUCTION

Paper manufacturing has been a major source of employment in the Alleghany Highlands directly employing 1,890 employees in manufacturing and converting operations and an estimated 3,000 individuals supplying goods and services to this industry. The paper mill in Covington employs 1,450 employees making it the second largest in the state of Virginia. This mill manufactures approximately 2,700 tons of paperboard per day used in consumer packaging such as food and juice packaging, pharmaceuticals, tobacco and cosmetics. Approximately 40 percent of the paperboard produced is exported overseas. (Gleason, 2002, p. 1) An uneducated workforce was adequate during the early part of the last century due to the physical nature of the industry. However with the introduction of automated controllers by mid-century and computers during the 1970's came the need for a more educated workforce. The introduction of these new technologies with the consequences of increased productivity and reduction of the need for physical handling of the materials in process emphasized the need for an educated workforce.

Most industries have had to deal with this technological change by educating the entire workforce; from remedial reading and mathematics classes for those who are illiterate or functionally illiterate, to graduate level seminars for professionals new to their chosen industries. As late as 1989 (Hartman, 1990), testing performed on individuals who presented themselves for voluntary skills upgrade revealed that a small percentage were unable to read at the sixth grade level.

The available workforce was a reflection of this problem. Although there are two community colleges within twenty miles of the paper mill, eighty percent of those individuals presenting themselves for employment consideration are lacking in either English or mathematics skills that are expected of ninth grade students. There is a huge cost borne by the industry to perform this screening; there is an even larger cost if a skills deficient individual enters the technological workplace. Ten years ago the affected industry, in conjunction with one of the nearby community colleges, developed a pre-employment class, which would be part of that screening process. This process is now in its second iteration and it appears to be successful.

### **STATEMENT OF THE PROBLEM**

The problem of this study was to determine whether changes made to the MeadWestvaco pre-employment screening process has improved employability of potential job applicants.

### **RESEARCH GOALS**

To guide the answering of this research problem, the following hypotheses were established:

H<sub>1</sub>: Did the changes in the type of training given to potential job applicants improve their chances of gaining employment?

H<sub>2</sub>: What are the pass rates of the new program compared to the original program?

### **BACKGROUND AND SIGNIFICANCE**

The MeadWestvaco facility was not always as critical to the economic health of the Alleghany Highlands as it is today. In the 1950s there were three other industries employing more individuals - C&O Railroad (the Railroad), A.E.T. (formerly Hercules),

and Acadia (the Rubber plant) (IGCC, 1989). Clifton Forge was the center of rail traffic in the eastern mid-Atlantic with the rail bridge over the Jackson River being the largest in the world. Some of the materials hauled included coal, wood products, and chemicals destined for the industrialized East Coast. From a peak of 2,500 employees, the Railroad now employs less than 100 (Dean, 2002). In 1961, Industrial Rayon sold its Covington facility to Hercules and at that time employed about 1,800 individuals. Economic factors caused reductions in employment and after a bitter strike and fire the workforce at this facility contracted to 340 by 1994. After the purchase of the plant by Applied Extrusion Technologies, A.E.T., job losses continued with just 170 workers employed at this facility (Crowder, 2002). Acadia Rubber had over 600 employees until the mid-1950's when they began to manufacture various rubber gaskets used in automobiles. Much of the work then migrated reducing the employment at this plant to just 250.

MeadWestvaco then became the largest employer within fifty miles, so maintaining its commercial success was critical. In 1989 the Human Resource Department petitioned the Commonwealth of Virginia to establish a program designed to upgrade the skills of the workforce. The local community college expanded this mandate to the creation of an Associate Degree program in Pulp and Paper Technology to provide a pool of potential employees familiar with the papermaking process. By 1993 the mill was hiring individuals as far away as 60 miles and found that they were screening ten individual applications for employment to find one suitable person. To reduce the expenses associated with this phase of human resource management, the local community college was asked to create a pre-employment training program. The initial program (designated PETC-1) tested potential applicants and found that eighty percent were



deficient in basic math skills, English or both. The initial program had minimal exposure to the paper mill, with extensive basic math preparation. The current program (designated PETC-2) incorporated a more extensive papermaking process introduction with three in-mill field trips.

These two pre-employment programs have been administered by the local community college. Every ten years SACS evaluates the effectiveness of this institution, with the next evaluation occurring during the spring of 2003. The study was undertaken to determine if there has been incremental improvements in the education provided to the individuals taking part in the pre-employment process.

### **LIMITATIONS**

This study was guided by the following limitations:

1. This research studied only the pre-employment program for one workplace, MeadWestvaco.
2. The company studied hired thirty-to-fifty individuals per year.
3. This study did not cover the screening process for salaried employees.
4. Economic circumstances were not considered when comparing different pre-employment participants.
5. Individuals for the first pre-employment program were selected by random drawing; all individuals who passed a series of tests were allowed to enter the second pre-employment class.

### **ASSUMPTIONS**

The assumptions that this study was based upon included the following:

1. Testing for higher math and English proficiencies will lead to a more highly educated candidate pool.
2. After receiving an extensive exposure to the paper mill environment some candidates will choose not to participate further in the employment process, which will mean reduced hiring expenses.
3. A paper specific pre-employment training program will shorten the learning curve for new hires.
4. All candidates for employment will truthfully answer all questions in each application.

### **PROCEDURES**

Applications for employment were reviewed over a ten-year period of time. During the first two years reviewed there was no pre-employment screening process. The total number of applications for employment will be compared to the number of individuals being offered employment. The first pre-employment training class was a two-week class, offered at night. Participants applied at the VEC and were selected by random drawing to enter into the class. Those who 'won' the drawing were then tested and many were found deficient in either math or English or both. Individuals who were found deficient could then take remedial classes, which would lead to entrance into the pre-employment class. Those who then completed this program could apply for employment consideration. This study took the total number of individuals who applied to work at MeadWestvaco and compared that to the number of individuals accepted for employment. The current pre-employment program made the assumption that with a more rigorous level of testing, the math component could be eliminated and by adding an

additional week of course work the training program could expand to areas now seen as critical to include quality control, safety and three industrial visits. Those who then completed the second program could apply for employment consideration. This study took the total number of individuals who applied to work at MeadWestvaco and compared that to the number of individuals accepted for employment. Both pre-employment programs considered it important that the students who participated would be encouraged to stay with the programs and complete the course of study.

### **DEFINITION OF TERMS**

The following items are defined to assist the reader:

**Alleghany Highlands** – A region of Virginia/West Virginia described by the boundaries of counties of Alleghany, Bath, northern Botetourt, Craig, and eastern Rockbridge in Virginia and Pocahontas and Greenbrier counties in West Virginia.

**Corrugating Medium** – Unbleached paperboard that is converted into the fluted layer found in corrugated boxes. It is normally manufactured from recycled corrugated boxes and unbleached semi-chemical hardwood pulp.

**DSLCC** – Dabney S. Lancaster Community College. This community college serves the Alleghany Highlands.

**SACS** – Southern Association of Colleges and Schools

**V.E.C.** – Virginia Employment Commission. Throughout the period covered by this study, the V.E.C. office in Covington played a major roll as intermediary between the potential employee and MeadWestvaco.

## **SUMMARY AND OVERVIEW**

Chapter I introduced the problem of the study, which was to determine whether changes made to the MeadWestvaco pre-employment screening process have improved employability of potential job applicants. The research goals that were outlined asked four questions: Did the changes in the type of training given to potential job applicants improve their chances of gaining employment? Has the type of person seeking employment at MeadWestvaco (Covington) changed, in terms of educational background and age? Is a significant portion of students completing the current Pre-Employment Training class and then not applying for a job? And finally, what are the pass rates of the new program compared to the original program? The background and significance provided information on the events that led to this study as well as describing why it was important that this study be undertaken. The boundaries of this study were described by the limitations with statements that the researcher believed to be true and were contained in the section on assumptions. The procedures stated how the two different employment-screening processes would be compared. Terms specific to this study were defined in the definition of terms.

Chapter II provides a literature review related to the population and labor statistics as well as area employment trends. Chapter III describes the methods and procedures used in this study. Chapter IV presents the potential employee qualifications and hiring rates and Chapter V concludes this study with conclusions and recommendations.

## CHAPTER II

### REVIEW OF LITERATURE

Presented in this chapter is a review of the literature relate to this study's questions and factors affecting them. Background information is provided on the area population and manufacturing employment. Math and English skills of the job applicants are reviewed as well as their academic attainments. Finally, enrollment in the various pre-employment training classes (PETC) is presented.

### STATE VERSUS AREA TRENDS

Over the past thirty years Virginia has experienced tremendous growth in both its population and its manufacturing base. Data provided by the U.S. Department of Commerce's Bureau of Economic Analysis (BEA, 2002) is presented in Figure 1.

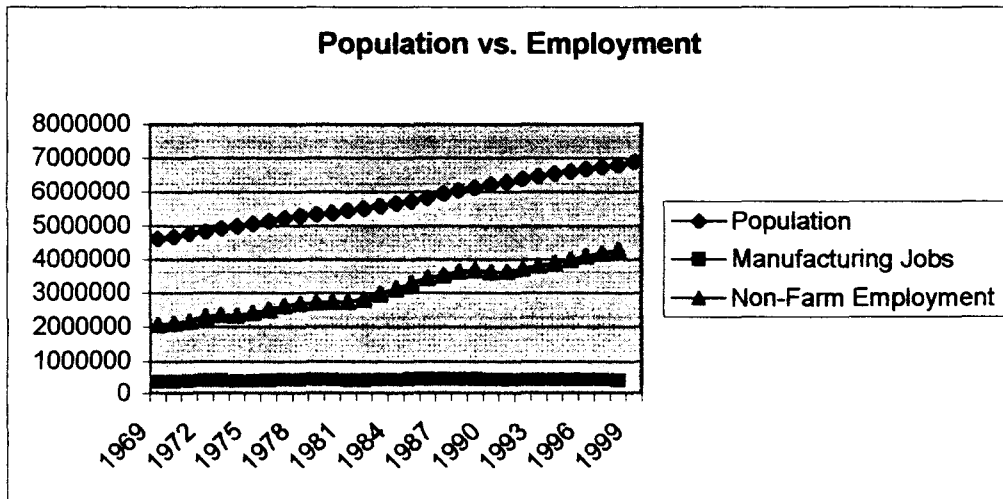


Figure 1 – Virginia Population and Employment

It is clear from Figure 1 that the state has made gains in population, non-manufacturing jobs and manufacturing jobs. The Alleghany Highlands has not fared as well. Figure 2 illustrates that during the past thirty years, population has shown a relatively constant

decline that has been mirrored by the decline in manufacturing jobs (BEA, 2002). With many areas of the country actively seeking industrial jobs by offering land, labor, training and tax abatements, it is critical that for an area to grow jobs, high-paying jobs must be found to retain the individuals who are not currently employed in the area. For the Alleghany Highlands, this means that jobs must be found or created for our youth, or they will move elsewhere.

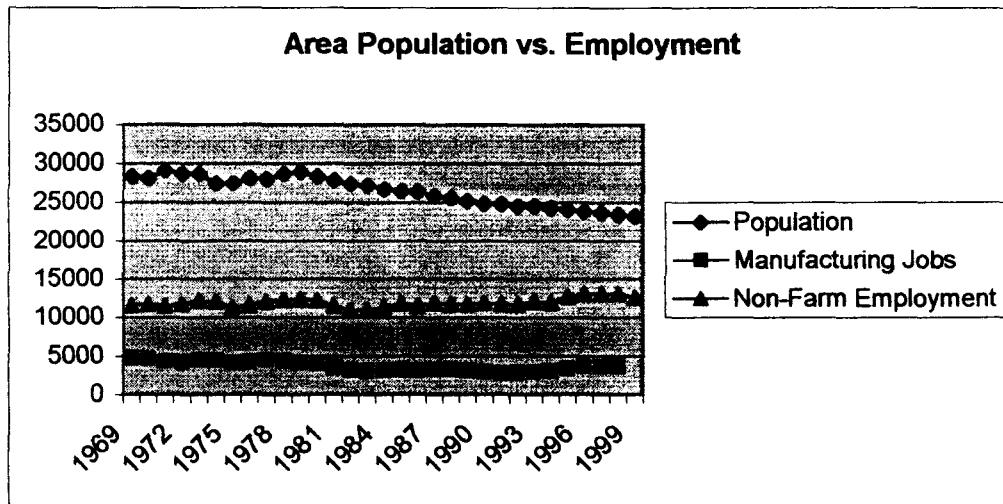
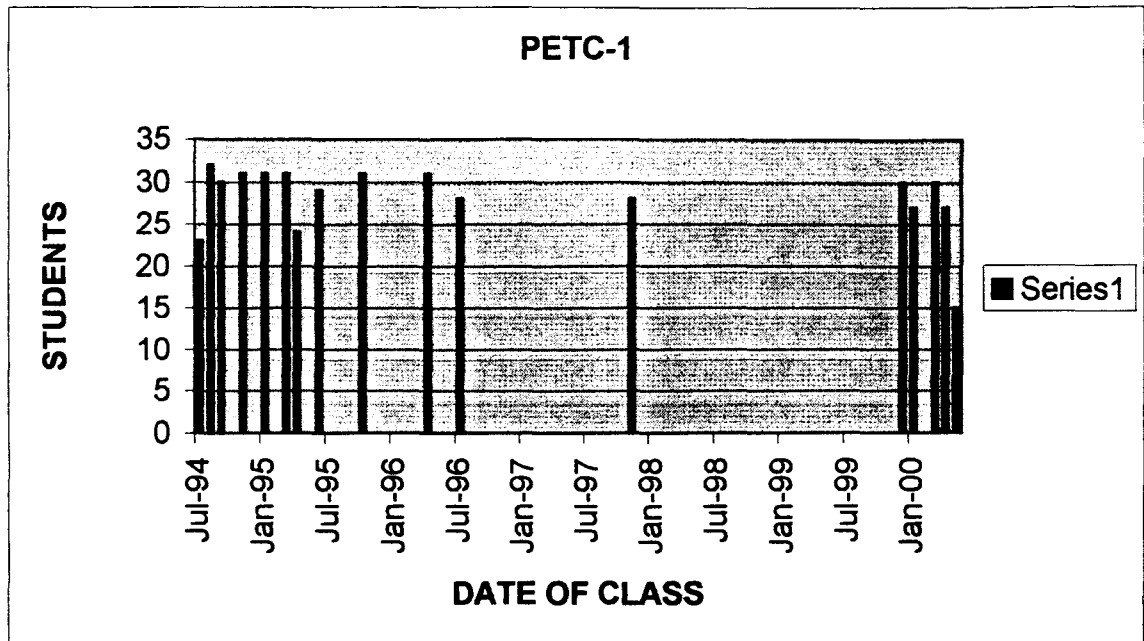


Figure 2 – Area Population and Employment

### ENROLLMENT LEVELS IN PETC

PETC-1 (Pre-Employment Training Class – the initial program) began on July 25, 1994, with 23 students completing that first class. All totaled there were 17 classes offered with 476 individuals completing the training (Continuing Education and Workforce Services, 2002). Except for PETC-1 class 12, there was a three-year period of time where no training was offered. During this time MeadWestvaco had shut down an obsolete machine and suspended new hiring until the excess workforce (employees were not laid off during this event) could be absorbed into the mill population, see Figure 3 for these details.



**Figure 3 - Pre-Employment Training Class-1**

The #6 paper machine at MeadWestvaco manufactured corrugating medium. Since the other four machines manufactured SBS, the #6 machine consumed resources that could be used more profitably on other machines. Rather than discharging the individuals assigned to this obsolete machine, senior employees were allowed to move into less senior positions throughout the paper mill. Those junior employees migrated down to the lowest mill position, extra board. The individuals in this position are placed in various jobs, on various shifts, throughout the mill. It is the least enviable position in the mill. Some individuals were in this position for over two years before re-entering a regular shift job.

**DIFFERENCES IN TRAINING CLASSES**

The first PETC involved classes in basic math, tool use (one section covered the use of a tape measure), basic safety procedures and quality control (Keener, 2002). There was no paper manufacturing covered in this two-credit hour course. Dabney S. Lancaster Community College coordinated this course, but the curriculum development and

teaching responsibilities were contracted to The Hamilton Group, Inc., a private training firm. This course met four nights per week, for two weeks.

To enroll in this class the applicant had to first register with the V.E.C. in Covington, Virginia. When the PETC was announced over 600 applicants took this first step. The applicants, who were chosen at random to enter this course of training, were then tested by DSLCC. Roughly 80% were found to be deficient in mathematics, English or both. Those who passed this second screening were then allowed to participate in the pre-employment class. After completing the training (almost all participants completed the training) they were allowed to fill out a MeadWestvaco application.

Many complaints were registered during the six years this program was in place. While there were no tabulation of these complaints, individuals interviewed indicated that the random nature of the trainee selection rated high on the list. Additionally some complained that had they known that they were deficient in basic skills they would have embarked on a course of remediation so they would be ready to take the PETC. From the mill side several individuals who had completed the PETC, filled out the application, went through the interview and were hired, but later quit because of the work environment. This type of dropout is expensive in terms of the energy and cost borne by the mill staff.

The current training program was implemented because key mill personnel felt that those concerns should be addressed. The first change was to move the testing and training part of the employment process prior to the point where the V.E.C. would be involved. Even though many students register with the V.E.C. prior to registering for the PETC, the V.E.C. is no longer involved in selecting the PETC participants. Individuals



who desired to undertake the pre-employment training must be tested for mathematical ability and English proficiency. If individuals are found deficient, DSLCC can identify the areas of weakness and enroll them in classes to raise their proficiency. The former Program Head for Pulp and Paper Technology at DSLCC with the help of the engineers and managers who were on the Lay Advisory Committee for that program, designed the current PETC. As such, a strong paper-manufacturing component was included in the training, along with three field trips that escorted the participants through many of the departments that they might be called on to work. These classes were scheduled in the evening and met four days per week for three weeks. Once students successfully completed this class they were authorized to complete the MeadWestvaco application.

#### **SUMMARY**

This chapter covered demographics and needs of the Allegheny Highlands as they are related to employment at the areas' largest employer, MeadWestvaco. Even though statewide trends in population and employment rose, this was not true for the Allegheny Highlands. To continue to provide an adequate workforce for MeadWestvaco, the local community college facilitated the creation of a two-credit hour pre-employment training class. After seven years the former head of the Pulp and Paper Technology redesigned this class and along with key mill personnel restructured the employment procedure.

## **CHAPTER III**

### **METHODS AND PROCEDURES**

This study is a case study and the information gathered will be used to determine if job acquisition rates were affected by changes in pre-employment training. This design allowed the researcher to examine the pre-employment training records for 32 different classes conducted from July 1994 until March 2002. Two different training programs were used and hiring rates were reviewed to determine whether there was a difference in rates of hire.

### **POPULATION**

The target population was one hundred percent of all participants in both pre-employment programs. The population was divided into two groups; one group consisting of 476 individuals participating in the program designated PETC-1 and the other 96 individuals participating in the program designated PETC-2.

### **RESEARCH VARIABLES**

The independent variable in the study was the employee selection process that is used by MeadWestvaco. This process remained substantially unchanged during the past ten years so both PETC-1 and PETC-2 had students evaluated by this process. The time, manner and place of the pre-employment training were held constant for much of the training (several students took the class in a non-traditional way or at a non-traditional time.

## **METHODS OF DATA COLLECTION**

All the information on enrollment in the pre-employment classes was provided to the researcher for review and analysis. Each participant in these classes was compared to a list of employees provided by MeadWestvaco. Since all participants were enrolled at DSLCC the class records and grades were available directly to the researcher.

Employment data were kept by MeadWestvaco and were provided to the researcher.

Each PETC session had individuals who were extended employment offers. The number of offers for each session was provide to the researcher.

## **STATISTICAL ANALYSIS**

The data from both pre-employment processes were analyzed using the Chi-squared method of analysis. This method was selected because the researcher needed to determine the 'frequency' of employment rates and the 'frequency' of program completion (pass rates). The results enabled the researcher to determine whether there was any significant difference between PETC-1 and PETC-2.

## **SUMMARY**

The researcher developed an experimental method and followed specific procedures to document data from the pre-employment processes. The research design included two groups of potential employees trained under two different programs. Chapter IV reports the findings of the pre-employment training class rolls and employment records to determine any significant difference in employment rates of PETC participants.

## **CHAPTER IV**

### **FINDINGS**

The problem of the study was to compare the two different Pre-Employment Training classes with the employment rates of those individuals who complete the classes and applied for employment. The data and results of the research have been reported in tabular format, with an explanation provided on the methodology used to calculate the research findings.

### **FINDINGS**

The research goals were to test the following hypotheses:

- H<sub>1</sub>: The changes in the type of training given to potential job applicants improved their chances in gaining employment with MeadWestvaco.
- H<sub>2</sub>: There are no significant changes in the pass rates of the new training program compared to the original program.

To test these hypotheses, the researcher had to collect enrollment data on all the relevant PET classes, and correlate this enrollment data with employment data provided by the MeadWestvaco Human Resources personnel. There were seventeen PET classes, designated PETC-1, conducted between July 1994 and June 2000. Table 1 compares the number of participants with the number of job offers made to each class. Of particular note is the small number of employees selected from the tenth and eleventh classes. These classes were completed just prior to the shutdown of the number-six paper machine. Another oddity is that the only class that had any failures was in the fourth class. The class raw scores for all classes were in excess of 90%, usually over 95%.

Table 1 – Participants in PETC-1

Class Enrollees	Job Offers		Class Enrollees	Job Offers
1 <sup>st</sup> Class 23	11		10 <sup>th</sup> Class 31	5
2 <sup>nd</sup> Class 32	10		11 <sup>th</sup> Class 28	4
3 <sup>rd</sup> Class 29	10		12 <sup>th</sup> Class 28	10
4 <sup>th</sup> Class 31, 2-F	14		13 <sup>th</sup> Class 30	8
5 <sup>th</sup> Class 31	19		14 <sup>th</sup> Class 27	11
6 <sup>th</sup> Class 31	19		15 <sup>th</sup> Class 30	12
7 <sup>th</sup> Class 24	18		16 <sup>th</sup> Class 27	6
8 <sup>th</sup> Class 29	17		17 <sup>th</sup> Class 15	4
9 <sup>th</sup> Class 31	15			

The first seven classes of the PETC-2 have completed the training and employment process. The results of these classes can be found in Table 2. There were only two failures, those in the second class. There were a total of 96 participants with 48 receiving offers of employment.

Table 2 – Participants in PETC-2

Class Enrollees	Job Offers		Class Enrollees	Job Offers
1 <sup>st</sup> Class 23	12		5 <sup>th</sup> Class 7	4
2 <sup>nd</sup> Class 21, 2-F	16		6 <sup>th</sup> Class 11	1
3 <sup>rd</sup> Class 16	7		7 <sup>th</sup> Class 6	2
4 <sup>th</sup> Class 12	6			

**OFFERS OF EMPLOYMENT EXTENDED TO PETC COMPLETERS**

The total number of participants in each training class as well as the total number of individuals who accepted offers of employment at MeadWestvaco is found in Table 3. A simple percentage taken of the offers of employment made to the individuals in both training classes finds that 40.5% of those in PETC-1 received such offers and 50% of those in PETC-2 received employment offers. Given the difference in hiring rates, it is

Table 3: PETC Participants and Offers of Employment

	PETC - 1	PETC - 2
Number of participants in training program	476 <span style="border: 1px solid black; padding: 2px;">B</span>	96 <span style="border: 1px solid black; padding: 2px;">A</span>
Number of job offers extended to participants	193 <span style="border: 1px solid black; padding: 2px;">D</span>	48 <span style="border: 1px solid black; padding: 2px;">C</span>

critical to determine whether this difference is significant. The Chi-squared method was then utilized to compute this nominal data in order to determine whether there was a difference in job offers extended to each group of PETC participants. Each of the lettered cells in Table 3 corresponds to the Chi-square formula values. N, 813, is the sum of the values found in the four lettered cells. See Appendix A for the equation and calculations. The Chi-square value was computed to be 1.1425 ( $\chi^2 = 1.1425$ ) with one degree of freedom (df = 1).

**FAILURE RATES OF THE TWO PETC PROGRAMS**

The Chi-squared method was then utilized to calculate this nominal data in order to determine whether there was a difference in rates of failure in each group of PET

participants. Each of the lettered cells in Table 4 corresponds to the Chi-square formula values. N, 576, is the sum of the values found in the four lettered cells.

Table 4: PETC Participants and Failures

	PETC - 1	PETC - 2
Number of participants in training program	476 <span style="border: 1px solid black; padding: 2px;">B</span>	96 <span style="border: 1px solid black; padding: 2px;">A</span>
Number of PETC failures	2 <span style="border: 1px solid black; padding: 2px;">D</span>	2 <span style="border: 1px solid black; padding: 2px;">C</span>

The Chi-square value was computed at 6.187 ( $\chi^2 = 6.187$ ) with one degree of freedom (df = 1). See Appendix A for the equation and calculations.

### SUMMARY

The researcher collected data from the two types of PET classes as well as employment data from MeadWestvaco in order to test the two research hypotheses. The Chi-square method was used to test for any significant differences in job offers extended to the PETC participants as well as training failure rates. Chapter V will summarize the research study, provide conclusions based on the research goals and data collected, and make recommendations based on the research results for this study and any future studies.

## **CHAPTER V**

### **SUMMARY, CONCLUSIONS AND RECOMMENDATIONS**

This chapter summarizes the research problem and goals, as well as the significance and limitation of the study. The population and methods of data collection are also provided with an outline of the statistical procedures used. The conclusions are the result of the data that were collected. Lastly, the researcher provides recommendations based on the results of this study and makes recommendations for future studies.

### **SUMMARY**

This research study was conducted for the purpose of comparing the number of job offers extended to participants in two Pre-Employment Training Classes, as well as whether there was a significant difference in rates of failure to the training. The goals of this research were to test two predictive hypotheses:

H<sub>1</sub>: Did the changes in the type of training given to potential job applicants improve their chances of gaining employment?

H<sub>2</sub>: What are the pass rates of the new program compared to the original program?

Individuals involved in training potential employment candidates as well as those who would select and interview those candidates felt that there was a significant improvement in the quality and job-based knowledge of those candidates participating in PETC-2. Since this was a subjective evaluation individuals involved in the pre-employment training wanted rigorous research into both the background and significance of the study.



The limitations of this study provided boundaries to the research. Any statements the researcher believed to be true that could have had an effect on the study were considered in assumptions. The limitations included restrictions to the pre-employment program for one workplace, new hires of hourly personnel, and the selection procedure for participants was different for each PETC.

The reviews of rates of employment as well as the decline of manufacturing-based employment were discussed. While there has been an increase in the population and number of non-farm employment across the state, the Alleghany Highlands has suffered declines in area population and stagnation in the number of non-farm jobs available. Many area leaders recognized the need for a stronger manufacturing sector if the Alleghany Highlands was to prosper.

Procedures outlined the data that would be collected and defined terms that would be used in this study. The target population for this study was one hundred percent of the PETC participants, who were later processed for employment. The enrollment data were to be collected from the Division of Workforce Development at Dabney S. Lancaster Community College and the employment data were to be provided by Human Resource personal at MeadWestvaco.

The enrollment data from each Pre-Employment were compared with the employment data for each class to determine whether there was a significant difference between the two PETC. The Chi-squared method of statistical analysis was used to manipulate this data to determine the frequency of jobs offered to each group of PETC participants. The Chi-square value was compared with levels of significance for one-tailed tests.

## **CONCLUSIONS**

The research goals tested two hypotheses. The first hypothesis tested was:

H<sub>1</sub>: The changes in the type of training given to potential job applicants improved their chances in gaining employment with MeadWestvaco.

The researcher collected and tabulated both the number of participants in each PETC as well as the subsequent offers of employment to each group of participants. The Chi-square value was computed to be 1.1425 with one degree of freedom (df = 1). This was compared to levels of significance for a one-tailed test since the hypothesis was predictive and was less than 2.710 at the .05 (5%) level. The researcher rejected the hypothesis and concluded that there was no significant difference between the two PET classes, in terms of subsequent offers of employment.

The second hypothesis tested was:

H<sub>2</sub>: There are no significant changes in the pass rates of the new training program compared to the original program.

The researcher collected and tabulated both the number of participants in each PETC as well as the failure rates of each group of participants. The Chi-square value was computed at 6.187 with one degree of freedom (df = 1). This was compared to levels of significance for a one-tailed test since the hypothesis was predictive and was greater than 5.410 at the .01 (1%) level. The researcher then accepted the hypothesis that there was a higher failure rate in PETC-2.

## **RECOMMENDATIONS**

Even though there was an improvement in job placement with the new PETC (50% verses 40.5%), there was not enough data to find this improvement significant.

This researcher recommends that the same hypothesis be tested when the number of potential job applicants reaches 400.

The low numbers of failures in the PETC-2 seemed insignificant; the second hypothesis was shown to be significant. There are more failures with the PETC-2. Since the raw data included percentile scores, this researcher recommends that a more exhaustive examination of the class rankings be undertaken to see if the PETC-2 has more challenging material in its presentation. A greater differentiation in class scores may be an indicator of degree of difficulty. If the raw scores for each student are summed, a significant difference between the score may indicate more challenging material.

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**APPENDIX A**

**THE CHI-SQUARE METHOD**

The Chi-squared method was utilized to calculate this studies nominal data in order to determine whether there was a difference in job offers extended to each group of PETC participants. The formula used to calculate the Chi-square value is shown below.

$$\chi^2 = \frac{N(AD - BC)^2}{(A+B)(C+D)(A+C)(B+D)}$$

N is the sum of values found in the lettered cells.

$$\chi^2 = \frac{813(18528 - 22848)^2}{(574)(241)(144)(669)}$$

For the first hypothesis the Chi-square value was computed at 1.14525 ( $\chi^2 = 1.1425$ ) with one degree of freedom ( $df = 1$ ). This value was compared with the levels of significance for a predictive hypothesis and was less than 2.710 at the .05 (5%) level.

$$\chi^2 = \frac{576(192 - 952)^2}{(574)(4)(98)(478)}$$

For the second hypothesis the Chi-square value was computed at 6.187 ( $\chi^2 = 6.187$ ) with one degree of freedom ( $df = 1$ ). This value was compared with the levels of significance for a predictive hypothesis and was greater than 5.410 at the .01 (1%) level.