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### Determining the Validity of the Auto Mechanics I Curriculum and Student Competencies at Virginia Peninsula Vo-Tech (South Campus)

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DETERMINING THE VALIDITY  
OF THE AUTO MECHANICS I  
CURRICULUM AND STUDENT COMPETENCIES  
AT VIRGINIA PENINSULA VO-TECH  
(SOUTH CAMPUS)

A RESEARCH PAPER

Submitted to the Darden School of Education  
of  
Old Dominion University  
In Partial Fulfillment of the Requirements For  
The Degree of Master of Science In Education

by Bruce M. Godwin

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Norfolk, Virginia

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This research paper was prepared by Bruce M. Godwin 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 Degree of Master of Science in Education.

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## TABLE OF CONTENTS

CHAPTER	PAGE
I. INTRODUCTION.....	1
STATEMENT OF THE PROBLEM.....	2
GOAL.....	2
OBJECTIVES.....	2
BACKGROUND AND SIGNIFICANCE.....	3
LIMITATIONS.....	4
ASSUMPTIONS.....	4
PROCEDURES FOR COLLECTING DATA.....	5
DEFINITION OF TERMS.....	6
SUMMARY.....	7
II. REVIEW OF LITERATURE.....	9
VOCATIONAL EDUCATION.....	9
COMPETENCY BASED EDUCATION.....	10
STUDENT COMPETENCIES.....	10
CRAFT COMMITTEES AND CURRICULUM DEVELOPMENT.....	11
VOCATIONAL PREPARATION.....	12
SUMMARY.....	13
III. METHODS AND PROCEDURES.....	15
TARGET POPULATION.....	15
SELECTION OF SUBJECTS.....	15
DATA COLLECTION, ANALYSIS AND INTERPRETATION.....	16
SUMMARY.....	17

TABLE OF CONTENTS

CHAPTER	PAGE
IV. FINDINGS.....	19
PRE-TEST/POST-TEST.....	19
CRAFT COMMITTEE.....	19
VIRGINIA PENINSULA VOCATIONAL-TECHNICAL EDUCATION FOLLOW-UP SURVEY.....	20
MEAN SCORE COMPARISON OF EMPLOYER FOLLOW-UP RESULTS.....	21
TILLEY REPORT.....	23
SUMMARY.....	23
V. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS.....	24
CONCLUSIONS.....	25
RECOMMENDATIONS.....	26
BIBLIOGRAPHY.....	27
APPENDIX	
A. PRE-TEST/POST-TEST.....	29
B. STUDENT COMPETENCY RECORD.....	47
C. EMPLOYER SURVEY.....	54
D. DOUGLAS TILLEY, LTD. REPORT.....	56

## CHAPTER I

### INTRODUCTION

Vocational education was an excellent way for students to experience industrial related occupations. However, curriculums and student competencies must be developed and constantly scrutinized to assure that the content of the course will fulfill those job entry level skills which students should possess prior to employment.

Vocational education in auto mechanics was a means of allowing students to study automotive technology and application of theory in both the classroom and shop environments. Special emphasis was placed on the development of safe and practical work habits.

The present automotive curriculum training was divided into four (4), nine (9) week segments. It's arrangement was to offer a structured program to develop and train competent mechanics to the helper level. Each segment provided basic fundamentals and knowledge to prepare the student in: shop and personal safety, career opportunities, automotive systems, service techniques and related equipment. The course consisted of 540 classroom/shop hours of instruction. The hourly allowance was based on the Vocational Auto Mechanics Curriculum Guide, State Department of Education.

After completion of this course of instruction, the student would need a period of on-the-job experience for advancement to the level of a competent "general" automotive mechanic.

## STATEMENT OF THE PROBLEM

The problem of this study was to determine the validity of the present curriculum and student competencies for the Auto Mechanics I Course at Virginia Peninsula Vo-Tech, South Campus, for the years 1982-83.

## GOAL

The goal of this study was to assure that the present curriculum reflected the needs of the students and of occupationally related employers. The curriculum was developed to train students for employment which would last a lifetime. By constantly updating, expanding, and revising the curriculum, trainees were guaranteed the best possible investment in a practical education.

Cooperation with industry and education was important to the future of both, as well as the economy of the United States. Using this goal, it was reasonable to assume that periodic assessment was necessary and that educational institutions could not adequately shape the whole person without valuable input from industry.

## OBJECTIVES

The objectives of this study were as follows:

1. Craft committees, consisting of members of the business community, were used to review the curriculum and offer ideas that would help update the curriculum.
2. An employer follow-up was developed to survey the abilities of

automotive graduates working in the community and determine the effectiveness of their educational experience at Vo-Tech.

3. By talking to area employees and industry representatives, we were able to determine those work traits most necessary for successful employment.

#### BACKGROUND AND SIGNIFICANCE

The importance of examining current curriculums and competencies was explained by the fact that to fulfill industry's needs, we must properly train and educate our students. Without evaluating and updating our skills, we may be responsible for producing vocational graduates with sub-standard abilities. Vocational training for future employability was the main objective of curriculum evaluation. Some educators have been guilty of teaching only for the immediate future or for one specialized job in industry, rather than using teaching techniques to fulfill the long range goals of students and the needs of industry.

In 1979 there were over 13.5 million people employed in automotive related occupations. A large number of these people were involved in the development and manufacturing of new automobiles. One of every six workers is in an automotive related occupation (Tolbolt and Johnson, 1979, p. 708).

As the technology changed, new jobs were created and some old occupations were suddenly obsolete. Without proper technical or vocational training, those employees faced with a sudden career change often would not adapt to abrupt technological and economic growth.

Technical advances, including replacement of



men by machines, have demanded a higher level of technical and professional training and have produced a resulting decrease in employment opportunities for the unskilled and under-educated (Venn, 1964, p. 565).

To combat the loss of valuable employees during these changes, the industries have set up several criteria for hiring new employees. "They were primarily interested in hiring people who were malleable and, thus relatively inexpensive to train" (Weisberg, 1983, p. 357).

The nature of vocational education provided students with a head start in learning how to meet industry's needs by acquiring necessary skills and work attitudes. Once these students were hired, they would be trained as needed by their employers and molded to adapt to an ever changing world of work.

#### LIMITATIONS

This study was primarily concerned with the educational impact of a vocational automotive mechanics course. The course, which was evaluated for changes in the curriculum and student competencies, was the Automotive Mechanics I Class for the 1982-83 School Year at Virginia Peninsula Vo-Tech, South Campus. The students who attended this course were high school sophomores, juniors and seniors.

#### ASSUMPTIONS

It was assumed that:

1. Not all students would actually choose a career as an auto mechanic, but would use their knowledge and skills for employment in other related fields or would further their education by attend-

ing other trade schools, colleges, and universities before entering the world of work.

2. The craft committee would provide valuable input that would be used to update and validate the current curriculum and student competencies.

3. Employer evaluations of graduated students would provide an accurate measurement of the individual levels of competency reached by each former student. The employers would also help determine the level of success of the Auto Mechanics program at Vo-Tech.

4. Not all students were of the same educational or social background.

#### PROCEDURES FOR COLLECTING DATA

The procedures for collecting data were as follows. A survey was taken of all recent auto mechanic graduates to find out how many were actually employed in an automotive trade, how many were employed in related occupations, how many were employed in another trade and how many were unemployed.

Each member of the craft committee was sent a copy of the present curriculum and student competencies along with a self addressed, stamped envelope and a cover letter asking them to comment on any areas where they saw a need for change or improvement.

Employer evaluations were performed locally and compared to a state survey using the same area of questions. The survey helped to assess the preparation and vocational training of each former automotive student.

Each student was given a pre-test which was administered again as a post-test to help measure the level of automotive experience prior to and at the completion of the first year of study.

Student competency sheets were evaluated and compared to the needed and necessary automotive skills used by area general automotive service shops.

#### DEFINITION OF TERMS

1. CBE - Competency Based Education is used as a step by step method of education to individually learn or master tasks. This allows a student to follow a progression of learning at his/her own rate, but certain tasks must be satisfactorily passed before proceeding to the next area of study.
2. Auto Mechanics I - The first year of a two (2) year course of study dealing with the safety, operation theory and repair of automobiles. The first year consisted of 540 hours of classroom and shop experiences using CBE as the basic method of instruction.
3. Mechanical Aptitude - The ability to perform work using the coordination of the hands and the mind.
4. Craft committee - A committee of select members of the automotive field who were called upon to evaluate automotive educational curriculum and student competencies.
5. Student Competencies - A selected collection of theory and practical techniques which a student must pass with a minimum acceptable level of competency before satisfactorily completing a course of study. This would use the format of CBE and would assure that students and

educators were accountable for content and theory shown on the competency record.

#### SUMMARY

The assessment of educational curriculum is not only the responsibility of the educator, but in the area of vocational education, also the responsibility of industry. Valuable information can be obtained by cooperation between schools and future employers. Students should have been aware of limitations caused by certain professions and should have developed basic skills and attitudes which would allow them to adapt to technological changes. The ability to change from one work area to another with minimal retraining was a necessity and a prerequisite of many employers to retain the reliable and technologically literate.

In Chapter II, Review of Literature, curriculum development and competency based education were discussed. Vocational education was defined. The importance of education and industry interaction were explained and employer listed skills and attitudes were shown and assessed in order of importance to future employees.

In Chapter III, Methods and Procedures, collection and accumulation of data was explained. The selection of subjects and the requirements of the Auto Mechanics I Program were discussed. The curriculum was examined by the craft committee and the employer survey was discussed.

In Chapter IV, data was presented in graphic and tabular forms which helped to validate the present competencies and curriculum of

the Auto Mechanics I course. No conclusions were drawn until Chapter V, Summary, Conclusions and Recommendations.

Chapter V, Summary, Conclusions and Recommendations, evaluated all the data used to evaluate the effectiveness of the competencies and curriculum based on information gathered in Chapter IV. Recommendations and comments were formulated to enhance the present course of study.

## CHAPTER II

### REVIEW OF LITERATURE

This chapter will present a review of literature explaining the importance of developing a curriculum and student competencies within the guidelines of competency based education. The importance of industry and education playing equal roles will be discussed. Development of proper employability traits will also be explained.

### VOCATIONAL EDUCATION

Vocational education was defined as training in the practical application of knowledge.

Vocational education includes all the various forms of higher or professional education. Thus, education for the law, medicine, the Christian ministry and for the various phases of engineering are also forms of vocational education (Cyclopedia of Education, 1913, p. 740).

Vocational education was seen as a very positive means of developing necessary technical skills, and proper work habits.

Labor statistics make it clear that there is a pressing need for more vocational education. ...As a society we must hold high the objective of "education for the whole person", but if the "whole person" can't get a job, it's pointless to talk about enriching his life.

The bottom line is: there are a lot of young people in the United States today who need and wish to be taught, quite specifically, how to earn their livelihood in a more technological world.

Knowledge is going to be this country's most precious resource. American industry

will have to be wiser, more innovative, relying on ever more advanced technology to compete effectively. American workers, all of us, will have to be smarter, more sophisticated, go to school longer, and be better trained.

What is to be done? It is clear that increased investment in vocational as well as professional education must be placed at the top of our national agenda (Frey, Spring, 1983, p. 8).

Current vocational education consisted of many varied training areas. Service industries, management, building trades, and business trades were usually taught in area vocational schools.

To provide students with the most needed skills, a format of assuring task proficiency was developed. These proficiencies were developed using the format of competency based education.

#### COMPETENCY BASED EDUCATION

The present method of vocational education advocated the use of task mastery, known as "competency based education". "CBE" was a more accurate method of measuring student achievement; this was done by breaking each task or job down into small, progressive steps. "CBE" must reflect its occupational domain. Each job must be broken down into duties, the duties into tasks (skills), and the tasks into individual steps that a student must perform in order to master a task or skill" (Virginia's Voc Ed Voice, 1983, p. 2).

#### STUDENT COMPETENCIES

Student competencies were best developed using the CBE format. This allowed for individualized self-progress type learning and was a more accurate record of a student's abilities. These compe-

tencies were developed to reflect necessary theoretical and technological skills needed for employment. The student competency was also a permanent record of specific, attained achievement in areas of a vocation.

The importance of a developed student competency was reflected upon in this statement:

Vocational students don't just read about it or view it. They work with it. They use it to solve world problems, to test ideas, to explain natural phenomena, and to reinforce their basic reading, reporting, and calculation skills. This blend of hands-on skills and understanding is particularly suited to the development of technological literacy (Dyrenfurth, 1983, p. 43).

This "technological literacy" or competency was accentuated by the use of CBE. Success and progression towards future employment were end results of competency based education when used with input from educators and major employers of vocational graduates. Input from "craft committees" or members of area industry was an excellent means of validating competencies.

#### CRAFT COMMITTEES AND CURRICULUM DEVELOPMENT

The craft committee was used to evaluate and offer information to help update the course curriculum and student competencies.

The local industry-education council can be an adjunct committee of the local chamber of commerce or an autonomous committee. Its purpose involves establishing philosophy and guidelines to facilitate the real and complete showing of resources needed to develop, implement, and maintain high-quality, high-technology training.



Education can take the lead in curriculum development, but with maximum input from industry. Education also stands in the best position to provide the curriculum's academic core with such areas as math, physics, communications, and socioeconomics. However, where facilities, equipment, and expert personnel are concerned, full-fledged industry-education cooperation will be needed (Goetsch, 1984, p. 18).

The development of craft committees and educational interaction was only one variable in providing better trained students. Proper work habits and preparatory classes should have been developed during the educational process prior to employment.

#### VOCATIONAL PREPARATION

Vocational careers were carefully planned to best serve the students and selected industries. However, without the proper amount of self-motivation and work attitudes, all vocational education was wasted. Students would best serve themselves and educators by developing fundamental skills and work habits.

Before one goes to vocational school he should have had a good course in physics, chemistry, and mathematics. He should have learned how to study on his own time. Those that are better with their hands than their heads should fill some other work.

I wonder if we would have better designed automobiles if the designers were required to repair the cars they design (Jackson, 1984, p. 25).

Properly trained and educated vocational graduates were soon contributors to the economy of the United States. By learning how to work and deal with technology in addition to traditional job skills, these students would become workers of the future, rather than joining the ranks of the unemployed.

A 1979-1980 study showed that 71.3% of vocational education graduates had found related employment or were engaged in further education; another 18% were employed in other areas or were serving in the military.

The unemployment rate was only 10%, compared with 16.5% for members of the general population in this same age group (Bottoms and Copa, 1983, p. 352).

"Unemployment figures show a positive correlation between years of schooling and success in the labor market" (Weisberg, 1983, P. 357).

Career planning and guidance was very important for students because of the varied levels of skills and training needed for each job. To help assess where each student had specific areas of interest or aptitude, an aptitude test was developed by the United States Department of Defense.

#### SUMMARY

In this chapter a review of literature was used to explain the importance of proper vocational education training. A direct link between industry and education was examined and discussed and a means of validating both the curriculum and student competencies was shown by this link.

Competency based education, as shown by using task-mastery to acceptable performance levels was also acceptable to industry standards. Most employers would have CBE develop basic vocational and academic skills with an emphasis on dependability.

Proper initiation of career planning through careful analysis of student interest and aptitude would increase the ability of a

student to become successfully employed. One variable which would augment future employment would be the selection and completion of the proper academic courses prior to a selected vocational training.

Chapter III, Methods and Procedures, will explain the collection and accumulation of data. A survey of graduated and employed students will be found here, but results will be found in Chapter IV. The target population and methods of subject selection will also be discussed.

## CHAPTER III

### METHODS AND PROCEDURES

The purpose of this study was to determine the validity of the present curriculum and student competencies for the Auto Mechanics I Course at Virginia Peninsula Vo-Tech, South Campus, for the years 1982-83. The goal of evaluating the course was accomplished by a systematic order of methods and procedures.

#### TARGET POPULATION

There were actually three target populations used to evaluate the program. The first population was the first year Auto Mechanic students for the 1982-83 Class. They had received a total of 540 hours of class and shop instruction.

The second population was those employers chosen to answer a survey rating graduates of the 1982-83 Auto Mechanics I Program. This limited the number of employers to survey and gave more accurate information from which to draw conclusions.

A local craft committee made up of automotive related mechanics and businessmen was the third target population. This group included one member of a local car dealership, two partners in a recently opened automotive repair shop, one mechanic-owner of a transmission repair shop and one owner-operator of an automotive parts store.

#### SELECTION OF SUBJECTS

Students were selected based upon their ability to complete the

first year program. All students received a competency record which showed their attained levels of proficiency in necessary skills and theory.

A random sample of students who completed two years of automotive training was taken, and their employers were surveyed to attain results. These results helped determine the validity of the present vocational training available.

Craft committee members were chosen as a representative group of related employers. Their participation in the study provided an impartial opinion of the program.

#### DATA COLLECTION, ANALYSIS AND INTERPRETATION

Data was accumulated from many sources. In Appendix A, a 200 question, comprehensive examination will be found. This examination was used as a pre-test, post-test to measure prior subject knowledge and compare it to results at the conclusion of the year.

Appendix B, will provide a copy of the present student competencies which was evaluated by the local craft committee. This committee was familiar with the necessary skills and behavior traits needed for successful employment in the automotive field.

An employer survey of students who completed the two-year automotive course will be located in Appendix C. This survey allowed a comparison of local students and state wide graduates of vocational automotive programs.

A report by Douglas Tilley Associates, Ltd. was used to determine the current number of successfully completed, employed and unemployed

automotive mechanics students. This will be found in Appendix D.

#### SUMMARY

This chapter described the target populations. The three populations used were the students of the Auto Mechanics I Course, the local craft committee and local employers who employed recent vocational graduates.

Data was gathered from these three populations to help determine the validity of the present program. By submitting all students to a pre-test, post-test, levels of achievement were measured. Local employers of recent graduates were surveyed to determine if vocational training was performing at adequate levels. This was valuable because a similar state survey of employers of automotive graduates had just been completed and provided a means of comparison.

The local craft committee was used to gather information about necessary skills and behavior traits needed for successful employment. Each member of this committee was provided with a copy of the student competency sheet and a copy of the course curriculum. By using the craft committee for input, the program best reflected the needs of local employers.

Douglas Tilley Associates, Ltd., an independent firm, was hired to determine the needs of a new area vocational center. Their research showed how many recent automotive graduates had been employed or were unemployed at the present time. This provided a method of determining how successful the automotive training at Vo-Tech had been for the number of students involved.

In Chapter IV, Findings, data will be presented to help determine the validity of the automotive program.

## CHAPTER IV

### FINDINGS

This chapter will present the data compiled to determine the validity of the Auto Mechanics I Course curriculum and student competency records.

#### PRE-TEST/POST-TEST

Data was gathered from four areas. The first area was from individual students who entered and completed the first year course. These students were all given a pre-test and an identical post-test. There were one hundred and one (101) students enrolled in the Auto Mechanics I Course. All students were administered the pre-test during the first two weeks of the course. Because of the large number of students tested, only mean and median averages were used to compare the pre-test and post-test results.

Only fifty eight (58) students, of the original one hundred and one, completed the course. The results of the pre-test and post-test are as follows:

	<u>PRE-TEST</u>	<u>POST-TEST</u>	<u>SCORE INCREASE</u>
MEAN	45	61.5	16.5
MEDIAN	48.4	63	14.6

These results showed a positive correlation in the length of time spent in the course and an increase in overall automotive knowledge.

#### CRAFT COMMITTEE

The craft committee provided data based upon the fact that



each member was familiar with the necessary skills and traits needed for employment. Each member was also familiar with the present curriculum and student competencies. No changes were recommended by the members of the committee. The present method of determining student competency was determined to be adequate and encompassed those skills and employability traits needed by employees. Not all of the material covered in the curriculum was found in the student competency and was noted by the craft committee.

VIRGINIA PENINSULA VOCATIONAL-TECHNICAL EDUCATION CENTER  
EMPLOYER FOLLOW-UP SURVEY

The following data was gathered through comparison of a survey conducted at Vo-Tech, South Campus and a State VERS 4 report:

1. As a result of your employee's Vo-Tech training, how would you rate his/her preparation in relation to other employees doing similar jobs, but who do not go to Vo-Tech. (check one)

86% Individual is better prepared.

       Individual is less prepared.

14% Both about the same.

       No basis for comparison.

2. Have you visited the Vo-Tech Center?

7% Yes                      93% No

3. Would you be willing to serve on a Vo-Tech Advisory Committee?

15% Yes                      85% No

4. Would you recommend other employers to hire Vo-Tech graduates?

100% Yes                      0 No

5. Are you familiar with the Vo-Tech competencies related to your employee's training?

67% Yes                      33% No

6. After reviewing the competencies, do you feel that they are up-to-date?

100% Yes                      0 No

7. Please comment on any suggestions for improvement of training programs.

Please rate the vocational training received by the individual whom you supervise. 1 = very poor; 2 = poor; 3 = neutral; 4 = good; 5 = good.

- 8. \_\_\_\_\_ Development of technical knowledge related to job.
- 9. \_\_\_\_\_ Development of desirable work attitudes.
- 10. \_\_\_\_\_ Development of ability to maintain desirable inter-relationships with fellow workers.
- 11. \_\_\_\_\_ Overall vocational rating.
- 12. \_\_\_\_\_ Ability to produce quality work.

MEAN SCORE COMPARISON  
OF  
EMPLOYER FOLLOW-UP RESULTS

	<u>VO-TECH</u>	<u>STATE VERS 4</u>
Development of technical knowledge related to job.	3.95	3.67
Development of desirable work attitudes.	4.14	3.88
Development of ability to maintain desirable inter-relationships with fellow workers.	4.19	4.20

	<u>VO-TECH</u>	<u>STATE VERS 4</u>
Overall vocational rating.	4.00	3.67
Ability to produce quality work.	4.09	4.11

1 = Very Poor

2 = Poor

3 = Neutral

4 = Good

5 = Very Good

Significant data:

1. 86% of the employers rated Vo-Tech students better prepared than other employees doing similar jobs.

2. 93% of the employers have not visited Vo-Tech.

3. 100% of the employers feel competencies are up-to-date.

4. 100% of the employers would recommend other employers to hire Vo-Tech graduates.

5. The following comments were common:

"Best worker we've had in four years."

"After hiring several Vo-Tech graduates, I've found them to come prepared to work and have a basic mechanical knowledge."

"Good place to start training; it gives basic knowledge and ability to work with other individuals. Team work is the name of the game."

"My opinion of Vo-Tech is very high; good training in attitude, attendance, safety and cooperation."

6. The five ratings (questions 9-12) given by local employers were higher or on par with employer ratings across the state (see table).

Note:

Due to lengthy time involvement and the return of VERS 3 and 4 for

implementation by localities, this particular questionnaire may be a duplication of effort. However, the VERS 3 and 4 does not allow for direct employer input and lacks personalization as well as retrieval of other pertinent information not on the VERS 3 and 4.

#### TILLEY REPORT

A report by Douglas Tilley Associates, Ltd. determined that only nineteen (19) percent of the 1982-83 graduates were unemployed. Thirty nine (39) percent were placed in jobs as auto mechanics. Nineteen (19) percent were placed in closely related occupations. Only twenty-three (23) percent were working in a non-related occupation. This represented an overall employment rate of eighty one (81) percent.

#### SUMMARY

The data gathered in Chapter IV, Findings, helped show that the present curriculum and competencies were adequate for employability of students. By using four separate means of evaluating the program, the overall validity of results was assured. The methods of evaluation were the pre-test, post-test, craft committee, employer survey and Douglas Tilley report.

In Chapter V, Summary, Conclusions and Recommendations will be found.

## CHAPTER V

### SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The goal of this study was to determine the validity of the present curriculum and student competencies. Vocational education was reviewed and the need for curriculum development and student competency was discussed in Chapter II.

Methods of gathering data was broken down into four (4) areas. The first method was a pre-test of all entering Auto Mechanics I students. Upon completion of the first year course, a post-test was given and the overall results compared. An increase was shown of 16.5% over the course of one year in the mean and an increase of 14.6% was found in the median from pre-test to post-test.

The second method of data collection was by using a craft committee. The craft committee was familiar with the needs of the local automotive industry and with the area vocational automotive program. The committee members all agreed that the present curriculum and student competencies met the needs of industry.

A survey of local employers of recent automotive graduates represented the third method of gathering data. This survey showed that eighty six (86) percent of the employers felt that Vo-Tech graduates were better prepared than other employees doing similar jobs. One hundred (100) percent of the employers would recommend other employers hire Vo-Tech graduates. All employers felt that the automotive competency was up-to-date.

A report by Douglas Tilley Associates, Ltd. was the final source of data. This report showed that the 1982-83 automotive graduates had an overall job placement of eighty one (81) percent.

#### CONCLUSIONS

Based upon the data gathered, it was fair to conclude that students' overall knowledge of auto mechanics increased based upon time and exposure to the trade. By experiencing both a class and shop environment for a total two year course of 1080 hours, students would be ready to begin employment at the mechanics helper level or as an apprentice mechanic.

The craft committee concluded that the present course curriculum and student competency record would be adequate to serve the needs of the students and of local employers. By examining both technical and employability traits, the craft committee determined that educating the whole person was necessary for a proper work environment.

Local employers concluded that the present student competencies were up-to-date and that the vocational training was good. By relating local employer results to State VERS 4 results, we were able to see that Peninsula Vo-Tech automotive graduates were as well prepared as graduates of similar programs across the state.

The fact that eighty one (81) percent of the 1982-83 graduates were employed at the time of the Tilley report was evidence that the curriculum and competency does meet the needs of local employers.

## RECOMMENDATIONS

The present Auto Mechanics I curriculum would seem to adequately serve the needs of the industrial community. It has been shown by the craft committee and the local employer survey that the program meets present industry standards. Therefore, the curriculum and student competency should be left intact until technology or industrial needs dictate a change.

The present curriculum and competency record were based upon CBE. The format should be expanded to incorporate those students who were labelled as handicapped. All students should be made aware of the many types of spin-off jobs available and related to auto mechanics. A spin-off job example, related to the auto mechanics field, is a job as a tire changer and balancer. This person would not be considered a "line mechanic" but does serve a valuable part in the automotive field. A possible job for a handicapped person is as a rebuilder of electrical components for automobiles. The automotive industry employs one of every seven people in the United States.

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A P P E N D I C E S

APPENDIX A - PRE-TEST/POST-TEST

APPENDIX B - STUDENT COMPETENCY RECORD

APPENDIX C - EMPLOYER SURVEY

APPENDIX D - DOUGLAS TILLEY, LTD. REPORT

APPENDIX A

PRE-TEST/POST-TEST

## AUTO MECHANICS I

### Final Test

1. What is the main reason for using a box type wrench:
  - a. Greater strength
  - b. Used on rounded nuts
  - c. Less liable to slip on nut
  - d. None of the above
  
2. The end of a phillips-type screwdriver is:
  - a. A flat blade
  - b. Pointed end with four grooves
  - c. Fluted end
  - d. Offset
  
3. Solder is an alloy of:
  - a. Lead and tin
  - b. lead and zinc
  - c. Tin and zinc
  
4. The rounded end of a machinists hammer is known as the:
  - a. Face end
  - b. Peen end
  - c. Riveter end
  - d. Heel end
  
5. After cutting a piece of tubing, why should it be reamed:
  - a. to increase its size
  - b. to restore it to its original size
  - c. to remove any burrs from the cut edge
  - d. to keep from kinking the tubing
  
6. Most bolts have what shape head:
  - a. Square head
  - b. Octagonal head
  - c. Hexagonal head
  - d. Round head
  
7. When the thimble of a micrometer is turned one division as indicated by the lines on the beveled edge of the thimble, how far is the spindle moved:
  - a. .025 inch
  - b. .0025 inch
  - c. .001 inch
  - d. .005 inch
  
8. A thickness guage is used:
  - a. to measure the thickness of sheetmetal
  - b. to measure the diameter of car engine cylinders
  - c. to measure the space between two surfaces

9. Which metal produces the longer stream of sparks when held against an abrasive wheel:
  - a. Nickel
  - b. High carbon steel
  - c. Low carbon steel
  - d. Lead
10. T. F. All automobiles have either six or eight cylinder engines.
11. T. F. The majority of automobile engines are of the water-cooled type.
12. What is the largest single part of an automobile engine:
  - a. Manifold
  - b. Crankcase
  - c. Head
  - d. Oil pan
13. What is the proper sequence of events that occur in a four-cycle internal combustion engine:
  - a. intake, exhaust, compression, power, ignition
  - b. Power, exhaust, intake, compression, ignition
  - c. Exhaust, intake, compression, ignition, power
  - d. Intake, compression, ignition, power, exhaust
14. T. F. A valve and a port are the same thing.
15. T. F. The I-head, valve-in-head and overhead engines are identical in design.
16. How many "throws" are on the crankshaft of a V-8 engine:
  - a. Two
  - b. Four
  - c. Eight
  - d. Sixteen
17. T. F. All four cylinder crankshafts are alike.
18. T. F. The power of an automobile engine is determined by the number of cylinders.
19. The stroke of an engine is determined by:
  - a. The length of the cylinder
  - b. The crankshaft throw
  - c. The displacement of the piston
20. T. F. A wet cylinder sleeve is lubricated, a dry sleeve is not.
21. The combustion chamber is usually:
  - a. Above the piston
  - b. Below the piston
  - c. In the crankcase
  - d. None of the above

22. Which material is used mostly for pistons:
  - a. Steel
  - b. Aluminum
  - c. Cast iron
  - d. Plastic
23. T. F. Pistons are slotted so that they can be more readily inserted in the cylinders.
24. T. F. Engine blow-by may be a serious problem after the engine warms up to operating temperature.
25. T. F. Piston rings move up and down in the piston grooves.
26. T. F. A piston ring may act as a pump.
27. T. F. Piston rings move in and out in the piston grooves.
28. T. F. More oil leakage occurs at the ring gap than around behind the ring.
29. T. F. If an engine has good compression it will not pump oil.
30. In order to obtain the greatest wearing surface, the piston pin should be clamped:
  - a. In the connecting rod
  - b. In the piston
  - c. Neither
  - d. None of the above
31. How many possible firing orders are there for a four-cylinder, four-cycle engine:
  - a. One
  - b. Two
  - c. Three
  - d. Four
32. A six-cylinder, four-cycle, inline engine camshaft has how many lobes on it:
  - a. Six
  - b. Twelve
  - c. Eighteen
  - d. Twenty-four
33. How many power impulses per revolution occur in an eight-cylinder, four-cycle engine:
  - a. Four
  - b. Eight
  - c. Sixteen
  - d. Thirty-two
34. T. F. Bushings are always used on all camshaft journals.
35. T. F. Valves are sometimes hollow to make them lighter.

36. Excessive heat gets out of the valve by flowing:
- to the valve seat
  - to the valve guide
  - both of the above
  - none of the above
37. An exhaust valve may reach a temperature of:
- 500 degrees
  - 1000 degrees
  - 2000 degrees
  - 3000 degrees
38. At what speed does the camshaft operate:
- Half crankshaft
  - Twice crankshaft
  - Same as crankshaft
  - None of the above
39. Are timing chains adjustable for wear:
- yes
  - no
  - sometimes
  - always
40. How many types of valve lifters are there:
- one
  - two
  - three
  - four
41. What is the great advantage of a hydraulic valve lifter:
- better valve action
  - closes the valves faster
  - quieter valve action
  - more accurate valve timing
42. T. F. Brake horsepower is a reliable measure of the power developed by an engine.
43. A gas is best measured by:
- Volume
  - weight
  - unweighable
  - heat
44. The volume within a cylinder of a certain engine is 50 cubic inches and the volume of the combustion chamber is 5 cubic inches, what is the compression ratio:
- 10 to 1
  - 10 to 5
  - 5 to 0
  - 10 to 0

45. T. F. It is a good idea to run an engine fast as soon as it starts in order to warm the oil up quickly.
46. T. F. Oil filters are placed in the engine oil system to remove dirt and abrasives from the oil.
47. How much of the heat energy in the fuel must be handled by the cooling system:  
a. One fourth  
b. One third  
c. One half  
d. Two thirds
48. T. F. Several thousand gallons of water are circulated through the cooling system every hour of operation.
49. Where is the thermostat installed in a cooling system:  
a. between pump inlet and radiator  
b. between pump outlet and radiator  
c. between pump outlet and water jacket  
d. between water jacket outlet and radiator
50. Where does the water from the engine usually enter the radiator:  
a. Top  
b. Bottom  
c. Side  
d. None of the above
51. When water freezes, it expands approximately:  
a. 2 per cent  
b. 4 per cent  
c. 6 per cent  
d. 9 per cent
52. T. F. An ethylene glycol solution will boil at a lower temperature than water.
53. In an air cooled engine, how much of the total volume of cooling air is directed to the cylinder heads:  
a. 40 per cent  
b. 60 per cent  
c. 80 per cent  
d. 100 per cent
54. What is one distinct advantage of an air-cooled engine:  
a. Noisiness  
b. Higher horsepower  
c. Faster warm-up  
d. Lower horsepower
55. T. F. Carburetors are not used on diesel engines.
56. T. F. Inboard marine engines are made as light as possible.



57. Outboard engines are cooled by:
- air
  - water
  - either
  - oil
58. T. F. Small industrial engines are usually air cooled.
59. Free piston engines are related to:
- diesel engines
  - gasoline engines
  - neither engine
  - both engines
60. T. F. An oversize bearing is required on a reground crankshaft journal.
61. T. F. A cylinder sleeve should be honed after installation.
62. T. F. Piston expanders should always be used in sets.
63. Invisible cracks in steel parts may be found by means of:
- chemical equipment
  - magnetic equipment
  - both of the above
  - none of the above
64. T. F. If a camshaft bushing is pressed in crooked, the inside diameter will be decreased.
65. Valve tappet adjustment is more critical on:
- L-Head engines
  - I-Head engines
66. T. F. Clean cloths must be used to wipe parts of hydraulic valve lifters.
67. Water under 25 PSI pressure has a higher or lower boiling point than water under atmospheric pressure:
- higher
  - lower
68. What is the pressure in a modern automobile cooling system:
- 2 psi
  - 5 psi
  - 15 psi
  - 25 psi
69. What procedure should be followed when most of the coolant has boiled from the cooling system:
70. T. F. Water coming from exhaust pipe is a sure indication that a cylinder head gasket is blown.
71. T. F. A kink in the muffler or tail pipe may cause engine overheating.
72. T. F. Insufficient fluid in an automatic transmission may cause engine vibration.

73. T. F. Shorting out a spark plug will help locate a loose piston pin.
74. What is the function of a pressure type radiator cap:
- control pressure in a cooling system
  - control vacuum in a cooling system
  - control vacuum and pressure in a cooling system
75. At an elevation of 5,000 feet above sea level, an engine in good condition will give a vacuum guage reading of:
- 8 - 12
  - 12 - 17
  - 17 - 21
  - 21 - 26
76. If the vacuum guage needle is steady, but the reading is extremely low, the trouble is likely to be:
- narrow spark plug gaps
  - leaking piston rings
  - air leak in intake system
  - carburetor out of adjustment
77. What should the manifold heat control valve be tested for:
- valve lash
  - torque tightness
  - freedom of operation
  - air leaks
78. What happens when a file is used as a pry bar:
- it bends
  - it breaks
  - it will mar the surface
  - it's perfect
79. Which of the following is correct:
- Carbon monoxide is used in welding
  - carbon monoxide is a deadly poison
  - carbon monoxide is used to inflate tires
  - carbon monoxide is used as a fire extinguisher
80. The volatility of gasoline is equivalent to its:
- octane rating
  - boiling point
  - cetane rating
  - distillation
81. ISO-octane and what other material are used to determine the octane rating of fuel:
- cetane
  - propane
  - heptane
  - benzol

82. Alcohol is added to gasoline primarily to:
- provide easier starting
  - absorb any moisture that may be present
  - increase the volatility of the fuel
  - none of the above
83. Immediately after ignition, combustion chamber temperatures may reach a value of:
- 1500 degrees
  - 2500 degrees
  - 5500 degrees
  - 7500 degrees
84. When starting an internal combustion engine, the fuel mixture should be:
- rich
  - lean
  - average
  - liquid
85. For normal operation conditions, what fuel-air ratio will give the best economy:
- 16 to 1
  - 20 to 1
  - 25 to 1
  - 30 to 1
86. For quick acceleration, what is the best fuel-air ratio:
- 5 to 1
  - 10 to 1
  - 12 to 1
  - 20 to 1
87. The purpose of a venturi in a carburetor is to:
- increase the speed of air passing through the carburetor
  - maintain the correct fuel-air ratio
  - provide extra fuel for acceleration
  - make the mixture richer for starting
88. In a carburetor venturi, which point has the highest vacuum:
- entrance to the venturi
  - narrowest point of the venturi
  - point one inch beyond the venturi
  - point two inches beyond the venturi
89. The idle system of a carburetor supplies fuel at what speeds:
- idle speed only
  - speeds up to 40 mph
  - speeds up to 15 mph
  - at all speeds
90. How many fuel discharge parts does the conventional idle system have:
- one
  - two
  - three
  - four

91. When the idle system is no longer supplying fuel to the engine, which system then supplies fuel:
- air bleed system
  - main system
  - vaporizing system
  - choke circuit
92. Under what conditions is ice most likely to form in a carburetor:
- 20 degrees below zero and high humidity
  - 32 degrees above zero and high humidity
  - zero degrees and low humidity
  - 60 degrees above zero and high humidity
93. On what type of car are you most likely to find an anti-stall dashpot:
- cars with automatic transmission
  - cars with manual transmission
  - cars with four-barrel carburetors
  - none of the above cars
94. Which speed requires a richer mixture:
- high speed
  - 60 mph
  - 30 mph
  - idling
95. There are six main circuits in a modern carburetor, name four of them:
96. Where is the intake manifold on a V-type engine located:
- one each side of the engine
  - on the front of the cylinder block
  - under the cylinder block
  - in the V, between the two banks of cylinders
97. Which cylinders of a V-8 engine do the barrels of a dual carburetor supply:
- both barrels supply all cylinders
  - The left barrel supplies the left side and the right barrel supplies the right side
  - The right barrel supplies the center cylinders on right side and end cylinders on the left side. The left barrel supplies center cylinders on the left side and the end cylinder on the right side
  - none of the above are correct
98. Where is the air cleaner installed:
- between the carburetor and manifold
  - at the entrance to the carburetor
  - on the carburetor air bleed
  - on the bottom of the engine
99. In general which engine has the highest intake manifold vacuum:
- two cylinder
  - four cylinder
  - six cylinder
  - eight cylinder

100. For perfect combustion, how many pounds of air are required to burn one pound of gasoline:
- 27.15 lb.
  - 13.50 lb.
  - 15.27 lb.
  - 12.75 lb.
101. Ice forms at what point in the fuel system when the engine is first started:
- fuel pump
  - at the air inlet to the carburetor
  - at the edge of the throttle plate
  - in the fuel filter
102. Which should be adjusted first:
- ignition
  - carburetor
103. How can a carburetor float be checked for leaks:
- by inflating with air
  - by immersing in cold water
  - by immersing in water at 200 degrees
  - by immersing in gasoline
104. For what purpose is the vacuum pump built into some types of fuel pumps:
- to operate the pistons in automatic chokes
  - operate windshield wipers
  - aid in pumping fuel
  - none of the above
105. How much pressure should the conventional mechanical type fuel pump develop:
- 1 lb.
  - 5 lbs.
  - 10 lbs.
  - 15 lbs.
106. What is the average vacuum developed by a vacuum pump that is part of a fuel pump:
- 5 in.
  - 7½ in.
  - 10 in.
  - 15 in.
107. Liquified petroleum gas is a mixture of:
- butane and propane
  - propane and heptane
  - methane and octane
  - butane and methane
108. On the compression stroke, what does a diesel engine compress:
- air
  - air-fuel mixture
  - diesel fuel
  - propane

109. What effect does back pressure have on the operation of an engine:
- reduces power of the engine
  - increases power of the engine
  - increases the amount of carbon monoxide
  - none of the above
110. What is a major factor in the rusting of a muffler:
- long distance driving
  - high speed
  - low speed
  - Short distance driving
111. What material is used in making the nuts used to bolt together the flange between the manifold and exhaust pipe:
- cast iron
  - steel
  - castellated
  - brass
112. T. F. Retarding the spark at idle increases the emission of hydrocarbons.
113. T. F. On cars equipped with automatic transmissions, it is more difficult to control the emissions of exhaust gases.
114. T. F. The amount of unburned hydrocarbons is proportional to combustion chamber surface area.
115. How do similarly charged electrified bodies react to each other:
- attract
  - repel
  - no reaction
  - none of the above
116. If in an automotive circuit there is a current of 6 amperes and the voltage is 12, how many watts are there:
- 2
  - 6
  - 18
  - 72
117. How many watts are there in one electrical horsepower:
- 764
  - 464
  - 746
  - 674
118. Which one of the following is magnetic:
- glass
  - brass
  - nickel
  - lead

119. How much will the field be strengthened if you insert a magnetic core in a coil of wire carrying current:
- twice
  - reduce it
  - several hundred times
  - fifty times
120. When using the left-hand rule as applied to current-carrying coil, what does the direction of the thumb indicate:
- South pole
  - North pole
  - Either pole
  - neither pole
121. In a direct current generator, voltage is generated in which unit:
- armature
  - field
  - stator
  - regulator
122. In an armature wound for a two-pole generator, how many neutral points are there:
- two
  - four
  - six
  - eight
123. In an alternator, what is the name of the part which changes the current from alternating to direct:
- converter
  - commutator
  - rectifier
  - shield
124. How many windings are there in a Y-type stator:
- one
  - two
  - three
  - five
125. What material should be used when cleaning a commutator:
- No. 80 sandpaper
  - very fine emery paper
  - No. 00 sandpaper
  - powdered carborundum
126. If the inner surface of a generator cover band is found to be covered with globules of solder, what is indicated:
- generator has been operating at excessive speed
  - generator was producing excessive current
  - generator was not polarized
  - none of the above

127. In a current regulator, how much of the current passes through the winding:
- a. 100 percent
  - b. 75 percent
  - c. 50 percent
  - d. 25 percent
128. What type generator-regulator circuit is used on most Ford cars:
- a. "A" circuit
  - b. "B" circuit
  - c. "C" circuit
  - d. "D" circuit
129. What is the approximate gear ratio between the cranking motor pinion and the engine flywheel ring gear:
- a. 1 to 1
  - b. 15 to 1
  - c. 25 to 1
  - d. 50 to 1
130. Under load, approximately what current will be flowing through a 12 volt starting motor:
- a. 50 amps
  - b. 150 amps
  - c. 300 amps
  - d. 500 amps
131. What is the voltage at the secondary side of the ignition coil:
- a. 12 volts
  - b. 250 volts
  - c. 20,000 volts
  - d. 100,000 volts
132. Ignition voltage is higher at:
- a. high speeds
  - b. low speeds
  - c. stays the same at all speeds
  - d. dead engine
133. T. F. There is a definite advantage in keeping the high tension leads as short as possible.
134. The capacity of an ignition condenser is measured in what units:
- a. volts
  - b. farads
  - c. joules
  - d. micro farads
135. On a four-cycle engine at what speed is the distributor driven:
- a. engine speed
  - b. half engine speed
  - c. twice engine speed
  - d. three times engine speed



136. On a typical distributor, how many lobes are there on the breaker cam for a six cylinder engine:
- one
  - three
  - six
  - twelve
137. When the engine is idling, when is the spark usually timed to occur:
- before top center
  - after top center
  - before bottom center
  - none of the above
138. What is the approximate resistance of the resistors used in the primary circuit:
- 18 ohms
  - 25 ohms
  - 1.5 ohms
  - 14 ohms
139. How much voltage can be obtained from a single cell of a storage battery:
- About 2 volts
  - About 6 volts
  - About 12 volts
  - Varies with size of plates
140. What instrument is used to measure the specific gravity of a liquid:
- potentialometer
  - barometer
  - hydrometer
  - gravometer
141. How many cells are in a 12 volt battery:
- 3
  - 6
  - 9
  - 12
142. T. F. A battery has less cranking power as the temperature decreases.
143. A positive terminal of a storage battery is usually \_\_\_\_\_ than the negative terminal.
- smaller
  - larger
  - darker
  - lighter
144. On what principle does the speed indicating portion of the speedometer operate:
- electronic
  - mechanical
  - magnetic
  - electrical

145. The AC cruise master speed control is found on what vehicle:
- Chrysler
  - Rambler
  - Pontiac
  - Ford
146. How are two wiper blades operated when there is only one wiper motor:
- by means of gears
  - by means of linkage
  - magnetically
  - by means of cables
147. When using a ammeter, how should it be connected in the circuit:
- series
  - parallel
  - series-parallel
  - None of the above
148. What type of spring is used in conjunction with solid axle beams:
- coil springs
  - leaf springs
  - hair springs
  - torsion bars
149. How is tension increased on a torsion bar:
- by flexing
  - by compressing
  - by twisting
  - none of the above
150. How is toe-in adjusted:
- Shortening or lengthening relay rods
  - shortening or lengthening tie rods
  - shimming control arms
  - none of the above
151. If the area between two contacting surfaces is increased, what happens to the friction:
- It increases
  - It decreases
  - It remains the same
  - none of the above
152. T. F. Friction is the same for all materials.
153. If the pressure provided by a master cylinder is 500 psi, what is the total pressure at a wheel cylinder of 2 sq. inch area:
- 250 lbs.
  - 500 lbs.
  - 1000 lbs.
  - 2000 lbs.
154. What material is used mostly for the braking surface of brake drums:
- Cast iron
  - Wrought iron
  - Steel
  - Brass

155. Under extreme conditions, what temperature may be expected in the brakes:
- 100 degrees
  - 700 degrees
  - 1200 degrees
  - 2000 degrees
156. What is the limit in oversize when re-conditioning brake drums:
- .006 inch
  - .030 inch
  - .060 inch
  - .125 inch
157. When cleaning hydraulic brake parts what type cleaning fluid should be used:
- gasoline
  - alcohol
  - kerosene
  - varsol
158. Rule of thumb figure for clutch pedal free play is:
- $\frac{1}{2}$  inch
  - 1 inch
  - $1\frac{1}{2}$  inch
  - 2 inches
159. What is the gear ratio of a setup where the driving gear has 20 teeth and the driven gear has 50 teeth:
- 2.5 to 1
  - 1 to 2.5
  - 50 to 2.0
  - 2.0 to 50
160. What is the function of an overrunning clutch in an overdrive transmission:
- eliminates the clutch
  - disengages the overdrive unit
  - restricts drive to one direction only
  - none of the above
161. What purpose does a fluid coupling accomplish in an automatic transmission:
- serves as a hydraulic clutch
  - multiplies engine torque
  - builds up hydraulic pressure to operate valves
162. Which of these three factors is used to control automatic transmission operation:
- Engine speed
  - Engine weight
  - Engine compression
163. When is a fluid coupling most effective:
- low speed
  - high speed
  - idling speed

164. T. F. The length of the drive shaft changes while a car is being driven.
165. T. F. Cars with "swing axles" may have the rear wheels toed-in or toed-out.
166. T. F. Fluids give up heat when changing from a liquid to a gas.
167. What is the state of a refrigerant when it is pumped by the compressor to the condenser:
- liquid
  - gas
  - liquid and gas
  - steam
168. What is indicated if bubbles appear in the sight glass of refrigerator system:
- system is fully charged with refrigerant
  - system is low on refrigerant
  - refrigerant is fully discharged from system
  - system has moisture in refrigerant
169. T. F. Only natural rubber is used in the manufacture of tires.
170. What provides sealing for a tire:
- the valve cap
  - the valve core
  - the hub cap
  - the rim seal
171. Taking corner too fast will wear tires at:
- the center of the tread
  - on the outer edges of tread
  - both inner and outer edges of tread
  - will not wear
172. Which is considered better:
- re-treading
  - re-capping
173. When straightening a wrinkled panel, the damage should be removed:
- in the same manner as it was made
  - in the reverse manner which it was made
174. T. F. The main purpose of a body file is to locate high spots on the surface.
175. The main reason for chaining oxygen and acetylene tanks in a cart is:
- to prevent their theft
  - to prevent their tipping over
  - so that they will be out of the way
  - to make sure they are grounded
176. What is the normal pressure of the atmosphere:
- 1.74
  - 4.17
  - 71.4
  - 14.7

178. The oil level in the rear end is:
- a. Keep at the correct level through oil draining into it from the transmission
  - b. Oil level is maintained at the bottom of the fill plug
  - c. A and B above
179. Name four units normally found in the drive line:
180. Name four items in the air conditioning system:
181. The Corvair engine is:
- a. Air cooled
  - b. Opposed 6 cylinder
  - c. Has two carburetors
  - d. all of the above

**APPENDIX B**

**STUDENT COMPETENCY RECORD**

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 2102 Mercedes Drive - Hampton, Virginia 23661  
 Telephone: 838-8115

STUDENT'S NAME \_\_\_\_\_ PROGRAM \_\_\_\_\_

ENTRY DATE \_\_\_\_\_ EXIT DATE \_\_\_\_\_ HOURS \_\_\_\_\_

GRADES:			1st Sem.			2nd Sem.
	<u>1st Per</u>	<u>2nd Per</u>	<u>Final</u>	<u>3rd Per</u>	<u>4th Per</u>	<u>Final</u>
1st Year	_____	_____	_____	_____	_____	_____
2nd Year	_____	_____	_____	_____	_____	_____
<u>ABSENCES:</u>						
1st Year	_____	_____	_____	_____	_____	_____
2nd Year	_____	_____	_____	_____	_____	_____

This record shows the competencies demonstrated by the person above on the date specified in the designated instructional area. This document will become a part of the student's cumulative record and will be available to subsequent training institutions or prospective employers. The student will be provided a copy of this competency record upon termination of his training.

INTERPRETATION OF STUDENT RECORD

NO EXPOSURE	(NE)	- Has had no exposure to this competency.
KNOWS THEORY	(TH)	- Knows and understands the theory, concepts, and principles.
PROFICIENCY	(P1)	- Degree of skill is below minimally acceptable performance level.
PROFICIENCY	(P2)	- Minimally acceptable level of skill; can perform with supervision.
PROFICIENCY	(P3)	- High level; can perform independently and consistently.

# PROGRAM COMPETENCIES

## AUTO MECHANICS

### INTRODUCTION

- \_\_\_ 1. Shop safety
- \_\_\_ 2. First-aid requirements
- \_\_\_ 3. Common hand tools
- \_\_\_ 4. Common shop equipment
- \_\_\_ 5. Standard shop machinery
- \_\_\_ 6. Standard shop operating procedures

### PERFORMING ENGINE OVERHAUL

- \_\_\_ 1. Steam clean engine
- \_\_\_ 2. Clean engine parts and check for conditions
- \_\_\_ 3. Adjust valves
- \_\_\_ 4. Inspect and test windshield wiper motors, blades, arms
- \_\_\_ 5. Diagnose valve train and head malfunctions
- \_\_\_ 6. Disassemble engine
- \_\_\_ 7. Fit piston pins
- \_\_\_ 8. Grind valve seats
- \_\_\_ 9. Replace crankshaft and main bearings; inspect and correct bearing fittings; inspect crankshaft and connecting rod assembly
- \_\_\_ 10. Inspect exhaust system
- \_\_\_ 11. Inspect head for warp
- \_\_\_ 12. Replace exhaust manifolds
- \_\_\_ 13. Perform cylinder compression test



- \_\_\_ 14. Perform cyclinder balance test
- \_\_\_ 15. Perform cyclinder leakage test
- \_\_\_ 16. Perform operational inspections of positive crankcase ventilation system
- \_\_\_ 17. Perform operational inspections of engine lubrication systems
- \_\_\_ 18. Remove engine from vehicles
- \_\_\_ 19. Replace connecting rods and bearings
- \_\_\_ 20. Replace engine mounts
- \_\_\_ 21. Replace wheel and flywheel ring gear
- \_\_\_ 22. Replace camshaft. Replace camshaft bearings. Replace timing gear and chain. Replace gasket seals.
- \_\_\_ 23. Replace muffler
- \_\_\_ 24. Remove and replace oil pump
- \_\_\_ 25. Remove and replace oil pans
- \_\_\_ 26. Replace pistons. Replace piston rings. Replace gaskets and seals.
- \_\_\_ 27. Replace tailpipe assemblies
- \_\_\_ 28. Replace valves, measure valve seats. Service rocker arm assembly.

MAINTAINING AND REPAIRING

- \_\_\_ 1. Replace water pump
- \_\_\_ 2. Replace freeze plugs
- \_\_\_ 3. Inspect and replace defroster hose
- \_\_\_ 4. Service heater control components
- \_\_\_ 5. Replace heater water control core

- \_\_\_ 6. Service or replace circulating heaters
- \_\_\_ 7. Diagnose heating system malfunctions

**BRAKING SYSTEM MAINTENANCE AND REPAIR**

- \_\_\_ 1. Adjust brakes
- \_\_\_ 2. Adjust hand brake linkage
- \_\_\_ 3. Free up parking brake cables
- \_\_\_ 4. Replace hand brake linkage
- \_\_\_ 5. Bleeds brakes
- \_\_\_ 6. Inspect, repair or replace self-adjusters
- \_\_\_ 7. Replace brake hoses and lines
- \_\_\_ 8. Inspect and replace brake pads (disc)
- \_\_\_ 9. Inspect and replace brake shoes
- \_\_\_ 10. Inspect and turn rotor if necessary (disc)
- \_\_\_ 11. Inspect and turn brake drums
- \_\_\_ 12. Repair or replace wheel cylinder
- \_\_\_ 13. Repair or replace master cylinder
- \_\_\_ 14. Repair or replace hydraulic power cylinder and valves

**FUEL SYSTEM MAINTENANCE AND REPAIR**

- \_\_\_ 1. Inspect, service, or replace carburetor air cleaner
- \_\_\_ 2. Clean or replace fuel filter units
- \_\_\_ 3. Remove, service, or replace fuel lines and hoses
- \_\_\_ 4. Install carburetors
- \_\_\_ 5. Inspect and measure fuel flow and pressure of system

- \_\_\_ 6. Adjust carburetor
- \_\_\_ 7. Inspect, clean and adjust choke unit (Automatic and Manual)
- \_\_\_ 8. Inspect, service, or replace gas tank, cap and sending unit
- \_\_\_ 9. Repair and service carburetors
- \_\_\_ 10. Repair or service exhaust emission systems
- \_\_\_ 11. Analyze fuel/ignition problems
- \_\_\_ 12. Perform operational inspection of exhaust emission control system

DRIVE TRAIN AND MANUAL TRANSMISSION

- \_\_\_ 1. Remove/replace front and rear u-joint
- \_\_\_ 2. Disassemble/reassemble differential
- \_\_\_ 3. Measure back lash and adjust
- \_\_\_ 4. Remove/replace 'c' axle
- \_\_\_ 5. Remove/replace 'B' axle
- \_\_\_ 6. Inspect drive shaft, u-joints and center bearing
- \_\_\_ 7. Disassemble/assemble 3 sp manual transmission
- \_\_\_ 8. Align clutch & disc on manual transmission
- \_\_\_ 9. Remove/install automatic transmission
- \_\_\_ 10. Adjust mechanical-type clutch

COOLING SYSTEM MAINTENANCE AND REPAIRS

- \_\_\_ 1. Check coolant freezing point
- \_\_\_ 2. Inspect and replace water hoses
- \_\_\_ 3. Pressurize and inspect coolant system

AUTO MECHANICS

5

- \_\_\_\_\_ 4. Test and replace thermostat
- \_\_\_\_\_ 5. Check overflow tank and accessories
- \_\_\_\_\_ 6. Remove and reinstall radiators
- \_\_\_\_\_ 7. Back flush a radiator system

LUBRICATION AND VEHICLE OPERATING MAINTENANCE

- \_\_\_\_\_ 1. Change oil and filters
- \_\_\_\_\_ 2. Lubricate vehicles and equipment
- \_\_\_\_\_ 3. Remove, repair or replace tires and maintain equipment
- \_\_\_\_\_ 4. Perform pre-inspection

The following traits are emphasized and developed throughout the student's vocational training. The instructor makes a concerted effort to impress upon the student the importance of developing these traits in order to prepare for successful job performance:

EMPLOYABILITY TRAITS	A	B	C	D	F
Appropriate Personal Appearance					
Punctuality, Dependable					
Neatness and Cleanliness of Work					
Safety Consciousness, Care of Equipment					
Ability to work without supervision					
Cooperative					
Ability to follow instructions willingly					
Ability to get along with others					

Evaluation Code:

A - Excellent (94-100)    B - Good (86-93)    C - Average (78-85)    D - Below Average (70-77)    F - Unacceptable (69-Below)

REMARKS:

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**CERTIFICATION OF COMPETENCY**

I hereby certify that the student named herein has achieved the level of proficiency required for each of the competencies checked in this document.

\_\_\_\_\_  
 (Instructor's Signature)

\_\_\_\_\_  
 (Date)

\_\_\_\_\_  
 (Principal's Signature)

\_\_\_\_\_  
 (Date)

APPENDIX C

EMPLOYER SURVEY

EMPLOYER FOLLOW-UP SURVEY

1. As a result of your employee's Vo-Tech training, how would you rate his/her preparation in relation to other employees doing similar jobs, but who do not go to Vo-Tech. (check one)

Individual is better prepared.

Individual is less prepared.

Both about same.

No basis for comparison.

2. Have you visited the Vo-Tech Center?

Yes  No

3. Would you be willing to serve on a Vo-Tech Advisory Committee?

Yes  No

4. Would you recommend other employers hire Vo-Tech graduates?

Yes  No

5. Are you familiar with the Vo-Tech competencies related to your employee's training?

Yes  No

6. After reviewing the competencies, do you feel that they are up to date?

Yes  No

7. Please comment on any suggestions for improvement of training programs.

Please rate the vocational training received by the individual who you supervise. 1 = very poor; 2 = poor; 3 = neutral; 4 = good; 5 = very good.

8. \_\_\_\_\_ Development of technical knowledge related to job.
9. \_\_\_\_\_ Development of desirable work attitudes.
10. \_\_\_\_\_ Development of ability to maintain desirable inter-relationships with fellow workers.
11. \_\_\_\_\_ Overall vocational rating.
12. \_\_\_\_\_ Ability to produce quality work.



APPENDIX D

DOUGLAS TILLEY, LTD. REPORT

GRADUATE PLACEMENT

Center Location N \_ \_ S \_ X

PLACEMENT	Total No. Of Graduates	Number Placed In Field For Which Trained	Percent Placed In Field For Which Trained	Number Placed In Closely Related Field	Percent Placed In Closely Related Field	Number Placed In Slightly Related Field	Percent Placed In Slightly Related Field	Number Placed In Non-Related Field	Percent Placed In Non-Related Field	Number Enter Military	Percent Enter Military	Number Cont. Education	Percent Cont. Education	Number Unemployed or Unknown	Percent Unemployed or Unknown
Air Cond.	6					5	(83)			1	(17)			7	(50)
Auto Body	14	4	(29)	2	(14)			7	(23)	1	(7)			6	(19)
*Auto Mech.	31	12	(39)	6	(19)										
Carpentry	7	5	(71)	2	(28)										
Drafting	6	2	(33)											4	(66)
Electricity	9	5	(55)					2	(22)	1	(11)			1	(11)
Electronics	11	4	(36)					5	(45)	2	(18)				
Health Ass't	11	2	(18)			4	(36)							5	(45)
Horticulture	4			4	(100)										
Mech. Shop	13	7	(54)	4	(31)					2	(15)				
Masonry	17	5	(30)	7	(41)			4	(23)	1	(6)				
I. P. H.	19	16	(84)									3	(16)		
Sheet Metal	11	2	(18)					2	(18)	1	(9)				
Sm. Engines	5	1	(20)							1	(20)				
Welding	6	2	(33)	2	(33)									2	(40)