DOCUMENT RESUME

ED 139 967 CE 010 988

AUTHOR Goldsbury, Paul; And Others
TITLE American Industries. Junior Hi. Pre-Vocational. Power and Transportation.
INSTITUTION Duval County School Board, Jacksonville, Fla.
PUB DATE Jul 75
NOTE 54p.

EDRS PRICE MF-$0.83 HC-$3.50 Plus Postage.
DESCRIPTORS *Behavioral Objectives; *Career Exploration; *Criterion Referenced Tests; Curriculum Guides; *Energy; Environmental Education; Fluid Power Education; *Industry; Junior High Schools; Occupational Information; Power Mechanics; Student Evaluation; Trade and Industrial Education; *Transportation
IDENTIFIERS United States

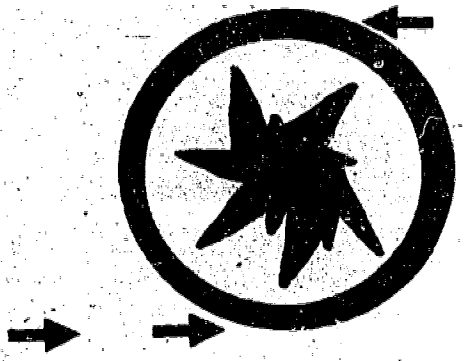
ABSTRACT

Several intermediate performance objectives and corresponding criterion measures are listed for each of 10 terminal objectives in this junior high school power and transportation course guide. Each objective also includes learning steps and suggestions for supplementary instructional aids. The overall focus is on the concepts of industrial enterprise in America, with emphasis placed on the role of industry, materials, personnel, production (mass and custom), processes, energy, management, distribution, and occupational information. Subject matter and learning experiences are organized to orient students to the industrial categories, manufacturing, graphics, construction and power, and transportation. Titles of the 10 terminal objective sections are Introduction to Power, History of Power, Safety, Work--Energy--Power, Machines, Internal Combustion, External Combustion, Power Transmission, Occupations, and Environmental Aspects. (This manual and 54 others were developed for various secondary level vocational courses using the System Approach for Education (SAFE) guidelines.) (HD)

Junior Hi.

AMERICAN INDUSTRIES

Pre-Vocational



POWER

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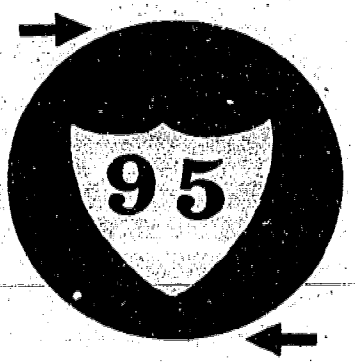
TRANSPORTATION



Duval County Schools
Jacksonville, Fla

DUVAL COUNTY PUBLIC SCHOOLS
July, 1975

Dr. John T. Gunning
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Associate Superintendent of Curriculum

David A. Rigsby
Director, Vocational-Technical Education

Lowell T. Hudson
Supervisor of Industrial Arts

* ACKNOWLEDGEMENTS *

This manual has been developed following guidelines established by S. A. F. E. (System Approach for Education) training program.

Recognition and appreciation are extended to the following educators who have assisted in the preparation of this manual.

Mr. David A. Rigsby, Director of Vocational Education
Mr. Lowell T. Hudson, Supervisor of Industrial Arts

The following educators participated as writers of this manual.

*Mr. Paul Goldsbury, Terry Parker Senior High
Mr. Larry Hilbert, Paxon Senior High
Mr. Richard Jones, Sandalwood Junior-Senior High
Mr. John Morrison, Terry Parker Senior High
Mr. William Paige, Sandalwood Junior-Senior High

*Chairman

Manual prepared by . . . . Duval County Print Shops

Typist . . . . Mrs. Nancy Turner

MAKE UP AND USE OF THIS MANUAL

Definitions:

Terminal Performance Objectives - are objectives referring to a behavior, knowledge, or skill you want the learner to demonstrate at the end of a particular unit or section. They are written in gross, overall terms.

Intermediate Performance Objectives - are sub-functions of terminal objectives referring to a behavior, knowledge or skill you want the learner to demonstrate along the way towards mastery of the terminal objectives. They are written in specific terms.

Criterion Evaluation - are the actual tests of evaluation exactly as it will be presented to the learner to see if he has met the objectives.

Method Media Analysis - specifically refers to personnel resources, tools, vehicles, software, and hardware - the physical hows for implementing the methods or ways of curriculum implementation. (Each media center is different in the materials available to assist the instructor in lecturing and demonstrating. Therefore, the individual instructor must research the school's media center for the appropriate materials to be used.)

Levels of Performance - The levels of performance (how well it must be done) given in this manual have been arrived at by the authors through past experiences and by consultation with other Industrial Arts teachers in Duval County. These levels are subject to change after try out. They are written as average levels of attainment that all students should achieve. This by no means limits the instructor, who can teach as far above the level as possible.

These objectives are minimal - The objectives in this manual represent the basic "need to know" knowledge and skills that should be attainable by any student that meets the prerequisites of the courses.

Course Prerequisites - The prerequisites for these courses may need revision. For example, if your course calls for a certain skills in reading ability and you are getting students below this ability that cannot perform up the course standards, then a prerequisite of "must be able to read at the ____ level" may be needed.

INTRODUCTION

This manual of Performance Objectives has been re-written and revised from the original manual introduced for the 1972-1973 school year. A pre and post examination has been added to test the level of attainment of each learner before any instruction and to be used again at the completion of the course as a final examination. It also includes Learning Steps, Criterion Evaluation and Methods-Media Sections.

Your own teaching methods and equipment may change the chronological order in which the objectives are here-in presented. Also, it is not necessary to use a specific objective as written as each may be altered to fit your own particular situation. It should be your responsibility to cover the material given so as to insure course content and uniformity of instruction throughout the system.

The Media of instruction for each Intermediate Performance Objective should be from the State of Florida Adopted Textbook listings and your should select those to which you have access. Any additional materials should be used at your own discretion.

In revising this edition from its original form, an attempt has been made to eliminate as much of the mechanics of teaching as possible. Employ your own methods and use the equipment you have available. The emphasis is placed on learning the core of each particular area and not on how it should be taught. This manual is not intended to dictate nor limit your program but should be used as a guide for the course for which it is intended.

The Time Requirements section of each Learning Step has been omitted so that you can make your own entries for future reference.

Lowell T. Hudson
Supervisor of Industrial Arts
Duval County School Board

POWER AND TRANSPORTATION

ACCREDITATION NO. 5890

PROGRAM PATH - EXPLORATORY

PREREQUISITE (S) - 7TH GRADE LEVEL

COURSE DESCRIPTION:

The study of the concepts of industrial enterprise in America. Emphasis is placed on the role of industry, materials, personnel, production (mass and custom), processes, energy, management, distribution, and occupational information. Subject matter and learning experiences are organized to orient students to the industrial categories, manufac uring, graphics, construction and power and transportation.

NOTE

This unit has been written to supplement the POWER section of the American Industries Performance Objective Manual for the 7th grade wheel curriculum and also as an addition to the course content of Junior High 8th and 9th grade programs. If used as course content of the wheel concept you will have to extract those sections that meet your needs and course length. It may be used also as a course guide reference for 8th and 9th grade Power and Transportation, (Accreditation No. 5850) from three weeks to one year time length segments. If your particular school is on the shorter time periods, lift out that material you feel is pertinent and on the longer periods, add that material that fits your objective goals.

POWER AND TRANSPORTATION

JUNIOR HIGH

INDEX

COURSE POWER AND TRANSPORTATION

TERMINAL PERFORMANCE
OBJECTIVE NO. 1.0

INTRODUCTION

With 70% proficiency, the learner will define in writing, the definition of power. He will list the four (4) major sources of power and define how these sources of power have been harnessed for man's use.

NO.	INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
1.0	In writing, list the seven (7) major sources of modern power. Define each. 1) Sun - original source 2) Wind - air currents 3) Water - controlled flow 4) Petroleum - stored energy 5) Coal - stored energy 6) Wood - stored energy 7) Atomic - nuclear energy	1.0	Write a list of seven (7) power sources and define each as an energy source.
1.1	Define power technology and state its importance in mans progress. Power technology - The study of energy converting machines and devices. Nature provides the source of energy and man has developed the machines to harness it.	1.1	Write a definition of Power technology and define how man has harnessed it.

FUNCTIONAL PERFORMANCE ANALYSIS

TERMINAL PERFORMANCE OBJECTIVE 1.0

INTERIM PERFORMANCE OBJECTIVE 1.1 - 1.2

NO.	LEARNING STEPS	NO.	CRITERION PERFORMANCE EVALUATION (Response)	NO.	METHOD/MEDIA SELECTION	TIME REQUIRED
1.1.1	Recall seven (7) sources of power.	1.1.1	Identify in writing seven (7) sources of power.	1.1.1	Textbook Audio-Visual Aids Lecture	
1.1.2	Define seven (7) sources of power.	1.1.2	Write the definition of how power is obtained for the seven sources listed in 1.1.	1.1.2	Refer to 1.1.1.	
1.2.1	Define Power Technology.	1.2.1	Write a definition of Power Technology.	1.2.1	Refer to 1.1.1.	
1.2.2	Identify man's application of power.	1.2.2	Write a description of how man has applied power to his advantage.	1.2.2	Refer to 1.1.1.	

COURSE POWER AND TRANSPORTATION

TERMINAL PERFORMANCE OBJECTIVE NO. 2.0

HISTORY OF POWER

With 70% proficiency, the learner will write a history of how the sun's energy was converted into power sources and he will list important developments that has lead to modern energy driven devices.

NO.	INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
2.1	The learner will write and define in chronoligical order, the early conversion of sun power to man's use: Fire - warmth and cooking Animals - taming beasts of burden Wind - motion harnessed Water - motion and steam	2.1	Write and define four methods man used to convert energy to power, stating an example for each. Fire - probably the first example of energy conversion. Used for warmth, shaping tools, protection and food preparation. Animals - caught and tamed for transportation, work and pleasure. Wind - harnessed for sea transportation, exploration, and food preperation Water - converted into steam energy.
2.2	Define the first major machine developed by man to convert energy. Wheel: Enabled man to move a heavier load and with less effort. It increased mans rate of doing work.	2.2	Orally define a wheel and state how it has changed mans history.

COURSE POWER AND TRANSPORTATION

TERMINAL PERFORMANCE OBJECTIVE NO. 2.0 (cont'd.) HISTORY OF POWER

NO.	INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
2.3	Write a brief resume' of the development of steam energy and state a history of a successful steam engine. James Watt - (1765) Native of Scotland. Developed a successful engine. This consisted of three (3) parts: 1) Boiler 2) Cylinder and piston 3) Condenser	2.3	Research and write a history of James Watt's development of a steam engine and include a drawn sketch of his invention. Identify each part.
2.4	Identify how the steam engine came to America and state where it was first used. a) Brought to America in 1789 by Samuel Slater from memorized plans. b) By 1807 in use at fifteen (15) cotton mills in America.	2.4	Orally state how the steam engine came to America and where it was first used.
2.5	Identify who, when, and where first successful steamship voyage was made. ROBERT FULTON - August 18, 1807 - from New York to Albany in 32 hours.	2.5	Orally state when, who and where first steamship voyage was made.

COURSE POWER AND TRANSPORTATION

TERMINAL PERFORMANCE OBJECTIVE NO. 2.0 (cont'd.)

HISTORY OF POWER

NO.	INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
2.6	Identify the second important development in steam power. RAILROAD – 1830 Dewitt Clinton from Albany to Schenectady.	2.6	Orally state the second important application of steam power stating what, who, when and where this occured.
2.7	Identify the third state in steam power development: STEAM TURBINE – Developed in 19th century used first for ship power and the production of electricity.	2.7	Orally state the third important application of steam power ans state how it was harnessed.

FUNCTIONAL PERFORMANCE ANALYSIS

TERMINAL PERFORMANCE OBJECTIVE 2.0

INTERIM PERFORMANCE OBJECTIVE 2.1, 2.2, 2.3, 2.4

NO.	LEARNING STEPS	NO.	CRITERION PERFORMANCE EVALUATION (Response)	NO.	METHOD/MEDIA SELECTION	TIME REQUIRED
2.1.1	Identify four (4) methods of early mans conversion of power sources.	2.1.1	Write four (4) natural power sources.	2.1.1	Textbook Lecture	
2.1.2	Identify conversion of power sources.	2.1.2	Write an example of the application of early power sources.	2.1.2	Textbook Media Center Lecture	
2.2.1	Identify a major invention in power conversion	2.2.1	Write the name of a major power conversion invention.	2.2.1	Textbook Media Center Lecture	
2.2.2	Define how this development has been applied by man.	2.2.2	Orally state the importance of this major development.	2.2.2	Refer to 2.2.1.	
2.3.1	Recall the history of steam power development.	2.3.1	Write a brief history of the steam engine.	2.3.1	Refer to 2.2.1.	
2.3.2	Identify parts.	2.3.2	Sketch an early steam engine and name its basic parts.	2.3.2	Refer to 2.2.1.	
2.4.1	Recall development of steam power in America.	2.4.1	Orally state how the steam engine was brought to America and by whom.	2.4.1	Lecture Textbook Media Center	
2.4.2	Recall the first application of steam power in America.	2.4.2	Orally state where steam power was first applied in America.	2.4.2	Refer to 2.4.1	

FUNCTIONAL PERFORMANCE ANALYSIS

TERMINAL PERFORMANCE OBJECTIVE 2.0

INTERIM PERFORMANCE OBJECTIVE 2.5, 2.6, 2.7

NO.	LEARNING STEPS	NO.	CRITERION PERFORMANCE EVALUATION (Response)	NO.	METHOD/MEDIA SELECTION	TIME REQUIRED
2.5.1	Identify the individual who developed steam power for water transportation.	2.5.1	Orally state the invention of successful steam ship transportation.	2.5.1	Refer to 2.4.1	
2.5.2	Recall details of a steam ship voyage.	2.5.2	Orally state date and distance of 1st successful steam ship run.	2.5.2	Refer to 2.4.1.	
2.6.1	Identify the inventor of land steam power transportation.	2.6.1	Orally state the inventor of 1st land steam power transported.			
2.6.2	Recall 1st land steam power voyage.	2.6.2	Orally state how land steam power was applied when this happened and where it transpired.			
2.7.1	Recall the third step of steam power development.	2.7.1	Orally state the third stage in steam power conversion.			
2.7.2	Define how this development was applied as a source of power.	2.7.2	Orally state how this conversion and development was applied to produce power.			

COURSE POWER AND TRANSPORTATION

TERMINAL PERFORMANCE OBJECTIVE NO. 3.0 SAFETY

With 85% proficiency, the learner will identify and define orally and in writing, the areas of this laboratory in which specific safety precautions will be observed and his responsibility in this area to himself and others.

NO.	INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
3.1	Define what is meant by A SAFE ATTITUDE. 1) You want to stay alive and healthy. 2) Machines create hazards. 3) Safety goes beyond yourself and includes all others. 4) Develop e a safe attitude in your mind. 5) How you use machines reveals your individual personality. 6) Control carelessness 7) Develope a defensive attitude.	3.1	Write the seven (7) aspects of a defensive attitude and define each.
3.2	The learner will display an understanding of the nature of gasoline and define the necessary precautions in its use: GASOLINE - a volatile and explosive liquid in common everyday use containing more power than TNT.	3.2	Orally state a physical description for gasoline and give six (6) safety precautions of its use.

COURSE POWER AND TRANSPORTATION

TERMINAL PERFORMANCE OBJECTIVE NO. 3.0 (cont'd.) SAFETY

NO.	INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
3.2	1) Store in proper containers 2) Never store inside a home 3) Never keep in prolonged storage 4) Keep away from children 5) Never store or use near flame or sparks 6) Always have a fire extinguisher near for immediate use.		
3.3	Define carbon monoxide and the safety precautions necessary where this gas is present. CARBON MONOXIDE (CO) - an odorless, colorless, tasteless gas resulting from incomplete combustion. 1) Do not operate internal combustion engines in closed areas. 2) Keep internal combustion engines tuned and properly adjusted 3) Recognize the symptons of monoxide poisoning and immediately get to fresh air a. tightness in the forehead b. throbbing temples c. weariness d. weakness e. headache f. dizziness g. nausea h. decrease in muscle control i. increase in pulse, heart and respiration action	3.3	Orally define carbon monoxide gas giving the characteristics of it and define three (3) precautions in its use.

COURSE POWER & TRANSPORTATION

TERMINAL PERFORMANCE OBJECTIVE NO. 3.0 (cont'd.) SAFETY

NO.	INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
3.4 s	The learner will demonstrate his understanding of the basic rules of safety regarding hand tool use. 1) Use only tools that are in good condition and properly sharpened. 2) Use the correct tool for the job 3) Do not carry sharp tools in your pocket 4) Keep your tools clean 5) Return a tool to its proper storage place after using 6) Never cut toward yourself	3.4	Orally state six (6) safety precautions for the use of hand tools and state an example of how these rules insure your safety in this laboratory.

FUNCTIONAL PERFORMANCE ANALYSIS

TERMINAL PERFORMANCE OBJECTIVE 3.0

INTERIM PERFORMANCE OBJECTIVE 3.1, 3.2, 3.3, 3.4

NO.	LEARNING STEPS	NO.	CRITERION PERFORMANCE EVALUATION (Response)	NO.	METHOD/MEDIA SELECTION	TIME REQUIRED
3.1.1	Recall a personal habit to be followed in the Powers laboratory.	3.1.1	Write the habit to be developed in your personal conduct in the laboratory.	3.1.1	Lecture Handout	
3.1.2	Define why a safe attitude should be developed.	3.1.2	Write seven (7) aspects of a safe attitude.	3.1.2	Refer to 3.1.1.	
3.2.1	Define gasoline.	3.2.1	Orally state a definition of gasoline and state an example of its explosiveness.	3.2.1	Textbook Lecture	
3.2.2	Identify safe use practices in connection with gasoline power conversion.	3.2.2	Write the safety rules of gasoline storage and use.	3.2.2	Handout	
3.3.1	Define carbon monoxide and state what it results from.	3.3.1	Orally define carbon monoxide and state how it is produced. Give three (3) characteristics of this toxic gas.	3.3.1	Textbook Lecture	
3.3.2	Identify effects of carbon monoxide inhalation.	3.3.2	Orally identify the symptons of carbon monoxide poisoning.	3.3.2	Lecture	
3.4.1	Recall safety in hand tool use.	3.4.1	Write the six (6) safe rules of hand tool use.	3.4.1	Textbook	
3.4.2	State application of safe hand tool use.	3.4.2	Write how each rule of safe hand tool use is applied in daily activity.	3.4.2	Lecture Demonstration	

COURSE POWER AND TRANSPORTATION

TERMINAL PERFORMANCE
OBJECTIVE NO. 4.0 WORK - ENERGY - POWER

The learner will demonstrate in writing his understanding of the terms work, energy and power and demonstrate an ability to calculate work, energy and power using mathematical terms. He will do this with 80% proficiency.

NO.	INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
4.1	The learner will define WORK. Work is "applying a force to cause motion and he will define how work is measured. Work = Force x Distance and is measured in foot pounds.	4.1	In writing, define work and calculate the foot pounds necessary to move a 30 pound weight 10 feet. W = F x D in Foot Pounds W = 30 pounds x 10 feet = 300 foot pounds W = 300 foot pounds
4.2	Define Energy. Energy is the ability to do work and is either potential or kinetic and measured in foot pounds. Potential Energy is stored energy. Kinetic Energy is the energy of motion.	4.2	Write a definition of energy and state what potential and kinetic energy is.
4.3	Define Power. Power is the rate of doing work and is measured in foot pounds per second.	4.3	Write a definition of power and calculate the power rate of moving a 30 pound weight 10 feet in 10 seconds. $\text{Power} = \frac{\text{Work}}{\text{Time}}$ (F x D) $30 \times 10 = \frac{300 \text{ ft. lbs.}}{10 \text{ seconds}} = 30 \frac{\text{ft. lbs.}}{\text{second}}$

COURSE POWER AND TRANSPORTATION

TERMINAL PERFORMANCE OBJECTIVE NO. 4.0 (cont'd.)

WORK - ENERGY - POWER

NO.	INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
4.4	Define Horsepower. Horsepower the measure of a machines power equal to the coverage work a horse could do. (550 ft. lbs. of work per second) $HP = \frac{\text{Work}}{\text{Time (in seconds)} \times 550}$	4.4	Define horsepower and calculate the horsepower needed to move a 55 pound weight, 10 feet in one second. $HP = \frac{W\ (F \times D)}{\text{Time (Secs)} \times 550}$ $HP = \frac{55 \times 10}{1 \times 550} = \frac{550}{550} = 1$ Horsepower.

FUNCTIONAL PERFORMANCE ANALYSIS

TERMINAL PERFORMANCE OBJECTIVE 4.0 INTERIM PERFORMANCE OBJECTIVE

NO.	LEARNING STEPS	NO.	CRITERION PERFORMANCE EVALUATION (Response)	NO.	METHOD/MEDIA SELECTION	TIME REQUIRED
4.1.1	Define work.	4.1.1	Orally state a definition of work.	4.1.1	Textbook	
4.1.2	Identify measurement of work.	4.1.2	Write the formula for calculating work and apply the formula to obtain foot pound results.	4.1.2	Textbook Lecture Demonstration	
4.2.1	Define energy.	4.2.1	Orally state the definition of energy.	4.2.1	Refer to 4.1.2.	
4.2.2	Identify three (3) types of energy.	4.2.2	Orally name three (3) different types of energy.	4.2.2	Refer to 4.1.2	
4.3.1	Define power.	4.3.1	Orally state a definition of power and state the formula for its computation.	4.3.1	Textbook Lecture	
4.3.2	Calculate power computation.	4.3.2	Calculate power by applying its formula to actual effort.	4.3.2	Refer to 4.3.1.	
4.4.1	Define horsepower.	4.4.1	Orally state a definition of one (1) horsepower.	4.4.1	Refer to 4.3.1.	
4.4.2	Calculate horsepower.	4.4.2	Calculate the horsepower developed from the figures given.	4.4.2	Refer to 4.3.1.	

COURSE POWER AND TRANSPORTATION

TERMINAL PERFORMANCE OBJECTIVE NO. 5.0 — MACHINES

With 70% proficiency, the learner will identify in writing six (6) basic machines and will give an example of how each is used to produce work.

NO.	INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
5.1	Write the names of six (6) basic machines. 1) Incline Plane - ramps 2) Lever - crow bars 3) Pulley - hoist 4) Screw - clamp 5) Wedge - chisel 6) Wheel and Axle - automobile	5.1	Orally name six (6) basic type machines and state a use for each.
5.2	Identify three (3) ways in which the basic machines are used to transmit power and state an example of each. 1) Change the amount of applied force - pulley 2) Change the direction of force - cam 3) Change the speed of applied - gear	5.2	Orally state three (3) ways in which machines change or alter a force. State an example of each.

FUNCTIONAL PERFORMANCE ANALYSIS

TERMINAL PERFORMANCE OBJECTIVE 5.0

INTERIM PERFORMANCE OBJECTIVE 5.1, 5.2

NO.	LEARNING STEPS	NO.	CRITERION PERFORMANCE EVALUATION (Response)	NO.	METHOD/MEDIA SELECTION	TIME ALLOCATED
5.1.1	Recall six (6) basic machines.	5.1.1	Orally name six (6) basic machines.	5.1.1	Textbook Lecture	
5.1.2	Identify use of six (6) basic machines.	5.1.2	Identify uses of basic machines.	5.1.2	Refer to 5.1.1.	
5.2.1	Identify three (3) ways basic machines change or alter applied force.	5.2.1	Orally state three (3) ways basic machines change forces.	5.2.1	Refer to 5.1.1.	
5.2.2	Identify examples of a changed force.	5.2.2	Orally state an example of the changes of applied force.	5.2.2	Refer to 5.1.1.	

COURSE POWER AND TRANSPORTATION

TERMINAL PERFORMANCE
OBJECTIVE NO. 6.0 INTERNAL COMBUSTION ENGINES

With 80% proficiency, the learner will orally identify five (5) internal combustion engines types and demonstrate his ability to visually identify the major parts of the engine and explain the basic operational principles of each.

NO.	INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
6.1	The learner will name (5) five internal combustion engines types and state an example of uses. 1) Piston - auto 2) Rotary - auto, boat 3) Diesel - truck 4) Jet - airplane 5) Rocket - space travel	6.1	Orally name five (5) types of internal combustion engines and an example of the use of each.
6.2	Identify transportation equipment that utilize one of the engine types stated in I.P.O. 6.0. Piston - autos, airplanes, motorcycles Rotary - autos, trains, boats Diesel - boats, trains Jet - airplanes Rocket - missles, airplanes	6.2	Orally state a means of transportation utilizing the internal engines listed in I. P. O. 6.0.
6.3	Given a diagram or mock-up of a 4-cycle/stroke engine, name its basic parts.	6.3	Orally name the basic parts of the mock-up or engine diagram shown you.

COURSE POWER AND TRANSPORTATION

TERMINAL PERFORMANCE OBJECTIVE NO. 6.0 (cont'd.)

INTERNAL COMBUSTION ENGINES

NO.	INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
6.4	Given a diagram or mock-up of a 2 cycle/stroke engine, name its basic parts.	6.4	Orally identify the basic parts of the 2 cycle/stroke engine on the diagram shown you.
6.5	Shown a diagram or mock-up of a Rotary engine, name its basic parts.	6.5	Orally identify the basic parts of the rotary engine on the diagram shown you.
6.6	Shown a diagram or mock-up of a diesel engine, name its basic parts.	6.6	Orally identify the basic parts of the diesel engine on the diagram shown you.
6.7	Shown a diagram or mock-up of a jet engine, name its basic parts.	6.7	Orally identify the basic parts of the jet engine on the diagram shown you.
6.8	Shown a diagram or mock-up of a rocket engine, name its basic parts.	6.8	Orally identify the basic parts of a rocket engine on the diagram shown you.
6.9	The learner will disassemble and identify the parts of a 2 or 4 cycle/stroke engine.	6.9	Using proper tools and following safety rules, disassemble the engine assigned you. Label and name each of the basic parts as they are removed.

FUNCTIONAL PERFORMANCE ANALYSIS

TERMINAL PERFORMANCE OBJECTIVE 6.0

INTERIM PERFORMANCE OBJECTIVE 6.1, 6.2, 6.3, 6.4, 6.5

O.	LEARNING STEPS	NO.	CRITERION PERFORMANCE EVALUATION (Response)	NO.	METHOD/MEDIA SELECTION	TIME REQUIRED
.1.1	Recall six (6) internal combustion engines.	6.1.1	Write six (6) types of internal combustion engines.	6.1.1	Textbook Lecture Audio-Visuals	
.1.2	Identify a use of each internal combustion engine.	6.1.2	Write a use for internal combustion engines.	6.1.2	Textbook Lecture	
.2.1	Recall means of transportation.	6.2.1	Write ten (10) means of transportation.	6.2.1	Refer to 6.1.1.	
.2.2	Identify transportation power sources.	6.2.2	Write the name of the type engine used on each means of transportation written in 6.2.1.	6.2.2	Refer to 6.1.2	
.3.1	Identify the engine displayed.	6.3.1	Orally identify the engine displayed.	6.3.1	Textbook Lecture Mock-up or engine or printed diagram	
.3.2	Name basic parts.	6.3.2	Point to and name its basic parts.	6.3.2	Refer to 6.3.1.	
.4.1	Identify the engine displayed.	6.4.1	Same as 6.3.1.	6.4.2	Refer to 6.3.1.	
.4.2	Name basic parts.	6.4.2	Same as 6.3.2.	6.4.2	Refer to 6.3.1.	
.5.1	Identify the engine or diagram displayed.	6.5.1	Same as 6.3.1.	6.5.1.	Refer to 6.3.1.	
.5.2	Name basic parts.	6.5.2	Same as 6.3.2.	6.5.2	Refer to 6.3.1.	

FUNCTIONAL PERFORMANCE ANALYSIS

TERMINAL PERFORMANCE OBJECTIVE 6.0

INTERIM PERFORMANCE OBJECTIVE 6.6.0 - 6.9

NO.	LEARNING STEPS	NO.	CRITERION PERFORMANCE EVALUATION (Response)	NO.	METHOD/MEDIA SELECTION	TIME REQUIRED
6.6.1	Identify the engine type displayed.	6.6.1	Orally identify the engine or diagram displayed.	6.6.1	Textbook Lecture Mock-up, engine, or printed diagram	
6.6.2	Name basic parts.	6.6.2	Point to and name its basic parts.	6.6.2	Refer to 6.6.1.	
6.7.1	Identify the engine displayed.	6.7.1	Same as 6.6.1.	6.7.1	Refer to 6.6.1.	
6.7.2	Name basic parts	6.7.2	Same as 6.6.2.	6.7.2	Refer to 6.6.1.	
6.8.1	Identify the engine type displayed.	6.8.1	Same as 6.6.1.	6.8.1	Refer to 6.6.1.	
6.8.2	Name basic parts.	6.8.2	Same as 6.6.2.	6.8.2	Refer to 6.6.1.	
6.9.1	Display engine disassembling.	6.9.1	Disassemble the engine displayed.	6.9.1	Engine Tools Supplies	
6.9.2	Identify parts.	6.9.2	Tag and write basic parts names.	6.9.2	Refer to 6.9.1.	

COURSE POWER AND TRANSPORTATION

TERMINAL PERFORMANCE
OBJECTIVE NO. 7.0 EXTERNAL COMBUSTION

With 75% proficiency, the learner will orally or in writing, identify and define a steam engine. He will demonstrate his understanding of the practical application of steam power.

NO.	INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
7.1	The learner will define external combustion. EXTERNAL COMBUSTION - Fuel is burned to produce energy outside the engine.	7.1	In writing, define external combustion.
7.2	Trace the energy path of a typical steam engine. 1) Chemical energy of the fuel is converted into 2) heat energy which boils the water to produce 3) steam which is confined in the boiler building up 4) high steam pressures which when released and channeled, are able to 5) move the engines pistons or turbine parts which do the work.	7.2	Orally trace the energy path of a steam engine.
7.3	The learner will identify the most important development in steam engine design that enabled the engine to be a means of transportation. (Reduction of the size and weight of the steam engine to transpose it from a stationary engine to a moveable engine. This was accomplished by Richard Trevithick who developed high pressure boilers.)	7.3	Research and write a history of steam engine developments of Richard Trevethick.

COURSE POWER AND TRANSPORTATION

TERMINAL PERFORMANCE OBJECTIVE NO. 7.0 (cont'd.)

EXTERNAL COMBUSTION

NO.	INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
7.4	The learner will identify the operational theory of a railroad steam engine and name its major components. 1) Water intake 2) Fire box 3) Fire tubes 4) Gas and steam 5) Exhaust port 6) Driver 7) Wheels 8) Piston	7.4	Research and sketch a steam driven locomotive and label its major parts.

FUNCTIONAL PERFORMANCE ANALYSIS

TERMINAL PERFORMANCE OBJECTIVE 7.0

INTERIM PERFORMANCE OBJECTIVE 7.1, 7.2, 7.3, 7.4

NO.	LEARNING STEPS	NO.	CRITERION PERFORMANCE EVALUATION (Response)	NO.	METHOD/MEDIA SELECTION	TIME REQUIRED
7.1.1	Recall the name of a combustion engine (external combustion type).	7.1.1	Orally state the name of a combustion engine.	7.1.1	Textbook	
7.1.2	Define what external combustion means as applied to engine types.	7.1.2	Orally state a definition of an internal combustion engine.	7.1.2	Textbook Lecture	
7.2.1	Recall steam engine as to its type.	7.2.1	Orally identify a steam engine as an external combustion type engine.	7.2.1	Textbook Lecture	
7.2.2	Recall energy path of a steam engine.	7.2.2	Orally trace the energy flow of a steam engine.	7.2.2	Textbook Demonstration	
7.3.1	Recall the history of steam engine development.	7.3.1	Write a resume' (brief) of the development of a steam engine.	7.3.1	Refer to 7.2.2.	
7.3.2	Identify how the stationary steam engine was converted to a portable type power source.	7.3.2	Write an important development that enabled the original steam engine to be changed from a stationary type to a moveable type engine.	7.3.2	Textbook Media Center Lecture	
7.4.1	Recall and identify a steam locomotive.	7.4.1	Research and sketch a steam driven type railroad locomotive.	7.4.1	Textbook Media Center	
7.4.2	Identify the basic parts of a railroad steam engine.	7.4.2	Write names of the basic parts of a railroad steam locomotive.	7.4.2	Textbook	

COURSE POWER AND TRANSPORTATION

TERMINAL PERFORMANCE OBJECTIVE NO. 8.0

POWER TRANSMISSION

With 70% proficiency, the learner will orally and in writing identify and define four (4) ways in which power is transmitted and give an example of each.

NO.	INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
8.1	The learner will identify four (4) ways power is transmitted. 1) Direct Transmission - the power source is connected directly to the desired action mechanism. 2) Mechanical Transmission- Transfers power through gears, pulleys, chains, levers, screws, etc. 3) Fluid Transmission - uses a liquid or gas as a media. 4) Electrical Transmission- uses conductive wires	8.1	Write four (4) methods of power transfer.
8.2	Give examples of practical application of power transmitting methods.	8.2	Write an example of the methods in I.P.O. 8.1 and state which methods is used. 1) Lawnmower 2) Automobile, motor boat, motorcycle 3) Automobile transmission, hydralics 4)Electrical motors generators

FUNCTIONAL PERFORMANCE ANALYSIS

TERMINAL PERFORMANCE OBJECTIVE 8.0

INTERIM PERFORMANCE OBJECTIVE 8.1, 8.2

NO.	LEARNING STEPS	NO.	CRITERION PERFORMANCE EVALUATION (Response)	NO.	METHOD/MEDIA SELECTION	TIME REQUIRED
.1.1	Recall four (4) ways power is transmitted from force to work.	8.1.1	Orally name four (4) methods of power transmission.	8.1.1	Textbook Lecture Media Center Audio-Visuals	
.1.2	Define methods of power transmission.	8.1.2	Orally define the mechanics of the four (4) power transmission methods.	8.1.2	Refer to 8.1.1.	
.2.1	Recall power transmission.	8.2.1	Orally state a method of transmitting power.	8.2.1	Refer to 8.1.1.	
.2.2	Identify application of power transmitting machines.	8.2.2	State of application of power transmission.	8.2.2	Textbook Lecture	

COURSE POWER AND TRANSPORTATION

TERMINAL PERFORMANCE OBJECTIVE NO. 9.0

OCCUPATIONS

With 75% proficiency, the learner will identify major occupational opportunities offered by the area of Power and Transportation and state employment examples for each of these areas.

NO.	INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
9.1	Identify the major areas of power and transportation as to its occupational opportunities. 1) Scientists 2) Inventors 3) Research 4) Engineers 5) Technicians 6) Management 7) Production 8) Sales 9) Service 10) Repair	9.1	Select (5) five areas of this industrial aspect and research and write what responsibilities employment in those fields incorporate.
9.2	The learner will state the entrance and vocational requirement necessary to enter a field of specializations in the power and transportation area.	9.2	Chose one (1) area listed in I. P. O. 9.1 and describe entrance requirements, completion requirements and advancement opportunities it offers.

FUNCTIONAL PERFORMANCE ANALYSIS

TERMINAL PERFORMANCE OBJECTIVE 9.0

INTERIM PERFORMANCE OBJECTIVE 9.1.9.2

NO.	LEARNING STEPS	NO.	CRITERION PERFORMANCE EVALUATION (Response)	NO.	METHOD/MEDIA SELECTION	TIME REQUIRED
.1.1	Recall occupational employment areas of Power and Transportation industries.	9.1.1	Orally name ten (10) occupational areas of this industry.	9.1.1	Textbook Guidance Material Media Center Lecture	
.1.2	Recall opportunities and responsibilities of employment.	9.1.2	Orally state some of the opportunities the occupational trades offer.	9.1.2	Refer to 9.1.1	
.2.1	Recall fields of specializations.	9.2.1	Orally state (2) two areas of Power and Transportation specialization.	9.2.1	Refer to 9.1.1.	
.2.2	Identify entrance requirements.	9.2.2	Orally state the entrance requirements of those areas given in 9.2.1.	9.2.2	Refer to 9.1.1.	

KEY OCCUPATIONS
EXPLORATORY INDUSTRIAL CAREERS

ELECTRICAL	MECHANICS	METALS	CONSTRUCTION	GRAPHIC ARTS	FOREST PRODUCTS
Electronic Technician	Construction Mechanic	Foundry Worker	Cabinet Maker	Draftsman	Forester Aide
Electrician	Auto Mechanic	Welder	Carpenter	Printer	Logger
Appliance Repair	Garage Foreman	Machinist	Construction Worker	Illustrator	Mill Worker
Electronic Assembler	Office Machine Service	Sheet Metal Worker	Cement Mason	Photographer	Composition Millman
	Diesel Mechanic	Production Machine Operator	Structural Steel Worker	Bookbinder	Woodworking Machine Operator
					Mill Hand
					Pulp and Paper Worker

COURSE POWER AND TRANSPORTATION

TERMINAL PERFORMANCE
OBJECTIVE NO. 10.0 ENVIRONMENTAL ASPECTS

With 70% proficiency, the learner will define orally and in writing, environment, pollution and ecology and the effect power development has had upon these factors of modern man.

NO.	INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
10.1	The learner will identify and define: 1) Environment - the sum total of things, conditions and influences that affect the development of our lives. 2) Pollution - is the waste that makes the environment unclea unclean or foul. 3) Ecology - the study of the interdependance of all life.	10.1	Define in writing: 1) Environment 2) Pollution 3) Ecology
10.2	Identify some ways that power uses have affected our environment. 1) Automobile exhausts 2) Factory smoke and fumes 3) Waste disposal 4) Electrical generating	10.2	Orally state examples of how environmental pollution is occuring in your local area.

COURSE POWER AND TRANSPORTATION

TERMINAL PERFORMANCE OBJECTIVE NO. 10.0 (cont'd.)

ENVIRONMENTAL ASPECTS

NO.	INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
10.3	Identify ways in which power consumption can be altered to greatly reduce environmental damages. 1) Automobile emission control 2) Conversion to neclear power 3) Utilization of solar power 4) Mass transportation	10.3	Orally identify what methods can and should be developed to prevent environmental pollution.

FUNCTIONAL PERFORMANCE ANALYSIS

TERMINAL PERFORMANCE OBJECTIVE 10.0

INTERIM PERFORMANCE OBJECTIVE 10.1, 10.2, 10.3

NO:	LEARNING STEPS	NO.	CRITERION PERFORMANCE EVALUATION (Response)	NO.	METHOD/MEDIA SELECTION	TIME REQUIRED
1.1	Recall three (3) areas of environmental concern of the Power and Transportation industry.	10.1.1	Orally identify three (3) areas of concern as it relates to our environment.	10.1.1	Lecture Textbook Media Center	
1.2	Define Power and Transportation environmental areas of concern.	10.1.2	Define each area give in 10.1.1.	10.1.2	Refer to 10.1.1.	
2.1	Recall ways that power usage has affected our environment.	10.2.1	Orally state four (4) ways some consumption has effected our surroundings.	10.2.1	Refer to 10.1.1.	
2.2	State Examples.	10.2.2	Orally state examples of the effects of power production.	10.2.2	Refer to 10.1.1.	
3.1	Recall four (4) areas that could be developed to alter environmental contamination.	10.3.1	Orally state four (4) examples of how our environment could be improved by power and transportation.	10.3.1	Textbook Lecture Films	
3.2	Identify examples of environment alteration.	10.3.2	Orally give examples of the changes given in 10.3.1.	10.3.2	Refer to 10.3.1.	

RELATED AUDIO-VISUAL MATERIALS

The Story of Power Generation (Allis-Chambers Research Lab)

Wind At Work (Pat Dowling Pictures, Milwaukee, Wisconsin)

Water and What It Does (Encyclopedia)

Simple Machines - Incline Plane (Encyclopedia)

Lets Look At Levers (Journal)

Age of Internal Combustion (GMC)

Basic Principals of Lubrication (GMC)

A B C's of Diesels (GMC)

The Gas Turbine (GMC)

Firebird (GMC)

Diesel Story (Shell)

Steam Engines (McGraw)

The Wakel Machine (Mazda Dealer)

Trucks and Your Town (Sterling Movies)

An Introduction To American History (DCA Educational Products)

Industry on Parade, No. 418 (National Association of Manufacturers)

Marketing Careers (Film, Inc.)

Basic Elements of Production (Encyclopedia)

Addresses for the above film agencies are available in the Florida Department of Education Guideline Bulletin.