DOCUMENT RESUME

ED 091 526 CE 001 294

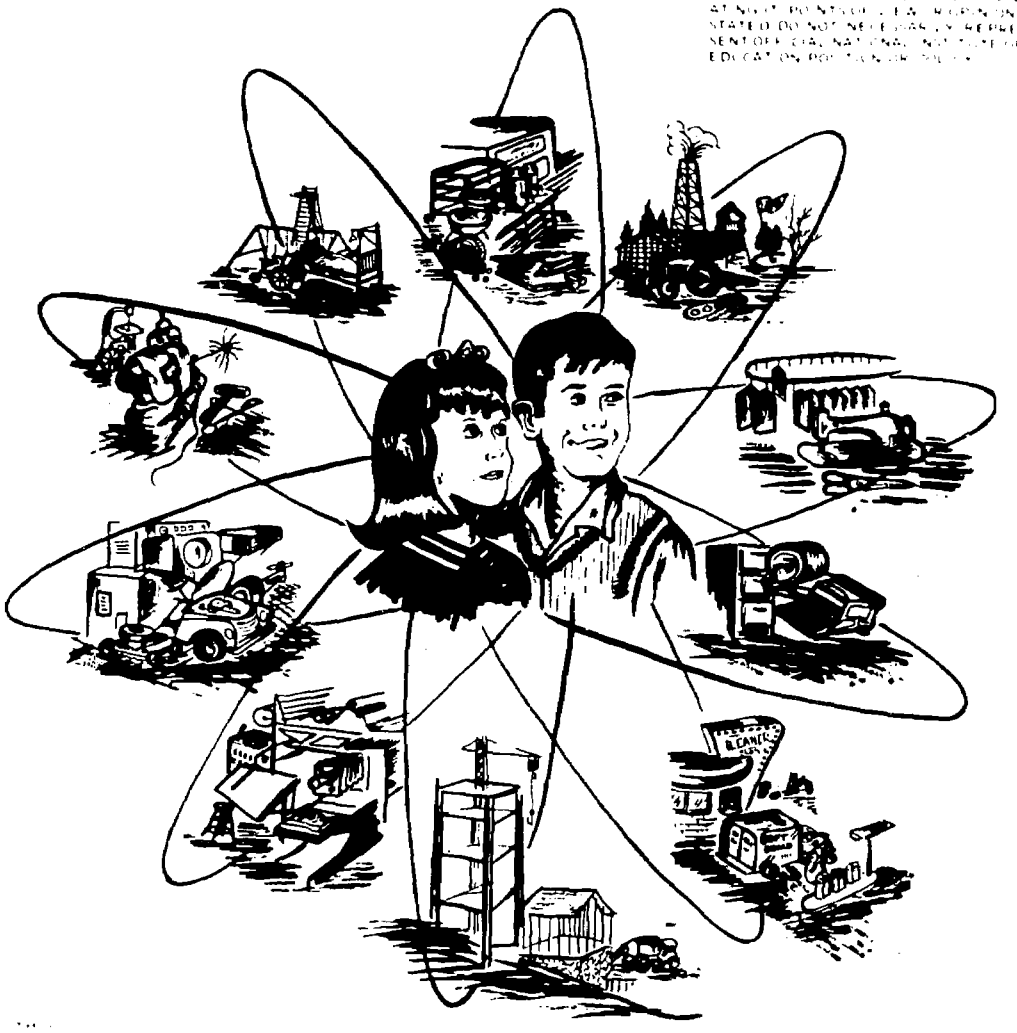
TITLE	Automotive and Power Service: Cluster Guide.
INSTITUTION	Central Michigan Univ., Mount Pleasant.; Michigan State Dept. of Education, Lansing. Special Needs Program.
PUB DATE	73
NOTE	244p.; For the other guides in this series, see CE 001 286-293 and CE 001 295. For the program guide, see CE 001 296
AVAILABLE FROM	University Press, Central Michigan University, Mt. Pleasant, Michigan 48859 ($30.00 per set of 11 documents)
EDRS PRICE	MF-$0.75 HC Not Available from EDRS. PLUS POSTAGE
DESCRIPTORS	Air Conditioning; *Appliance Repairing; *Auto Mechanics (Occupation); Behavioral Objectives; Cooperative Education; Employment Qualifications; Instructional Materials; Job Skills; Occupational Clusters; Occupational Information; *Refrigeration Mechanics; Repair; *Special Education; Task Analysis; Teacher Developed Materials; *Teaching Guides; Vocational Education
IDENTIFIERS	*Michigan

ABSTRACT

This teacher's guide is one of a series of publications focusing on the occupational preparation of persons with special education needs. The material was developed and tested by cooperating teachers over a period of three years. Task analysis information is presented using occupational descriptions from the Dictionary of Occupational Titles, covering entry level occupations generally available in Michigan. Instructional task modules are presented in detail under the headings: behavioral task knowledges/task skills, instructional methods, task-related competencies, instructional materials, basic information for cooperative teaching (language of the task and quantitative concepts), and suggestions. An instructional materials bibliography is included, followed by two appendixes, an instructional materials code indicating probable learning sensations, and a task-related competencies code. This guide describes 15 tasks common to the automotive and power service cluster, 23 tasks for eight selected entry occupations in the auto mechanics subcluster, 12 tasks for four selected entry occupations in the auto body repair subcluster, 24 tasks for five selected entry occupations in the small engines subcluster, 8 tasks for six selected entry occupations in the appliance repair subcluster, and 9 tasks for five selected entry occupations in the air conditioning subcluster. (SA)

Automotive and Power Service

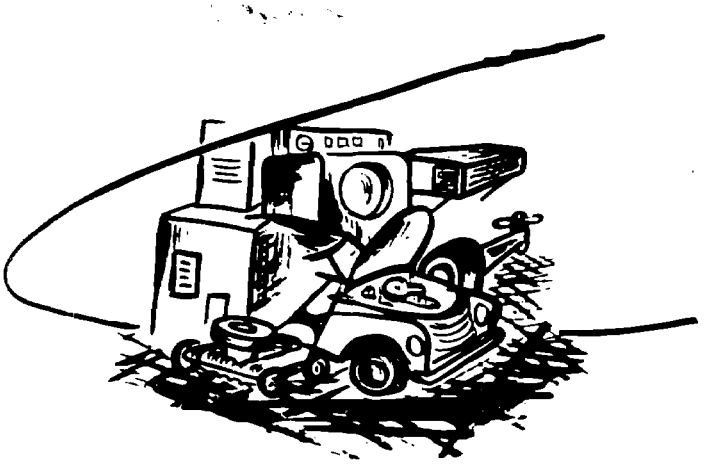
Cluster Guide



An Instructional Resource Guide to Enhance Cooperative Vocational Education / Special Education Teaching

Permission was obtained from The U. S. Department of Labor Manpower Administration to reprint selected portions of the "Dictionary of Occupational Titles" Volume 1 Third Edition.

AUTOMOTIVE AND POWER SERVICES CLUSTER GUIDE



VOCATIONAL EDUCATION/
SPECIAL EDUCATION PROJECT

Director: M. LeRoy Reynolds

Coordinator: Ronald J. Lutz

Special Education
Consultant: Cleo B. Johnson

Vocational Education
Consultant: L. Allen Phelps

Secretary: Jackie Champion

Funding Source

VOCATIONAL EDUCATION AMENDMENTS of 1968
Part B - Handicapped

Funding Agency

MICHIGAN DEPARTMENT OF EDUCATION
Vocational Education and Career Development Service
Special Needs Programs

Educational Agency

CENTRAL MICHIGAN UNIVERSITY
Mt. Pleasant, Michigan 48859

PREFACE

This teacher's guide is one of a series of publications focusing upon the occupational preparation of persons with special education needs. It is intended to be used jointly by concerned teachers as they work collectively to serve students with unique educational problems. Developed and tested by cooperating teachers, these materials represent the culmination of three years of intensive listening, communication, cooperation, and positive action between vocational and special education teachers. If the exciting ideas in these pages are actively and cooperatively implemented, the impact upon our young people could well be tremendous.

ACKNOWLEDGEMENTS

Field Evaluation Teachers

Martin Gottesman Automotive Vic Tresch Small Engines	Gloria Champion Chuck Raab Maxine Feidler Special Education	Bay City Central High School 1624 Columbus Bay City, Michigan 48706
Hank Tyszka Volkswagen Repair Frank Richards Small Engines	Mary Fouty Career English	Michigan School for the Blind 715 Willow Street Lansing, Michigan 48906
Chuck McIntosh Automotive Ranger Wilbur Small Engines	Nancy Rowbothum Chuck Dunham Kip Hogan Special Education	Calhoun Area Vocational Center 475 East Roosevelt Battle Creek, Michigan 49017
Joseph Smith Appliance Repair	Kitty Medler Special Education	Career Opportunities Center 2102 Weiss Street Saginaw, Michigan 48602
Dick Moore Heating/Air Conditioning Bill Schell Auto Body	Frank Davenport Lois Howell Special Education	Bay-Arenac Skill Center 4155 Monitor Road Bay City, Michigan 48706

Consultants

Louis Ecker	Department of Industrial Education and Technology	Central Michigan University Mt. Pleasant, Michigan 48859

Advisory Personnel

The occupational task analysis data/information for the Automotive and Power Service was obtained from the Ingham Intermediate School District. In early 1973, the Intermediate School District completed a comprehensive task analysis project covering 50 different occupations in a three-county area. The key analysis occupations selected for this cluster were identical to those automotive and power service occupations identified and analyzed by the project.

Acknowledgement is due the Ingham Intermediate School District and the Michigan Department of Education for arranging for the release of this data.

A Special Thanks is Extended to:

MICHIGAN DEPARTMENT OF EDUCATION
Vocational Education and Career Development Services
Special Needs Section, Disadvantaged and Handicapped Unit

Mr. Robert Kennon, Supervisor

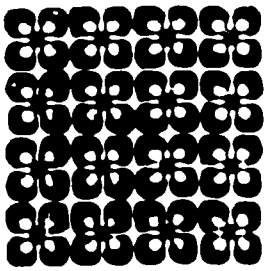
Mr. Lawrence Barber, Specialist

PROJECT CONSULTANTS

Donald Burke, Professor of Special Education
Michigan State University

Esther Kuenker, Consultant for Blind and Deaf Education

CONTENTS



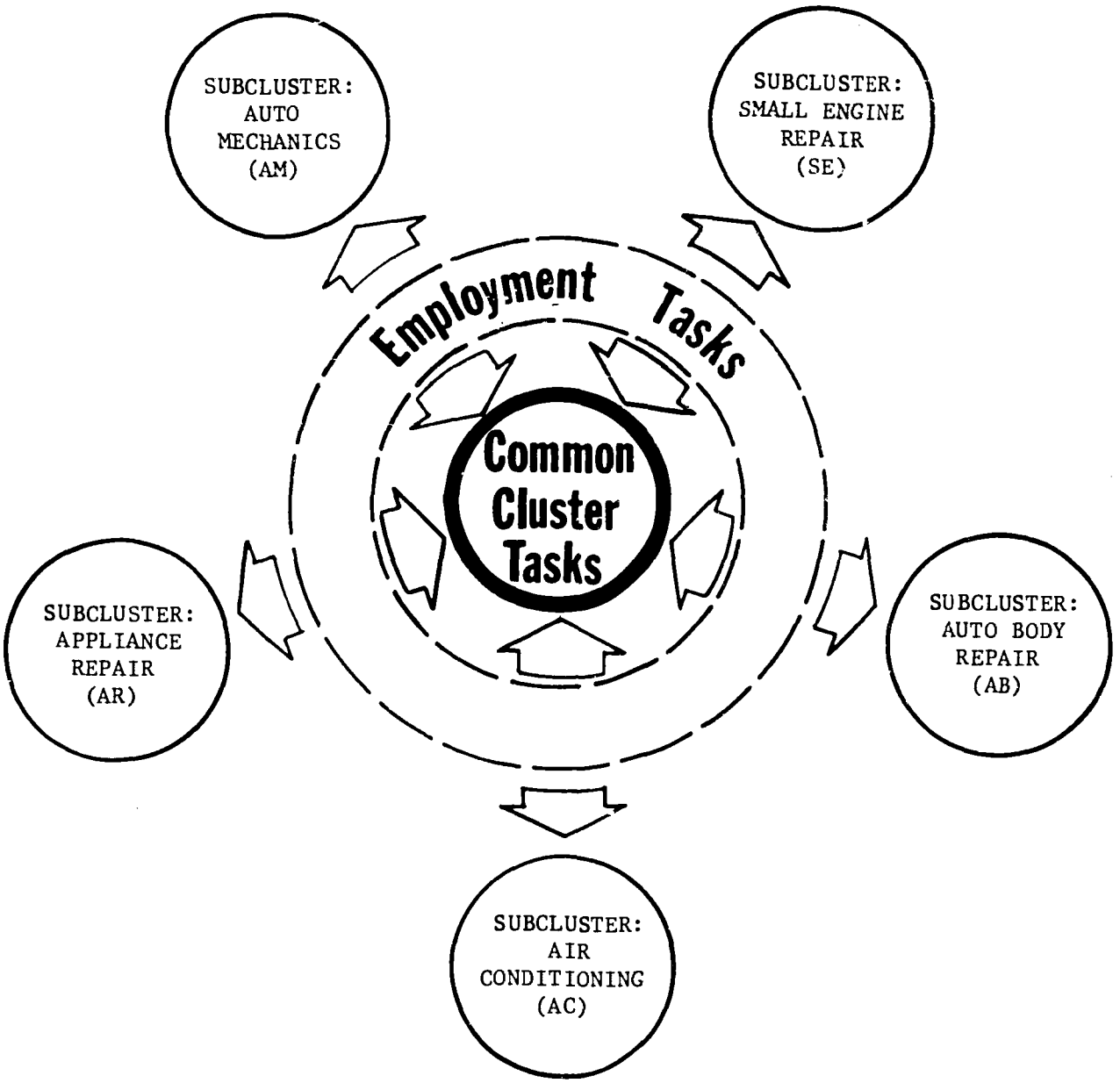
TASK ANALYSIS INFORMATION

AUTOMOTIVE AND POWER SERVICE

- CLUSTER ORGANIZATION
- CLUSTERED OCCUPATIONS
- DICTIONARY OF OCCUPATIONAL TITLES
- CLUSTER COMMONALITY ANALYSIS
- SUBCLUSTER COMMONALITY ANALYSIS:
  AUTO MECHANICS
- SUBCLUSTER COMMONALITY ANALYSIS:
  AUTO BODY REPAIR
- SUBCLUSTER COMMONALITY ANALYSIS:
  SMALL ENGINE REPAIR
- SUBCLUSTER COMMONALITY ANALYSIS:
  SMALL ENGINE REPAIR
- SUBCLUSTER COMMONALITY ANALYSIS
  APPLIANCE REPAIR
- SUBCLUSTER COMMONALITY ANALYSIS
  APPLIANCE REPAIR

CLUSTER ORGANIZATION

AUTOMOTIVE AND POWER SERVICE CLUSTER



CLUSTERED OCCUPATIONS

C L U S T E R : AUTOMOTIVE AND POWER SERVICES

OE PROGRAM CODE	SUBCLUSTER TITLE	D.O.T.	OCCUPATIONAL TITLES
17.01 17.0101	Air Conditioning	637.281	Air Conditioning Mechanic, Commercial
		*637.281	Air Conditioning Mechanic, Domestic
		637.381	Refrigeration Mechanic
		637.381	Refrigeration Unit Repairman
		827.884	Air Conditioning Installer, Domestic
17.02 17.0201	Appliance Repair	827.281	Household-Appliance Repairman
		827.381	Household-Appliance Installation Man
		*723.884	Appliance Repairman
		*827.281	Electrical-Appliance Serviceman
		827.884	Electrical-Appliance Set-up Man
		827.887	Electrical-Appliance Serviceman Helper
17.03 17.0302 17.0303 04.16	Auto Mechanics	*620.381	Automobile-Service Mechanic
		620.884	Automobile-Mechanic Helper
		807.884	Muffler Installer
		806.884	Automobile-Accessories Installer
		620.281	Transmission Mechanic
		620.884	Used Car Renovator
		806.381	New Car Get-Ready Man
		915.867	Automobile-Service-Station Attendant
17.0301	Auto Body Repair	806.287	Shop Estimator
		*807.381	Automobile Body Repairman
		845.781	Painter, Automobile
		807.887	Automobile-Body Repairman Helper
17.31	Small Engine Repair	620.281	Motorcycle Repairman
		*625.281	Gasoline Engine Repairman
		625.281	Power-Saw Mechanic
		623.281	Outboard-Motor Mechanic
			Snowmobile Mechanic
			*Key Analysis Occupation

DICTIONARY OF OCCUPATIONAL TITLES

The following is a list of occupational descriptions taken from the third edition (1965) of the Dictionary of Occupational Titles. These represent the key analysis occupations for the Automotive and Power Service Cluster.

Each occupational title represents an entry-level occupation which is generally available (in demand) across the state of Michigan at the present time. However, teachers and curriculum planners must carefully study the generalizability of this information/data to their specific community. Local or regional manpower information and data must be carefully reviewed and analyzed in making decisions related to local vocational program offerings and specific curriculum or course content.

637.281 *AIR CONDITIONING MECHANIC, DOMESTIC* Services and repairs domestic air-conditioning units, usually ranging from 1/2 to 2 tons capacity, in private residences and small business establishments: Examines unit visually for defective parts, or determines cause of malfunction by listening to machine in operation, utilizing knowledge of mechanical, electrical, and refrigeration theory. Dismantles whole or part of machine, as indicated by type of malfunction, and repairs or replaces such parts as switches, relays, fan motors, thermostats, and other components, using handtools and power tools. Replaces filters, lubricates unit, and adjusts controls. Reassembles machine, making necessary adjustments to insure efficient operation. May estimate cost of repairs or adjustments. May remove machines from customer's premises for major repairs or overhaul in shop, or for return to manufacturer for more extensive repairs. May repair sealed refrigeration units of machines. May install air conditioners.

827.281 *ELECTRICAL-APPLIANCE SERVICEMAN* Installs, services, and repairs stoves, refrigerators, dishwashing machines, and other electrical household appliances, using handtools and test meters and following wiring diagrams and manufacturer's specifications: Connects appliance to power source and test meters, such as wattmeter, ammeter, and voltmeter, and observes readings on meters and graphic recorders. Observes and listens to appliance during operating cycle to detect excess vibration, overheating, fluid leaks, and loose parts. Disassembles appliance and examines mechanical and electrical parts. Traces electrical circuits, following diagram, and locates shorts and grounds, using ohmmeter. Calibrates timers and thermostats, and adjusts contact points. Cleans and washes parts, using wire brush, buffer, and solvent to remove carbon, grease, and dust. Replaces worn or defective parts, such as switches, pumps, bearings, transmissions, belts, gears, blowers, and defective wiring. Repairs and adjusts appliance motors. Reassembles appliance, adjusts pulleys, and lubricates moving parts, using handtools and lubricating equipment.

620.381 *AUTOMOBILE-SERVICE MECHANIC* Performs minor repair and tune-up of motor vehicles: Replaces and adjusts fuel, electrical and cooling system components, such as carburetor, fuel and water pumps, distributor, voltage regulator, coil and generator, using handtools. Replaces and adjusts system component parts, such as distributor breaker points and generator brushes. Sets spark plug gap, using feeler gage. Replaces defective chassis parts, such as shock absorbers, tie rod ends, ball joints, suspension, brakeshoes, and wheel bearings. Install windshield wiper blades, fan belts, and batteries. May add oil to crankcase or drain oil from crankcase and refill with new oil. May lubricate moving parts of chassis with grease, using grease gun.

807.381 *AUTOMOBILE-BODY REPAIRMAN* Repairs damaged bodies and body parts of automotive vehicles, such as automobiles and light trucks: Examines damaged vehicles and estimates cost of repairs. Removes upholstery, accessories, electrical and hydraulic window and seat operating equipment, and trim to gain access to vehicle body and fenders. Places dolly block against surface of dented area and beats opposite surface with hammer to remove dents. Fills depressions with solder or other plastic material. Removes excessively damaged fenders, panels, and grills, using wrenches and cutting torch, and attaches replacements by bolting or welding them in position. Straightens bent frames, using hydraulic jack and pulling device. Files, grinds, and sands repaired surfaces, using power tools and handtools. Refinishes repaired surface by painting with primer coat and sanding it smooth. Aims headlights, alines wheels, and bleeds hydraulic brake system.

625.281 *GASOLINE-ENGINE REPAIRMAN* Repairs fractional horsepower gasoline engines used to power boats, lawnmowers, brushsaws, garden tractors, and similar machines, using handtools: Locates causes of trouble, using handtools and instruments. Dismantles engines and examines parts for defects. Replaces or repairs parts such as rings and bearings, using handtools. Cleans and adjusts carburetors and magnetos. Starts repaired engines and listens to sounds to test performance. Replaces engines on machines.

CLUSTER COMMONALITY ANALYSIS

AUTOMOTIVE AND POWER SERVICE CLUSTER

COMMON CLUSTER TASKS (CT)

INSTRUCTIONAL TASKS		SUBCLUSTERS (APS)				
		AUTO BODY	AUTO MECHANICS	SMALL ENGINE REPAIR	AIR CONDITIONING	APPLIANCE REPAIR
CT01	Prepare service orders	x	x	x	x	x
CT02	Order replacement parts	x	x	x	x	x
CT03	Use mechanic's hand tools	x	x	x	x	x
CT04	Use power and special tools	x	x	x	x	x
CT05	Perform soldering	x	x	x	x	x
CT06	Inspect and measure worn or defective parts	x	x	x	x	x
CT07	Use a screw extractor	o	o	x	x	x
CT08	Cut external threads	o	o	x	x	x
CT09	Cut internal threads	o	o	x	x	x
CT10	Operate and maintain pneumatic/hydraulic equipment	x	x	o	o	
CT11	Adjust and use a torque wrench	x	x	x	o	
CT12	Service batteries	x	x	x		
CT13	Measure with a micrometer	o	x	x		
CT14	Perform arc welding operations	x	o			
CT15	Operate a gas welding and cutting unit	x	x			

x - essential
o - desirable

SUBCLUSTER COMMONALITY ANALYSIS

AUTO MECHANICS

SELECTED ENTRY OCCUPATIONS

INSTRUCTIONAL TASK MODULES		AUTOMOBILE-SERVICE MECHANIC	AUTOMOBILE-MECHANIC HELPER	MUFFLER INSTALLER	AUTO-ACCESSORIES INSTALLER	TRANSMISSION MECHANIC	USED CAR RENOVATOR	NEW CAR GET-READY MAN	AUTOMOBILE SERVICE STATION ATTENDANT
AM01	Maintain and service the components of the mechanical system	x	x	o			x	x	x
AM02	Maintain and service cooling systems	x	x				x	x	x
AM03	Maintain and service lubrication systems	x	x				x	x	x
AM04	Maintain and service fuel and carburetion system	x	x				o	o	o
AM05	Maintain and service ignition systems	x	x				o	o	x
AM06	Maintain and service exhaust systems	x	x	x			o	o	x
AM07	Maintain and service electrical system	x	x				o	o	o
AM08	Maintain and service cranking motor systems	x	x				o	o	o
AM09	Maintain and service charging systems	x	x				o	o	o
AM10	Maintain and service standard transmissions	x	x			x	x	o	o
AM11	Maintain and service clutches	x	x			x	o	o	o
AM12	Maintain and service differentials	x	x			x	o	o	o
AM13	Maintain and service driveshafts	x	x			x	o	o	o
AM14	Maintain and service brake systems	x	x				x	x	x
AM15	Maintain and service suspension systems	x	x				o	o	o
AM16	Maintain and service hydraulic system components	x	x		o		x	x	o
AM17	Maintain and service air conditioning systems	x			x		x	x	o
AM18	Maintain and service emission control systems	x					o	o	o
AM19	Maintain and service front end alignment	x					x		x
AM20	Lubricate vehicle chassis and change engine oil and filter						x	x	x
AM21	Mount, balance, and rotate tires						x		x
AM22	Install auto accessories				x		x	x	x
AM23	Wash and wax cars						x	x	x

SUBCLUSTER COMMONALITY ANALYSIS

AUTO BODY REPAIR

INSTRUCTIONAL TASK MODULES		SHOP ESTIMATOR	AUTOMOBILE BODY REPAIRMAN	PAINTER, AUTOMOBILE	AUTOMOBILE-BODY REPAIRMAN HELPER
	SELECTED ENTRY OCCUPATIONS				
AB01	Remove, overhaul, and replace trim and hardware		x	o	x
AB02	Perform bumping operations	x	x	o	o
AB03	Remove and replace body components		x	x	x
AB04	Prepares surface for painting		o	x	x
AB05	Apply masking tape and paper			x	x
AB06	Operate spray paint equipment			x	o
AB07	Perform lacquer refinishing			x	o
AB08	Perform enamel refinishing			x	o
AB09	Remove and install glass		x	o	x
AB10	Preparing vehicle for delivery	o	o	o	x
AB11	Estimating damage repairs	x	x	o	
AB12	Select and use appropriate materials and supplies	x	x	x	x

x - essential
o - desirable

SUBCLUSTER COMMONALITY ANALYSIS

SMALL ENGINES

INSTRUCTIONAL TASK MODULES		SELECTED ENTRY OCCUPATIONS				
		MOTORCYCLE REPAIRMAN	GASOLINE ENGINE REPAIRMAN	POWER-SAW MECHANIC	OUTBOARD-MOTOR MECHANIC	SNOWMOBILE MECHANIC
SE01	Remove and replace engine flywheel	x	x	x	x	x
SE02	Clean the engine and chassis	x	x	x	x	x
SE03	Remove and replace the blower housing	x	x	x	x	x
SE04	Service the mechanical and air vane governor	x	x	x	x	x
SE05	Service the ignition system	x	x	x	x	x
SE06	Service the connecting rod	x	x	x	x	x
SE07	Service the cylinder	x	x	x	x	x
SE08	Service the piston	x	x	x	x	x
SE09	Service the valves	x	x	x	x	x
SE10	Service the crankshaft	x	x	x	x	x
SE11	Service the main bearings	x	x	x	x	x
SE12	Service the camshaft	x	x	x	x	x
SE13	Service the crankshaft bearing seals	x	x	x	x	x
SE14	Service the cylinder head	x	x	x	x	x
SE15	Remove and replace engine	x	x	x	x	x
SE16	Service the rotary mower blade		x			
SE17	Service the impulse and rewind starter		x	x	x	x
SE18	Service the lubricating system	x	x	x	x	x
SE19	Service the fuel system	x	x	x	x	x
SE20	Service the exhaust system	x	x	x	x	x
SE21	Service the cooling system	x	x	x	x	x
SE22	Prepare engine for winter storage	x	x	x	x	x
SE23	Complete engine check-up procedures	x	x	x	x	x
SE24	Perform engine tune-up procedure	x	x	x	x	x

SUBCLUSTER COMMONALITY ANALYSIS

APPLIANCE REPAIR

INSTRUCTIONAL TASK MODULES		SELECTED ENTRY OCCUPATIONS					
		HOME APPLIANCE REPAIRMAN	HOUSEHOLD-APPLIANCE INSTALLATION MAN	APPLIANCE REPAIRMAN	ELECTRICAL-APPLIANCE SERVICEMAN	ELECTRICAL-APPLIANCE SET-UP MAN	ELECTRICAL-APPLIANCE SERVICEMAN HELPER
AR01	Service small appliances	x		x	o		o
AR02	Service disposers		x		x		x
AR03	Service room air conditioners	x	o	x	x	o	x
AR04	Service refrigerators	x	o	x	x	o	x
AR05	Service dryers	x	x	x	x	x	x
AR06	Service automatic washers	x	x	x	x	x	x
AR07	Service ranges	x	x	x	x	x	x
AR08	Service dishwashers	x	x	x	x	x	x

x - essential
o - desirable

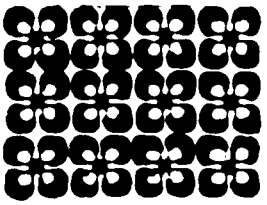
SUBCLUSTER COMMONALITY ANALYSIS

AIR CONDITIONING

SELECTED ENTRY OCCUPATIONS

INSTRUCTIONAL TASK MODULES		AIR CONDITIONING MECHANIC, COMMERCIAL	AIR CONDITIONING MECHANIC, DOMESTIC	REFRIGERATION MECHANIC	REFRIGERATION UNIT REPAIRMAN	AIR CONDITIONING INSTALLER, DOMESTIC
AC01	Perform basic wiring	x	x	x	x	x
AC02	Cut, thread, and install iron and copper piping systems	x	o	x	x	o
AC03	Measure and record refrigerant temperature	x	x	x	x	x
AC04	Install refrigerant filter and drier	x	x	x	x	x
AC05	Replace metering devices	x	x	x	x	x
AC06	Charge and test a refrigeration system	x	x	x	x	x
AC07	Service refrigerators and freezers	x	x	x	x	x
AC08	Apply principles of refrigeration	x	x	x	x	x
AC09	Apply principles of basic electricity	x	x	x	x	x

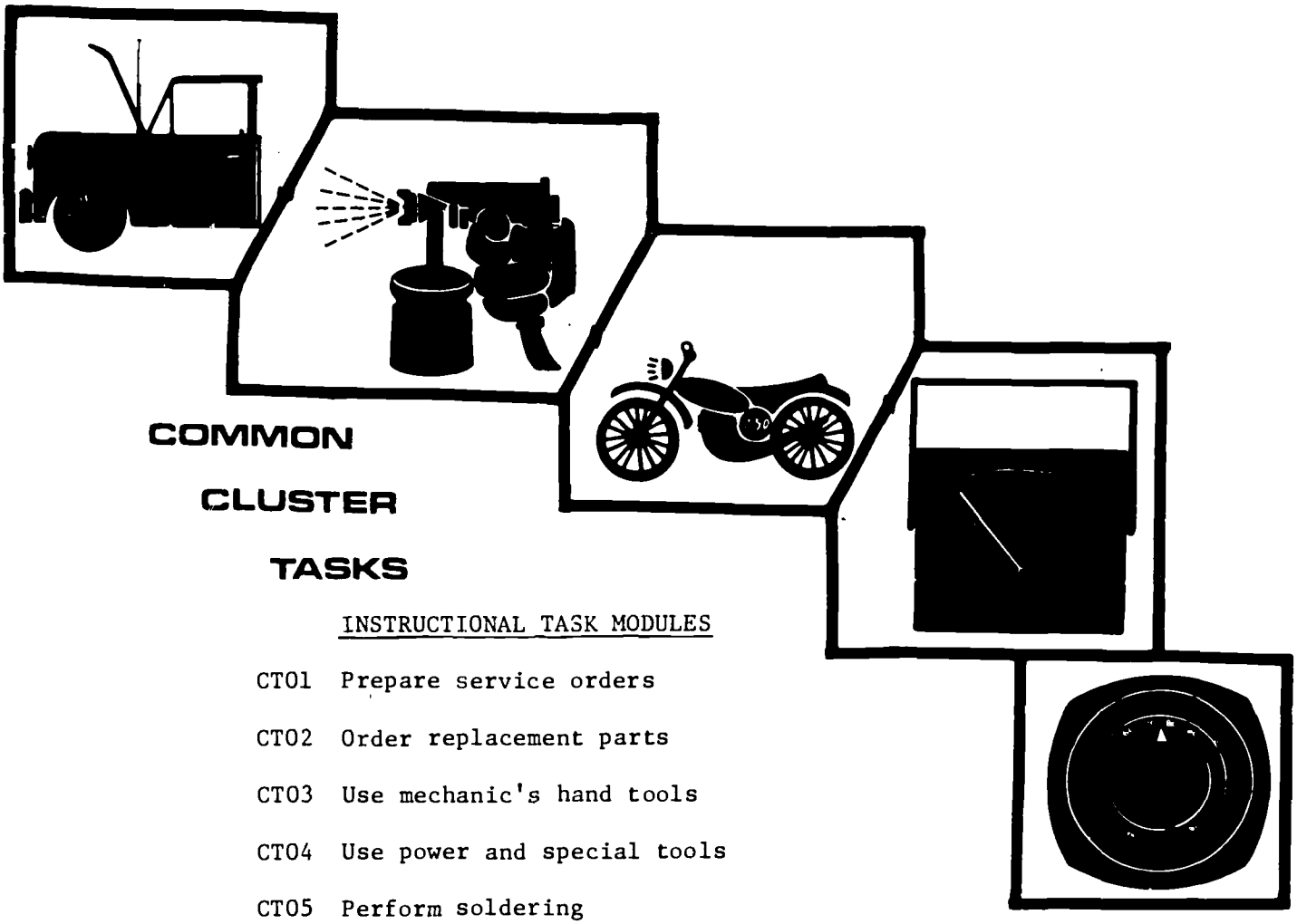
x - essential
o - desirable



INSTRUCTIONAL TASK MODULES

AUTOMOTIVE AND POWER SERVICE

- COMMON CLUSTER TASKS
- SUBCLUSTER: AUTO MECHANICS
- SUBCLUSTER: AUTO BODY REPAIR
- SUBCLUSTER: SMALL ENGINE REPAIR
- SUBCLUSTER: APPLIANCE REPAIR
- SUBCLUSTER: AIR CONDITIONING



COMMON CLUSTER TASKS

INSTRUCTIONAL TASK MODULES

CT01 Prepare service orders

CT02 Order replacement parts

CT03 Use mechanic's hand tools

CT04 Use power and special tools

CT05 Perform soldering

CT06 Inspect and measure worn or defective parts

CT07 Use a screw extractor

CT08 Cut external threads

CT09 Cut internal threads

CT10 Operate and maintain pneumatic/hydraulic equipment

CT11 Adjust and use a torque wrench

CT12 Service batteries

CT13 Measure with a micrometer

CT14 Perform arc welding operations

CT15 Operate gas welding and cutting unit

COMMON CLUSTER TASKS

TASK: Prepare service orders

Code: APS - CT01

Student Name: _____

Student Progress	Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced / Involved / Productive / Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will : 1. write up a service order following a prescribed procedure: a. determine from customer description the work required b. estimate job cost by computing parts and labor c. order parts (see CT02) d. complete service repair order by listing parts, labor time, tax and other charges	• Teacher leads class discussion and demonstrates writing service orders. • Teacher discusses keeping records and coding in braille (for visually impaired student). • Teacher explains use of parts manual, pricing guide, tax chart and manufacturer's suggestions for service procedures. • Teacher encourages small peer group cooperation and interaction.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 3,8,9	Manufacturer's parts and service manuals	14	16,17 18,19
NUMBERS B 2,3,4d,5,6	Service orders		
	Sales tax charts	16	
APPLICATION C 1a,b,3,8	Flat rate pricing guide manual	14	25
PHYSICAL D 1a,b 2a 3c			

COMMON CLUSTER TASKS

le: APS - CT01 TASK: Prepare service orders

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	• Collect sample service orders from vocational auto teacher.
Job cost Compute Labor Time Tax	Discuss time charges and hourly rates. Compute sales tax on various sales totals. Discuss listing/description of parts.	

Supportive Instructional Materials:

COMMON CLUSTER TASKS

TASK: Order replacement parts

Code: APS - CTO2

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. select the appropriate catalog(s) listing the desired part
2. use the index efficiently in locating the part listing
3. check for name, number, or other identifying information on a specific part
4. interpret the necessary information from the catalog listing or chart
5. check several catalogues for comparative pricing
6. transfer the necessary catalog information to the order form

Instructional Methods

- Teacher duplicates an order form from a common supplier and students complete the forms simulate the ordering procedure.
- Para-professionals provide sustained involvement with students having difficulty with this task.
- Teacher matches successful students who are interested in helping those having difficulty.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE			
A 3,8,9	Ordering forms	20	
NUMBERS			
B 1,2	Auto Supply Catalog	13	27
APPLICATION			
C 1,2a,3,6,8			
PHYSICAL			
D 1a,2a/b,3c			

COMMON CLUSTER TASKS

Title: APS - CT02 TASK: Order replacement parts

Basic Information for Cooperative Teaching

Language of the Task

Order number

Part number

Serial number

Catalog number

Index/table of contents

Order form

Quantitative Concepts

List items and item costs.

Multiply number of identical parts by the cost for one part.

Add cumulative costs to determine total.

Multiply total by sales tax % to determine sales tax amount.

List item weights and add the pounds and ounces to determine the weight of the entire order.

Use a transportation chart to determine shipping costs (i.e. air, truck, UPS, parcel post, etc.)

Suggestions:

- Collect sample order forms and duplicate them for students to simulate ordering.

Supportive Instructional Materials:

J.C. Whitney Catalog

COMMON CLUSTER TASKS

TASK: Use mechanic's hand tools

Code: APS - CT03

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. identify mechanic's hand tools by visual and tactual examination and verbal description
2. use the mechanic's hand tools in performing operations associated with each of these tools
3. demonstrate the care and storage of mechanic's hand tools in accordance with the manufacturer's recommendations and shop storage facilities
4. practice safety precautions by using mechanic's hand tools according to class safety instructions
5. without the aid of references, identify mechanic's hand tools and their uses
   a. wrenches
      1. open end
      2. box end
      3. adjustable
      4. ratcheting boxocket
      5. hex-head (Ablen)
   b. pliers
      1. slip-joint
      2. lever-action
      3. interlocking (channel-lock)
      4. hose clamp
      5. retaining ring
      6. diagonal cutters

Instructional Methods

- Teacher demonstrates the use and application of each specific tool.
- Students view a movie, ABC's of Handtools.
- Teacher organizes and administers a test on tool identification.
- Teacher provides a variety of "hands-on" opportunities for students to learn the appropriate use and function of each tool.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 1,6,9	ABC's of Handtools	8	8
NUMBERS B 2	Tools	1	
APPLICATION C 2			
PHYSICAL D 1a,d 2c 3c			

COMMON CLUSTER TASKS

e: APS - CT03 TASK: Use mechanic's hand tools

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Clockwise Counter-clockwise Spark plug gauge Wrench Metric measure Bolt Nut Bolt head Socket wrench For specific tool identification, get information from the vocational instructor.	Distinguish between: clockwise/counter-clockwise circular motion Select appropriate spark plug gauge sizes. Recognize common wrench sizes in English and metric sizes. Collect from the vocational education instructor or a hardware store an assortment of different kinds and sizes of bolts and nuts. Borrow a set of sockets for student to work in pairs of matching bolt heads with sockets by size or trial and error.	

Supportive Instructional Materials:

TASK: Use mechanic's hand tools

Code: APS - CT03

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced	Involved	Productive	Employable		

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will

- c. screwdrivers
  - 1. Phillips
  - 2. standard
  - 3. offset
- d. screwstarter
- e. nutdriver
- f. ratchet and accessories
- g. hammers
  - 1. ballpeen
  - 2. soft tip
- h. feeler gauge
- i. spark plug gauge and cleaner tool
- j. flat chisel
- k. punches
  - 1. pin
  - 2. center
- l. hacksaw
- m. scraper
- n. file
- o. wire stripper
- p. pickups
  - 1. magnetic
  - 2. grip-it
- q. wire brush
- r. C clamp
- s. oiler
- t. rules
  - 1. 1 ft. print
  - 2. 1 ft. braille
- u. wheel puller

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE			
NUMBERS			
APPLICATION			
PHYSICAL			

COMMON CLUSTER TASKS

: ___ - ____ TASK:

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	

Supportive Instructional Materials:

COMMON CLUSTER TASKS

TASK: Use power and special tools

Code: APS - CT04

Student Name: _____

Student Progress	Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced / Involved / Productive / Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify by name specific power and special tools 2. identify the different applications or operations for the use of selected tools 3. demonstrate a degree of skill in properly using power and special tools 4. employ the safety precautions in manipulation and operation of power and special tools 5. identify specific techniques for care and maintenance of power and special tools 6. clean tools using appropriate cleaning methods and materials	• Students view a movie, ABC's of Handtools. • Teacher demonstrates the use and application of each specific tool. • Teacher provides students work experience in a tool crib. • Teacher encourages small peer group cooperation and interaction.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 1,2,6,7 **NUMBERS** B 4d,f **APPLICATION** C 3,5,6 **PHYSICAL** D 1a,d 2a,b 3b,c,d,e, f,g	ABC's of Handtools	8	8
	Tools	1	
	Tool charts	16	32

COMMON CLUSTER TASKS

Title: APS - CT04 TASK: Use power and special tools

Basic Information for Cooperative Teaching

Language of the Task

Pliers	Wrench-Combination
Hammer	Drill/drill press
Punches	Valve grinder
Puller	Drum lathe
Voltmeter	Armature lathe
Amp meter	Scope analyzer
Ohm meter	Coil-condenser tester
Pilot shaft	Battery-starter tester
Grease gun	Air impact hammer
Lifter tester	Ridge reamer
Dwell meter	Cylinder hone
Timing light	Ring expander
Screwdriver	Valve compressor
Allen wrench	Brake adjuster
Torque wrench	

Quantitative Concepts

Read numbers and decimals when using meters.

Use simple multiplication.

Read gauges for:
- degrees of angularity
- voltage
- amperage

Suggestions:

- Have students actually handle tools in classroom, getting "feel" of tool.

Supportive Instructional Materials:

Check with vocational education teacher to get a selection of the tools currently being studied, a few at a time as the vocational education teacher is using them in project activity.

COMMON CLUSTER TASKS

TASK: Perform soldering

Code: APS - CT05

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced	Involved	Productive	Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. clean and tin the metal surfaces to be soldered by a. burning the paint off with a torch b. sanding the surface 2. select and apply liquid or paste flux 3. tin the metal surface to be soldered according to manufacturer's specifications 4. apply the appropriate solder to the surface 5. spread the solder over the area being tinned, if necessary	• Teacher demonstrates soldering procedures and techniques. • Students practice on samples or on actual damaged auto or components. • Teacher encourages small peer group cooperation and interaction.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,3,7,8,9 NUMBERS B 2a,b 4f,h APPLICATION C 3,5,6,8 PHYSICAL D 1a,b,c,d,f 2b 3b,c,d,e,f, g	Auto Body Repairing and Repainting pp. 78-79	13	9

COMMON CLUSTER TASKS

e: APS- CT05 TASK: Perform soldering

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Flux Solder Sweat fit Joint Gun Rosin Temperature Propane torch Striker Tin-lead mixture (solder)	Melting temperature of solder: 361°-437°F Solder flow temperature: 469°-543°F The higher the percentage of tin, the lower the melting point and the more expensive.	

Supportive Instructional Materials:

COMMON CLUSTER TASKS

TASK: Inspect and measure worn or defective parts

Code: APS - CT06

Student Name: _____

Student Progress	Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced / Involved / Productive / Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. thoroughly clean parts and components using a washer 2. identify and describe the appropriate use of precision measuring tools 3. demonstrate the use of precision measuring tools by measuring specific parts 4. identify defective or worn part identification information 5. inspect parts and components for functional defects and worn areas	• Teacher demonstrates the use of precision measuring devices. • Teacher provides work experiences for students in the tool crib. • Para-professionals provide sustained involvement with students having difficulty with this task. • Teacher concentrates his effort with students having difficulty.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,3,7,8,9 NUMBERS B 2a,b 4a,b 5 APPLICATION C 3,5,6,8 PHYSICAL D 1a,b,c,d,f 2b,c,g	"The Micrometer" Auto Mechanics	8,12 13	20 25

COMMON CLUSTER TASKS

e: APS - CT06 TASK: Inspect and measure worn or defective parts

Basic Information for Cooperative Teaching

Language of the Task

Thousandth

Micrometer

Straight edge ruler

Decimal

Fraction

Dividers

Telescoping gauges

Teeler gauges

Small holes gauges

Gauge

Quantitative Concepts

Borrow a micrometer and measure round objects such as coins.

Borrow a feeler gauge and measure thickness of the feeler gauge blades with the micrometer to compare micrometer readings with standard thicknesses.

Suggestions:

- Use replacement parts catalog in actual instructional sessions. These parts catalogs (standard ones) can be used by special education teachers in various ways.
- See vocational instructor to determine the supportive role of the special education teacher.

Supportive Instructional Materials:

TASK: Use a screw extractor

Code: APS - CT07

Student Name: _____

Student Progress	Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced / Involved / Productive / Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify a screw extractor by tactual and visual examination and verbal description 2. use an electric drill and screw extractor to remove broken bolt from engine 3. practice safety precautions by using the electric drill and screw extractors according to class safety instructions 4. perform the following job skills with accuracy so that the broken bolt is removed a. select the correct size screw extractor b. select the correct size drill c. use center punch to mark drill spot d. drill with electric drill e. remove broken bolt with extractor	• Teacher demonstrates job skills with directed observation for individual students. • Students will be involved in performing the identified job skills in a skill practice session. • Teacher encourages small peer group cooperation and interaction.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 9 NUMBERS B 2a APPLICATION C 8 PHYSICAL D 1a,d 2a/b 3c,g	Engine parts	1	
	Drill size chart	16	
	Screw extractor chart	16	

COMMON CLUSTER TASKS

e: APS - CT07 TASK: Use a screw extractor

Basic Information for Cooperative Teaching

Language of the Task	Quantitative Concepts
Extractor Stud Drill Chart Center punch	Pass drills around in class and ask students to identify diameters by reading and reporting the size stamped on the drill. By using the screw extractor chart, determine the drill size needed to correspond with various extractors.

Suggestions:

- Ask vocational education teacher to borrow a:
  screw extractor chart
  drill size chart

Supportive Instructional Materials:

Drill size chart
Screw extractor chart

COMMON CLUSTER TASKS

TASK: Cut external threads

: APS - CT08

Student Name: _____

Student Progress	Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced / Involved / Productive / Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify American Standard National Coarse and National Fine thread series dies by tactual and visual examination 2. select the correct size die for the diameter of the rod to be threaded by tactual and/or visual examination according to the standard tap and die specification chart 3. chamfer the end of the rod with a file or grinder 4. cut threads on the rod with die and die stock 5. observe prescribed safety precautions in using die and die stock, file or grinder	• Para-professionals provide sustained involvement with students having difficulty with task. • Students will be involved in using drill and dies in a skill practice session. • Teacher concentrates his effort with students having difficulty.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,9 NUMBERS B 2 4a,e APPLICATION C 2,3,8 PHYSICAL D 1a,d,f 2b, 3c,g	Tap and die specification charts	16	

COMMON CLUSTER TASKS

e: APS - CT08 TASK: Cut external threads

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
American Standard thread sizes National course National fine Die Die stock Threads per inch Specification chart Thread gauge	Recognize and interpret common die sizes. Determine the number of threads per inch on a bolt. Read a thread specification chart for taps and dies.	• Give the blind student ample time for accumulating finger knowledge. Instructor must aid student in moving fingers for gathering information. • Informally encourage voluntary buddy system for assisting blind or deaf students (individualize without calling attention to individual).

Supportive Instructional Materials:

Tap and die specification chart

COMMON CLUSTER TASKS

TASK: Cut internal threads

Code: APS - CT09

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. identify American Standard National Coarse and National Fine thread series taps by visual and/or tactual examination
2. select the correct size tap with the desired number of threads per inch by visual and/or tactual examination and use the screw pitch gauge according to the standard tap and die specification chart
3. select the correct size tap drill by tactual and/or visual examination according to the standard tap drill specification chart
4. drill the tap hole using the electric hand drill or drill press
5. cut threads in the drilled tap hole with tap and tap wrench according to prescribed procedures
6. observe prescribed safety precautions in using tap and tap wrench, electric drill or drill press

Instructional Methods

- Teacher demonstration with directed observation for individual students.
- Teacher concentrates his effort with students having difficulty.
- Students will be involved in a skill practice session.
- Para-professionals provide sustained involvement with students having difficulty with this task.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,9 NUMBERS B 2, 4a,e APPLICATION C 2,3,8 PHYSICAL D 1a,d,f 2b 3c,g	Tap and die specification charts	16	

COMMON CLUSTER TASKS

Title: APS- CT09 TASK: Cut internal threads

Basic Information for Cooperative Teaching

Language of the Task

American Standard thread series

National coarse

National fine

Tap

Tap wrench

Threads per inch

Specification chart

Tap drill

Center punch

Thread gauge

Quantitative Concepts

Recognize and interpret common tap sizes from a drill/tap/die specification chart.

Determine the number of threads per inch on a bolt or nut.

Read a specification chart for drill/tap/die sizes.

Suggestions:

- Give the blind student ample time for accumulating finger knowledge. Instructor must aid student in moving fingers for gathering information.
- Informally encourage voluntary buddy system for assisting blind or deaf students (individualize without calling attention to the individual).

Supportive Instructional Materials:

Tap and die specification chart

COMMON CLUSTER TASKS

TASK: Operate and maintain pneumatic/hydraulic equipment

Code: APS - CT10

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will :

1. identify and describe the use or operation of specific types of hydraulic equipment
   a. hoist
   b. floor jack
   c. lubrication equipment
   d. air chisel
   e. impact wrench
   f. chain fall
   g. tire changer
2. recognize and observe safety precautions related to operation of hydraulic/pneumatic equipment
3. clean equipment thoroughly following use of equipment
4. demonstrate a degree of skill in using equipment to perform specific tasks

Instructional Methods

- Teacher demonstrates hydraulic/pneumatic equipment operation and safety procedures.
- Students study illustrations of set-up and operation procedures in text.
- Students follow a teacher demonstration with "hands-on" supervision.
- Para-professionals provide sustained involvement with students having difficulty with this task.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,3,7,8,9 NUMBERS B 2, 4a,b APPLICATION C 3,4,5,6,8 PHYSICAL D 1 2b,c 3b,c,e,f,g	Lubrication manual Shell Oil Company	13	14

COMMON CLUSTER TASKS

: APS - CT10 TASK: Operate and maintain pneumatic/hydraulic equipment

Basic Information for Cooperative Teaching

Language of the Task

Hoist
Floor jack
Lubrication
Air chisel
Impact wrench
Chain fall
Crane
Tire changer
Hydraulic
Garage
Equipment
Pneumatic
Door
Switch
Adapter
Grease
Fluid

Quantitative Concepts

Recognize hydraulic system pressure given in pounds/sq. in. (p.s.i.)

hydraulic - oil (under pressure)
pneumatic - air (under pressure)

Suggestions:

Supportive Instructional Materials:

COMMON CLUSTER TASKS

TASK: Adjust and use a torque wrench

Code: APS- CT11

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced	Involved	Productive	Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify the parts of a torque wrench by tactual examination and verbal description 2. demonstrate the use of the torque wrench by tightening engine head bolts to manufacturer's specifications 3. demonstrate the care and storage of a torque wrench according to the manufacturer's specifications 4. utilize safety precautions in operating the torque wrench	• Students will practice setting and using the torque wrench as a skill practice session. • Teacher demonstrates the tightening of engine head bolts to manufacturer's specifications. • Para-professionals provide sustained involvement with students having difficulty with this task. • Teacher concentrates his effort with students having difficulty.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 9 NUMBERS B 4f APPLICATION C 5,8 PHYSICAL D 1a,d 2c 3c	Service Manuals	14,20	16,17 18,19
	Torque wrench adapted for blind use	11	38

COMMON CLUSTER TASKS

E: APS - CT11 TASK: Adjust and use a torque wrench

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	• Students may look up torque specifications in an engine service manual.
Torque Socket Specifications	The concept of torque - a measure of tightness. i.e. the tightness of a bolt or spark plug is measured by the product of the force (in pounds) and the perpendicular distance (in feet or inches) from the line of action of the force to the axis of rotation. Torque is measured in foot-pounds or inch-pounds by a torque wrench.	

Supportive Instructional Materials:

Engine service manual

TASK: Service batteries

Code: APS - CT12

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. identify the component parts of a battery
2. explain the basic function of each battery part
3. use safety precautions in servicing the battery
4. perform the following job skills with accuracy to meet the manufacturer's specifications
   a. check electrolyte level of battery cells and fill to proper level
   b. activate a new dry charge battery
   c. connect booster cable properly
   d. charge a battery to specifications
   e. check specific gravity of electrolyte with a hygrometer
   f. perform an inspection of battery case condition
   g. remove and install a battery in the vehicle with proper connections
   h. clean the battery and terminals

Instructional Methods

- Teacher demonstrates job skills on batteries with directed observation for individual students.
- Students handle models and actual batteries.
- Students will be involved in performing the identified job skills.
- Teacher leads class discussion covering this assignment.
- Use the "meter reader" by Science for the Blind

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 9	Service manuals	14	16,17 18,19
NUMBERS B 2,4c,f	AEA Training Manual pp. 51-53, 108	14	23
	Batteries	1	
APPLICATION C 2,5,8	Models	2	
PHYSICAL D 1a,c,d 2b 3c	VW Manual - Electrical	14	33
	Motors: Auto Engines and Electrical Systems	14	40

COMMON CLUSTER TASKS

Code: APS - CT12 TASK: Service batteries

Basic Information for Cooperative Teaching

Language of the Task

Voltage	Negative
Battery level	Ground
Battery	Sulfuric acid
Electrolyte	Lead sulfate
Cell	Hydrogen
Terminal	Water
Dry charge	Sulfate
Booster cable	Silute solution
Plates	Chemical energy
Specific gravity	Electrical energy
Hygrometer	Hold downs
Case	Polarity
Connections	Vent caps
Positive	Fluid level
Corrosion	Petroleum jelly

Quantitative Concepts

Determine the specific gravity of a battery.

Take temperature readings.

Suggestions:

- Ask vocational education teacher for cut-away battery model for discussion.

Supportive Instructional Materials:

COMMON CLUSTER TASKS

TASK: Measure with a micrometer

Code: APS - CT13

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will :

1. identify the parts of a visual or braille micrometer by tactual examination and verbal description
2. demonstrate the use of a visual or braille micrometer by measuring specific engine parts
3. demonstrate the care and storage of a micrometer according to the manufacturer's recommendations

Instructional Methods

- Students will practice measuring parts in an organized skill practice session.
- Teacher demonstrates with directed observation for individual students.
- Teacher encourages small peer group cooperation and interaction.
- Para-professionals provide sustained involvement with students having difficulty with this task.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 9	Sighted and braille micrometers	1	38
NUMBERS B 2,4f	Service manuals	14,20	16,17 18,19
APPLICATION C 2,5,8	Engine parts	1	
PHYSICAL D 1a,b,d 2b 3c			

COMMON CLUSTER TASKS

Title: APS - CT13 TASK: Measure with a micrometer

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	• Check into the possible use of metric micrometers by the vocational teacher.
Micrometer Inside micrometer Outside micrometer Parts of micrometer	Measuring by: 1000th of an inch 100th of an inch 10th of an inch	

Supportive Instructional Materials:

COMMON CLUSTER TASKS

TASK: Perform arc welding operations

Code: APS - CT14

Student Name: _____

Student Progress	Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced / Involved / Productive / Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify and describe the function of the component equipment used in arc welding 2. set-up and properly adjust the arc welding equipment for operation 3. select the appropriate safety equipment and clothing for arc welding 4. demonstrate a degree of skill in arc welding in the following positions: a. flat b. overhead c. horizontal d. vertical 5. recognize and observe specific safety precautions relating to arc welding	• Teacher demonstrates set-up and operation of arc welding with individual students using overhead transparencies. • Students work with welding teacher to build skills. • Students review illustrated text and visual materials. • Students follow a teacher demonstration with "hands-on" supervision. • Para-professionals provide sustained involvement with students having difficulty with this task.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,3,7,8,9 NUMBERS B 2, 4f,h APPLICATION C 3,5,6,8 PHYSICAL D 1a,b,c,d,f 2b 3b,c,d,e, f,g	"Arc Welding" (53 overlays)	12	15
	Metalwork Technology and Practice pp. 333-340	13	9
	Hobart Welder's Pocket Guide	14	26

COMMON CLUSTER TASKS

le: APS - CT14 TASK: Perform arc welding operations

Basic Information for Cooperative Teaching

Language of the Task

Helmet
Apron
Gloves
Electrode holder
Ground connection
Cable
Chipping hammer
Basic welding joints
- butt
- tee
- cap

Spatter
Burns
Arc
Identification and Nomenclature
Set-up procedures
Operating procedures
Safety precautions

Quantitative Concepts

Recognize diameters consistent with welding rod sizes: 1/8", 3/16", 1/4".

Recognize 4 digit numbers which are common to welding rods: 6010, 9018.

Suggestions:

- Consult with vocational welding instructor for charts or other instructional materials.

Supportive Instructional Materials:

COMMON CLUSTER TASKS

TASK: Operate gas welding and cutting unit

Code: APS - CT15

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. identify by name specific parts, components, and equipment used in oxyacetylene welding and cutting
2. properly set-up and prepare oxyacetylene welding and cutting equipment for operation
3. recognize and observe specific safety precautions in gas welding and cutting
4. select the appropriate material and equipment needed in specific welding operations
5. accurately prepare metal surfaces and materials for welding
6. demonstrate a degree of skill in
   a. fusion welding
   b. brazing
   c. cutting

Instructional Methods

- Students work with welding teacher to build skills.
- Teacher demonstrates set-up and operation of gas welding and cutting equipment with individual students.
- Students review and discuss illustrated text materials.
- Teacher encourages small peer group cooperation and interaction.
- Para-professionals provide sustained involvement with students having difficulty with this task.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A ?,3,7,8,9	Metalwork Technology and Practice pp. 328-332	13	9
NUMBERS B 2, 4f,h	Auto Body Repairing and Repainting pp. 57-59	13	9
APPLICATION C 2,5,7,8			
PHYSICAL D 1,2a-e 3a,b,c,e,g			

COMMON CLUSTER TASKS

de: APS - CT15 TASK: Operate a gas welding and cutting unit

Basic Information for Cooperative Teaching

Language of the Task

Oxygen
Braze
Cylinder
Adjust
Torch
Acetylene
Connecting hose
Protective goggles
Striker
Diaphragm
Cutting torch
Chipping hammer
Gauges
Bleed lines
Cleaning tip
Heat
Flame
Cut

Quantitative Concepts

Read common tank pressures:
oxygen - 5-50 lbs.
acetylene - 2 lbs. to 8 lbs.

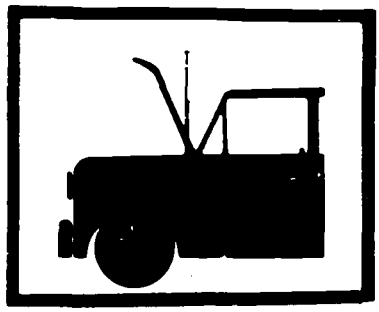
Suggestions:

- Draw pressure gauge faces and have students color in the appropriate pressure ranges for oxygen and acetylene.
- Recognize hose colors:
  red-acetylene
  green-oxygen

Supportive Instructional Materials:

List of procedures for set-up and operation of cutting equipment
Gauge faces

AUTO MECHANICS



INSTRUCTIONAL TASK MODULES

AM01 Maintain and service the components of the mechanical system

AM02 Maintain and service cooling systems

AM03 Maintain and service lubrication systems

AM04 Maintain and service fuel and carburetion system

AM05 Maintain and service ignition systems

AM06 Maintain and service exhaust systems

AM07 Maintain and service electrical system

AM08 Maintain and service cranking motor

AM09 Maintain and service charging systems

AM10 Maintain and service standard transmissions

AM11 Maintain and service clutches

AM12 Maintain and service differentials

AM13 Maintain and service driveshafts

AM14 Maintain and service brake systems

AM15 Maintain and service suspension systems

AM16 Maintain and service hydraulic system components

AM17 Maintain and service air conditioning systems

AM18 Maintain and service emission systems

AM19 Maintain and service front end alignment

AM20 Lubricate vehicle chassis and change engine oil and filter

AM21 Mount, balance, and rotate tires

AM22 Install auto accessories

AM23 Wash and wax cars

SUBCLUSTER: AUTO MECHANICS

Sheet 1 of 2

TASK: Maintain and service components of the mechanical system

Code: APS - AM01

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. identify the type or model of specific engines
2. explain the basic operation of the four cycle engine
3. identify, describe, and explain the basic function of each engine component
4. recognize and observe specific safety precautions relating to the maintenance and service of the mechanical system
5. perform the following job skills with accuracy to meet the accepted manufacturer's specifications:
   a. adjust valve lash (solid and hydraulic lifters)
   b. remove and replace engine
   c. disassemble and inspect engine visually
   d. ridge ream cylinder
   e. check cylinder taper
   f. remove and replace cam bearings
   g. remove vibration damper with puller
   h. hone cylinder walls
   i. clean ring grooves
   j. check piston ring end gap
   k. check piston ring side clearance
   l. measure crank journals, taper, out-of-round
   m. check crankshaft endplay

Instructional Methods

- Teacher demonstrates job skills on different types of engines.
- Students become acquainted with parts by handling part models.
- Students view engine operation sequences on teacher-made cutaway of a small gas engine.
- Students will be involved in disassembly and assembly of engines performing the identified job skills.
- Teacher designs and directs a series of performance tests for individual students on servicing the components of the mechanical system.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE	"Engine Breakdown"	5	13
A 1,3,6,7,8, 9	ABC's of the Automobile Engine	8	8
NUMBERS	Automechanics, 5th edition	13	11
B 1, 4a,b,c 5	"Engine Components"	5	10
APPLICATION	Teacher-made transparencies	12	
C 2,3,4,5,6, 7,8,9	3M transparencies	12	15
PHYSICAL	DCA transparencies	12	16
D 1a,c,d,f 2b 3a,c	Engine mock-up	1	15
	Service manuals from parts companies	14	

SUBCLUSTER: AUTO MECHANICS

le: APS - AM01 TASK: Maintain and service components of the mechanical system

Basic Information for Cooperative Teaching

Language of the Task

Engine
Block
Piston
Valve
Head
Ring
Cylinder
Timing chain
Bore
Stroke
Crankshaft
Oil seals
Manifold
Endplay
Camshaft
Out-of round
Taper
Bearing
Measurement
Connecting rod
Push rod
Water pump

Quantitative Concepts

Correctly read engine specifications.

Read charts and specification sheets.

Copy part or identify numbers accurately.

Relate the identifying number to part being used.

Suggestions:

- Use illustrated drawing of the various mechanical system components to learn part names.
- Students could assemble a plastic engine model.

Supportive Instructional Materials:

Motor's manual
Automobile manufacturer's manual

SUBCLUSTER: AUTO MECHANICS

Sheet 2 of 2

TASK: Maintain and service components of the mechanical system

Code: APS - AM01

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced	Involved	Productive	Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will n. fit and install rear main bearing oil seal o. torque main bearing caps p. compress piston rings and install piston q. check rod and main journal oil clearance r. replace motor mounts, engine in vehicle s. remove and replace cylinder heads t. torque connecting rod caps u. static time distributor to engine v. rebuild/replace oil pump w. remove and replace flywheel and torque converter x. remove and replace exhaust manifold y. remove and replace intake manifold z. check surface condition aa. reface valves to manufacturer's specification bb. recondition valve seats cc. clean and check valve guide clearance dd. align timing marks on camshaft to crankshaft ee. knurl valve guide sleeves ff. assemble engine for operating conditions	

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE			
NUMBERS			
APPLICATION			
PHYSICAL			

SUBCLUSTER:

___: ___ - ____ TASK:

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	

Supportive Instructional Materials:

SUBCLUSTER: AUTO MECHANICS

Sheet 1 of 1

TASK: Maintain and service cooling systems

Code: APS - AM02

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. identify and describe the basic operation of a water-cooled engine
2. recognize and observe specific safety precautions relating to maintenance and service of the cooling system
3. perform the following job skills with accuracy to meet the accepted manufacturer's specifications:
   a. check and replace heater and radiator hoses
   b. remove, test, and replace thermostat
   c. test and correct antifreeze protection level
   d. test cooling system for leaks with pressure tester
   e. test radiator cap for pressure
   f. remove and replace radiator
   g. remove and replace heater core
   h. flush radiator and system
   i. install freeze out plugs
   j. adjust fan belt tension
   k. drain and flush cooling system, winterize to -20°
   l. repair minor radiator leaks with sealer or solder
   m. inspect/replace water pump

Instructional Methods

- Teacher illustrates and discusses cooling system maintenance by using overhead transparencies.
- Teacher demonstrates job skills in servicing the cooling system.
- Students will be involved in maintenance and service of the cooling system - performing the identified job skills.
- Students view Allen Electric slides on cooling system.
- Give the blind student ample time for accumulating finger knowledge. Instructor must aid student in moving fingers for gathering information.
- Provide many tactile and hearing experiences for the blind student to reinforce task knowledges/skills.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 1,3,6,7,8,9 NUMBERS B 2b, 4f APPLICATION C 3,5,6,7,8,9 PHYSICAL D 1a,b,c,d 2b 3b,c,g	Allen Electric slides	4	1
	Automechanics	13	11
	"Radiator Construction"	12	6
	"Water Pump Construction"	12	
	"Lubrication and Cooling System"	5	10
	"V.W. Engine Manual"	14	33
	Motors: Auto Engines	14	40

SUBCLUSTER: AUTO MECHANICS

Code: APS - AM02 TASK: Maintain and service cooling systems

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Radiator Heater hose Radiator hose Radiator cap Anti-freeze Flush Fan belt Water pump Thermostat Pet-cock Pressure Inlet housing Heater core Freeze-out plug	Determine boiling point of cooling system. Determine temperature of cooling system.	• Students identify and label parts of the cooling system. • Role playing: Make list of causes for malfunctioning. Make list of repair parts. Mark bill out to customer. • Informally encourage voluntary buddy system for assisting deaf or blind students (individualize without calling attention to the individual).

Supportive Instructional Materials:

Chart: Antifreeze Content for Automobiles
"Dow" "Prestone" "Zerox"

SUBCLUSTER: AUTO MECHANICS

TASK: Maintain and service lubrication systems

Code: APS - AM03

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. identify and describe the basic operation and function of the lubrication system
2. recognize and observe specific safety precautions relating to the maintenance and service of the lubrication system
3. perform the following job skills with accuracy to meet the accepted manufacturer's specifications:
   a. change engine oil and filter
   b. change automatic transmission fluid and filter
   c. clean, repack and adjust front wheel bearings
   d. check and correct vital fluid levels: differentials, brake, transmission, engine, following manufacturer's specification or recommendation
   e. lubricate and inspect front end components and clutch linkage
   f. lubricate vehicle door latches, trunk and hood
   g. check oil level and adjust if necessary
   h. test and replace oil pressure gauge or sending unit

Instructional Methods

- Teacher demonstrates service and lubrication procedures.
- Teacher illustrates maintenance and service procedures with overhead transparencies.
- Students will be involved in maintenance and service of the lubrication system - performing the identified job skills.
- Students check service manuals to determine recommended oil and lubrication grades for specified engines.
- Teacher must practice with blind student for feeling oil level on dipstick.
- Oil company representatives commonly provide instructional materials and guest lecturers.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 1,4,7,8,9 NUMBERS B 2a,b 4b,c,f, 5 APPLICATION C 3,5,6,7,8 PHYSICAL D 2b 3a,c,e,f,g	Service manuals	1	5
	Teacher made slides	4	
	"Lubrication and Cooling Systems"	5	10
	"V.W. Engine Manual"	14	33
	Motors: Auto Engines	14	40

SUBCLUSTER: AUTO MECHANICS

Code: APS - AM03 TASK: Maintain and service lubrication systems

Basic Information for Cooperative Teaching

Language of the Task

Oil
Brands
Dipstick
Additives
Spout
Filter
Weights
10-W-30
20W
10-W-40
Fluid
Transmission
Brake fluid level
Grease
Front wheel bearing
Chassis
Ball joints
Differential
Universal joint
Clutch linkage
Tie rod ends

Quantitative Concepts

Learn the signals for the need to add oil.

Correctly read oil and filter specification charts.

Establish a reason for careful identification of product and correct and safe working procedures.

Suggestions:

- Chassis - cut - identify location.
- Identify specific products from a representative supply of products (10-W-30)(oil from other lubs, etc.).
- Read dipstick.
- Write out service label.
- Practice reading and interpreting specification charts.
  (Game, "Battle Ship", demonstrates parallel skill)
- Role play:
  Customer
  Attendant
  Manager

Supportive Instructional Materials:

Oil Filter Specification Chart

SUBCLUSTER: AUTO MECHANICS

Sheet 1 of 2

TASK: Maintain and service fuel and carburetion systems

Code: APS - AM04

Student Name: _____

Student Progress					Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable		
					Given the necessary tools, materials, equipment, and requisite knowledge, the learner will 1. identify the basic principles of operation for the fuel system and carburetion components 2. identify the component parts and accurately describe the function of each fuel and carburetion system component 3. recognize and observe specific safety precautions related to the maintenance and service of fuel and carburetion systems 4. perform the following job skills with accuracy to meet the accepted manufacturer's specifications: a. check, clean and/or replace fuel filter, fuel pump or carburetor b. remove and replace fuel pump c. test fuel pump pressure, volume, and vacuum d. bend and flare tubing to make fuel line e. adjust idle speed and mixture ratio f. check air fuel ratio with exhaust gas analyzer g. check for vacuum leaks in system h. check accelerator pump action i. check float level and drop j. remove and replace fuel tank

Instructional Methods

- Students will be involved in maintaining and servicing components of the fuel and carburetion systems - performing the identified job skills.
- Teacher demonstrates the job skills using transparencies and mockups.
- Students view filmstrip/record.
- Give the blind student ample time for accumulating finger knowledge. Instructor must aid student in moving fingers for gathering information.
- Advanced student works individually with students on a specialized servicing job.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 1,2,3,4,6, 7,8,9	Automechanics	13	11
NUMBERS B 2a,b 4c,f,i, 5	DCA transparencies - Group I - Fuel System	12	6
APPLICATION C 3,5,6,8	"The Fuel System"	5	1
	Teacher-constructed mockups	2	
PHYSICAL D 1a,b,c,d,f 2a,b 3b,c,g	Motors: Auto Engines	14	40
	"V.W. Engine Manual"	14	33

SUBCLUSTER: AUTO MECHANICS

APS - AM04 TASK: Maintain and service fuel and carburetion systems

Basic Information for Cooperative Teaching

Language of the Task

Carburetor

Fuel pump

Fuel filter

Flaring tools

Fuel ratio

Fuel lines

Gas tank

Fast idle cam

Choke

Intake manifold

Air cleaner

Sending unit

Float gauge

Quantitative Concepts

Gas mileage problems:
computing of gas mileage

Cost for repair:
totaling of replacement part costs

Suggestions:

- Students identify and label parts of the fuel system.
- Use parts manual to identify fuel system replacement parts.
- Discuss the refining process of gasoline and fuel (general).

Supportive Instructional Materials:

DCA transparencies

SUBCLUSTER: AUTO MECHANICS

Sheet 2 of 2

TASK: Maintain and service fuel and carburetion systems

Code: APS - AM04

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced	Involved	Productive	Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will k. test and replace fuel l. overhaul carburetor including: disassembling, clean, install new parts, make adjustments, assemble and test m. test and adjust automatic choke and fast idle n. remove and repair gas tank	

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE			
NUMBERS			
APPLICATION			
PHYSICAL			

SUBCLUSTER:

___: ___ - ____ TASK:

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	

Supportive Instructional Materials:

SUBCLUSTER: AUTO MECHANICS

Sheet 1 of 2

TASK: Maintain and service the ignition systems

Code: APS - AM05

Student Name: _____

Student Progress	Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced / Involved / Productive / Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will 1. identify and verbally describe the operation and function of each ignition system component 2. recognize and observe specific safety precautions related to the servicing of the ignition system 3. draw the basic ignition system of an automobile to describe the relationship of the component parts 4. perform the following job skills with accuracy to meet the accepted manufacturer's specifications: a. check compression and interpret readings (dry and wet) b. check cylinder leakage and interpret reading c. check and adjust or replace distributor points and condenser d. remove and replace distributor, ignition wires, coil dist. cap e. use dist. tester to check centrifugal and mechanical advance f. check lobe accuracy and point alignment g. test coil and condenser to manufacturer's specifications h. check, clean, gap, or replace spark plugs	• Para-professionals provide sustained involvement with students having difficulty with this task. • Students will be involved in maintaining and servicing the components of the ignition system - performing the identified job skills. • Teacher demonstrates the use of testing equipment and service. • Students view slide/sound program on ignition system. • Give the blind student ample time for accumulating finger knowledge. Instructor must aid student in moving fingers for gathering information.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 1,2,3,4,5, 6,7,8,9 NUMBERS D 2a,b, 4c,d, f,h, 5, 6 APPLICATION C 3,5,6,8 PHYSICAL D 1a,b,c,d,f 2b 3c	"Ignition Systems"	4	1
	3M transparencies (ignition)	12	15
	Mockups	2	
	"V.W. Engine Manual"	14	33
	Motors: Auto Engines and Electrical Systems	14	40

SUBCLUSTER: AUTO MECHANICS

e: APS - AM05 TASK: Maintain and service the ignition systems

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Contact points *Cam lobe* Condenser Distributor cap Rotor Ignition wires Resistor Spark plugs Coil Centrifugal Mechanical Advance Timing Dwell Alignment Gap	Identify ignition system components and parts from basic drawings. Identify basic electrical schematic symbols, copy the basic ignition system using schematic symbols.	• Teaching the vocabulary by having spelling bees. • Provide enforcement by using the parts manual. • Bring parts of the ignition system to class and identify each part.

Supportive Instructional Materials:

3M transparencies
Ignition system components

SUBCLUSTER: AUTO MECHANICS

Sheet 2 of 2

TASK: Maintain and service the ignition systems

Code: APS - AM05

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced	Involved	Productive	Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: i. use a scope analyzer to determine available voltage, secondary insulation, dwell variation, dwell angle, vacuum leakage, dynamic comp. test j. check and reset timing k. set timing of distributor l. diagnose and service a minor tune-up m. perform a major tune-up	

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE			
NUMBERS			
APPLICATION			
PHYSICAL			

SUBCLUSTER:

Code: ___ - ___ TASK:

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	

Supportive Instructional Materials:

SUBCLUSTER: AUTO MECHANICS

TASK: Maintain and service exhaust systems

Code: APS - AM06

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	
	•			Given the necessary tools, materials, equipment, and requisite knowledge, the learner will 1. describe the principles of operation of the exhaust system 2. check for an locate exhaust system leaks and cracks 3. demonstrate a degree of skill in manipulating and operating selected tools and equipment for replacing an exhaust system 4. remove and install selected components of the exhaust system, following a prescribed procedure a. engine pipe b. extension pipe c. muffler d. tail pipe e. hangers and clamps f. gaskets 5. recognize and observe specific safety precautions relating to servicing of the exhaust system

Instructional Methods

- Students observe and participate in a teacher demonstration of complete replacement process.
- Students use parts manuals to locate and list parts for replacement of a specific engine model system.
- Give the blind student ample time for accumulating finger knowledge. Instructor must aid student in moving fingers for gathering information.
- Teacher matches successful students who are interested in helping those having difficulty.
- Para-professionals provide sustained involvement with students having idfficulty with this task.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 1,4,6,7	Parts manuals	14	5
	"Exhaust System"	12	6
NUMBERS B 2a,b 4f, 5	"Muffler Replacement"	12	6
APPLICATION	"V.W. Engine Manual"	14	33
C 3,5,8	Motors: Auto Engines	14	40
PHYSICAL D 1, 2b, 3a,b,c, 3g			

SUBCLUSTER: AUTO MECHANICS

: APS - AM06 TASK: Maintain and service exhaust systems

Basic Information for Cooperative Teaching

Language of the Task

Muffler

Tail pipe

Exhaust pipe

Gaskets

Clamps

Hangers

Inlet

Outlet

Stud

Zip-gun

Chisel

Expander

Manifold

Quantitative Concepts

Use parts manual to identify parts name, number, and function.

Read charts.

Suggestions:

- Teach the students how to use the parts manual.
- Informally encourage voluntary buddy system for assisting deaf students (individualize without calling attention to the individual).
- Drill deaf student extensively on language of the task.
- Check with vocational education teacher to determine the best supportive role.

Supportive Instructional Materials:

SUBCLUSTER: AUTO MECHANICS

TASK: Maintain and service electrical systems

Code: APS- AM07

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will

1. identify and describe the basic operations of the electrical system
2. recognize and observe specific safety precautions relating to maintenance and service of the electrical system
3. explain the basic operation of Ohm's law in relation to electricity (practical)
4. perform the following job skills with accuracy to meet the accepted manufacturer's specification:
   a. remove and replace electrical accessories such as: radio, directional signals, tape player, antenna, headlights, brake light switch, dash gauges and lights
   b. check electrical system wiring by appropriate diagram
   c. check the amount of voltage, amperage and resistance in the system by using Ohm's law
   d. inspect, replace and adjust sealed beams and bulbs to specifications

Instructional Methods

- Students will be involved in maintenance and service of the electrical system - performing the identified job skills.
- Students view Allen Electric slides on electrical system.
- Teacher demonstrates job skills in maintaining and servicing electrical systems.
- Use audicator from Sciences for the Blind with audible photocell detector.
- Use audible continuity tester.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 1,2,3,4,5,6,7,8,9 NUMBERS B 2a,b 4a,f,h,5,6 APPLICATION C 3,5,6,8 PHYSICAL D 1a,b,c,d,f 2b, 3c,d,f	Allen Electric Slides	4	1
	Automechanics	13	12
	Charts: Electricity	16	7
	"V.W. Electrical Manual"	14	33
	Motors: Auto Engines and Electrical Systems	14	40

SUBCLUSTER: AUTO MECHANICS

Code: APS - AMO7 TASK: Maintain and service electrical systems

Basic Information for Cooperative Teaching

Language of the Task

Headlight	Wire
Tail light	Switch
Directional signal	Inspect
Volts	Bulb
Amps	
Resistance	
Radio	
Brake	
Fuses	
Dash board	
Atom	
Proton	
Neutron	
Electron	

Quantitative Concepts

Suggestions:

- Work on vocabulary by using the overhead projector and basic transparencies describing the basic electrical system.
- Informally encourage voluntary buddy system for assisting blind students or deaf students (individualize without calling attention to the individual).
- Give the blind student ample time for accumulating finger knowledge. Instructor must aid student in moving fingers for gathering information.
- Discuss head light alignment — its importance to safe driving.
- Identify colors of electrical wires
  red yellow black
  green white

Supportive Instructional Materials:

National Service Data Manual

SUBCLUSTER: AUTO MECHANICS

Sheet 1 of 1

TASK: Maintain and service cranking motor systems

Code: APS - AM03

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will

1. identify and describe with a drawing the starting system
2. recognize and observe specific safety precautions related to the maintenance and service of starters
3. perform the following job skills with accuracy to meet the accepted manufacturer's specifications:
   a. check starter draw with BST
   b. check for starter voltage drop
   c. remove and replace starter from vehicle
   d. remove and replace solenoid from starter
   e. disassemble and inspect starter
   f. bypass solenoid or switch to check operation
   g. test armature for shorts, opens, and grounds
   h. test field coil for shorts, grounds, and opens
   i. replace starter bushings
   j. replace starter brushes
   k. turn the commutator on the armature lathe
   l. bench test starter
   m. remove and replace bendix drive

Instructional Methods

- Students will be involved repairing and servicing starters - performing the identified job skills.
- Teacher demonstrates procedures/techniques with transparencies, mockups, and charts.
- Students view sound/slide presentation.
- Students review charts and other illustrated materials.
- Teacher matches successful students who are interested in helping those having difficulty.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 1,2,3,4,5, 6,7,8,9	Allen Electric "Cranking System"	4	1
NUMBERS B 2a,b, 4c,d, f,h, 5,6	Mockups - Disassembled starter	2	
APPLICATION C 3,5,6,8	Delco-Remy charts	16	7
	Transparencies (starter) 3M, DCA	12	6
PHYSICAL D 1a,b,c,d,f 2b, 3c	"V.W. Electrical Manual"	14	33
	Motors: Auto Engines and Electrical Systems	14	40

SUBCLUSTER: AUTO MECHANICS

e: APS - AM08 TASK: Maintain and service cranking motor systems

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Starter Solenoid Armature Bendix drive Field coil Ground Open Short Brushes Commutator Bushings Solder Armature lathe Rebuild Bushings	Read ampmeter to measure and record current flow.	• Sketch the components of a starter system and label each part without the aid of the auto manual. • Drill deaf student extensively on language of the task. • Give the blind student ample time for accumulating finger knowledge. Instructor must aid student in moving fingers for gathering information. • Informally encourage voluntary buddy system for assisting blind or deaf students (individualize without calling attention to the individual). • Indicate that many symptoms could contribute to a cranking system malfunction other than a bad starter such as the simple and common dirty battery terminal problem.

Supportive Instructional Materials:

3M transparency series

SUBCLUSTER: AUTO MECHANICS

TASK: Maintain and service charging systems

Sheet 1 of 2

Code: APS - AM09

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will

1. identify and describe the basic principles and operation of the charging system
2. list and name the parts of the charging system
3. accurately draw a simple schematic of the charging system
4. recognize and observe specific safety precautions related to servicing starter systems
5. perform the following job skills with accuracy to meet the accepted manufacturer's specifications:
   a. adjust belt tension
   b. test voltage drop in charging system
   c. perform a generator and regulator output test
   d. visually inspect generator, regulator and connecting wires
   e. disassemble and inspect generator
   f. test armature for shorts, opens and grounds
   g. test field coil for shorts opens and grounds
   h. undercut commutator mica
   i. turn armature on lathe
   j. replace brushes

Instructional Methods

- Teacher demonstrates job skills using charts, transparencies, and mockups.
- Students will be involved in the service of the charging components performing the identified job skills.
- Students view sound/slide presentation by Allen Electric
- Para-professionals provide sustained involvement with students having difficulty with this task.
- Teacher encourages small peer group cooperation and interaction.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 1,2,3,4,5, 6,7,8,9 NUMBERS B 2a,b, 4c,d, f,h, 5, 6 APPLICATION C 3,5,6,8 PHYSICAL D 1a,b,c,d,f 2b 3c	Allen Electric "Charging System"	4	1
	Mockups generator alternator regulator	2	
	Delco Remy Charts	16	7
	Transparencies (charging system)	12	
	Motors: Auto Engines and Electrical Systems	14	40
	"V.W. Electrical Manual"	14	33

SUBCLUSTER: AUTO MECHANICS

e: APS - AM09 TASK: Maintain and service charging systems

Basic Information for Cooperative Teaching

Language of the Task

Fan belt
Tension
Generator
Alternator
Regulator
Output
Amperage
Armature
Short
Ground
Open
Field coil
Commutator
Mica
Lathe
Bushings
Brushes
Relays
Polarize
Voltage
Current

Quantitative Concepts

Read voltmeter for voltage
ampmeter for current flow
ohmmeter for resistance

Suggestions:

- Using transparencies, the student will learn to identify and spell each part.
- Drill deaf student extensively on language of the task.
- Informally encourage voluntary buddy system for assisting deaf or blind students (individualize without calling attention to the individual).
- Students should review and copy basic electrical schematic symbols.

Supportive Instructional Materials:

SUBCLUSTER: AUTO MECHANICS

Sheet 2 of 2

TASK: Maintain and service charging systems

Code: APS - AM09

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced	Involved	Productive	Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will k. replace bushings l. replace bearings m. assemble and polorize generator n. perform an alternator output test o. check field relay operation p. repair or replace alternator for service q. check voltage limiter setting r. trace the charging circuit in an automobile s. determine the correct wiring diagram from a service manual to perform hook-up procedures	

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE			
NUMBERS			
APPLICATION			
PHYSICAL			

SUBCLUSTER:

: ___ - ___ TASK:

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	

Supportive Instructional Materials:

SUBCLUSTER: AUTO MECHANICS

Sheet 1 of 1

TASK: Maintain and service standard transmissions

Code: APS - AM10

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will

1. identify and describe the operation of component parts of standard transmissions
2. trace the power flow through the operation of the standard transmission
3. recognize and observe specific safety precautions relating to the servicing of transmissions
4. perform the following job skills with accuracy to meet the accepted manufacturer's specifications:
   a. remove and replace speedometer gear and cable
   b. check transmission fluid level
   c. remove and replace transmission from vehicle
   d. check and replace rear seal and bushing
   e. overhaul transmission including: disassembling, clean install new parts, make all adjustments, assemble and test

Instructional Methods

- Teacher concentrates his effort with students having difficulty.
- Teacher demonstrates construction, power flow, and job skills with mockups, transparencies, and charts.
- Students will be involved in the service of the standard transmission performing the identified job skills.
- Give the blind student ample time for accumulating finger knowledge. Instructor must aid student in moving fingers for gathering information.
- Teacher encourages small peer group cooperation and interaction.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 1,2,3,4,6, 7,8,9 NUMBERS B 1, 2a,b 4b,c,d,f,g APPLICATION C 3,5,6,7,8 PHYSICAL D 1a,b,c,d,f 2b,c,d 3a,b,c,g	Transparencies - DCA "Power Flow of Standard Transmissions"	12	6
	Mockups "3-speed" cutaway	2	
	"V.W. Transmission Manual"	14	33

SUBCLUSTER: AUTO MECHANICS

CODE: APS - AM10 TASK: Maintain and service standard transmissions

Basic Information for Cooperative Teaching

Language of the Task

Speedometer
Fluid
Rear seal
Input shaft
Bushing
Clutch
Gear
First
Second
Third
Fourth
Reverse
Linkage
Clutch fork
Neutral
Shift fork
Throw out bearing
Pressure plate

Quantitative Concepts

Determine the amount of transmission oil needed to replace old oil. Measure that quantity of liquid (water).

Suggestions:

- Drill deaf student extensively on language of the task.
- Informally encourage voluntary buddy system for assisting deaf or blind students (individualize without calling attention to the individual).
- Stress the importance of using the proper type of oil and maintaining the proper level.

Supportive Instructional Materials:

SUBCLUSTER: AUTO MECHANICS

TASK: Maintain and service clutches

Code: APS - AM11

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced	Involved	Productive	Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify and describe the function of the component parts of a clutch 2. recognize and observe specific safety precautions in servicing clutches 3. perform the following job skills with accuracy to meet the accepted manufacturer's specifications: a. adjust clutch freeplay b. remove and replace and inspect clutch, throwout bearing and pressure plate c. align clutch disc d. remove and replace pilot bushing e. adjust clutch linkage	• Para-professionals provide sustained involvement with students having difficulty with this task. • Students will be involved in the maintenance and service of clutches - performing the identified job skills. • Teacher demonstrates job skills using mockups, transparencies, and charts. • Teacher concentrates his effort with students having difficulty.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 1,2,4,5,6, 7,8,9 NUMBERS B 2a,b, 4b,c, d,f,g, 5 APPLICATION C 3,5,6,7,8 PHYSICAL D 1a,b,c,d,e, f, 2b,c,d, 3a,c,e,f,g	Mockup of clutch, pressure-plate, throw out bearing	2	
	Transparencies (clutches) DCA	12	6
	"V.W. Engine Manual"	14	33

SUBCLUSTER: AUTO MECHANICS

Code: APS - AM11 TASK: Maintain and service clutches

Basic Information for Cooperative Teaching

Language of the Task	Quantitative Concepts
Clutch Pressure plate Throw-out bearing Flywheel Pilot bushings Clutch linkage Fork Bell housing Inspection pan Free play Pilot shaft Slipping Grabbing	Study diagrams of clutch assemblies.

Suggestions:

- With the use of a tape recorder, the student will pronounce and spell the tools needed for job skill.
- Drill deaf student extensively on language of the task.
- Informally encourage voluntary buddy system for assisting deaf or blind students (individualize without calling attention to the individual).
- Check with vocational education teacher to determine appropriate supportive role.

Supportive Instructional Materials:

Mechanic's manual from vocational education teacher

SUBCLUSTER: AUTO MECHANICS

Sheet 1 of 1

TASK: Maintain and service differentials

Code: APS - AM12

Student Name: _____

Student Progress	Behavioral Task Knowledges/Task Skills
Introduced / Involved / Productive / Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify and describe the function of the component parts of a differential. 2. recognize and observe safety precautions in servicing differentials. 3. perform the following job skills with accuracy to meet the accepted manufacturer's specifications: a. replace differential pinion seal and bearing preload spacer. b. check and adjust bearing preload. c. check and adjust ring gear bearing preload. d. check and adjust backlash. e. press differential bearings and bearing races on and off. f. remove and replace axle shaft. g. replace rear wheel bearing. h. replace rear wheel grease seal. i. replace limited slip clutch. j. change differential fluid. k. change differential housing. l. replace ring and pinion gear. m. check differential fluid level.

Instructional Methods

- Students review illustrated transparencies to view differential assemblies.
- Students will be involved in the maintenance and service of differentials - performing the identified job skills.
- Teacher demonstrates job skills using mockups, transparencies, and charts.
- Give the blind student ample time for accumulating finger knowledge. Instructor must aid student in moving fingers for gathering information.
- Provide many tactile and hearing experiences for the blind student to reinforce task knowledges/skills.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 1,2,3,4,6, 7,8,9	Transparencies DCA "Differential"	12	6
NUMBERS B 2a,b, 1 4c,g, 5	Mockup of differential on a stand	2	
APPLICATION C 3,5,6,7,8	"Ford Differential"	12	34
PHYSICAL D 1a,b,c,d,f 3a,c,e,f,g			

SUBCLUSTER: AUTO MECHANICS

e: APS - AM12 TASK: Maintain and service differentials

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Pinion shaft Ring gear Spider gear Bevel gear Side gear Spline Rear axle Tapered bearing Seal Puller Springs Gasket Dial indicator Torque wrench	Compute gear ratio following the auto teacher's directions.	• With the aid of the auto manual, list the parts of the differential. • Learn how to read the label of the parts connected with the differentials. • Drill deaf student extensively on language of the task. • Informally encourage voluntary buddy system for assisting deaf or blind students (individualize without calling attention to the individual). • Be careful to mix hands-on experiences with the traditional academic reading and parts identification.

Supportive Instructional Materials:

SUBCLUSTER: AUTO MECHANICS

TASK: Maintain and service driveshafts

Sheet 1 of 1

Code: APS - AM13

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will

1. identify and describe the function of the component parts of a driveshaft.
2. recognize and observe safety precautions in servicing driveshafts.
3. perform the following job skills with accuracy to meet the accepted manufacturer's specifications:
   a. remove and replace driveline.
   b. remove and replace universal joint.
   c. check driveshaft for out-of-round and vibrations.
   d. check and adjust universal joint operating angle.

Instructional Methods

- Students handle and discuss the parts and components of different driveshafts to become familiar with each name and function.
- Students will be involved in the maintenance and service of driveshafts - performing the identified job skills.
- Teacher demonstrates job skills using mockups, transparencies, and charts.
- Students view Chrysler film/record.
- Provide many tactile and hearing experiences for the blind student to reinforce task knowledges/skills.
- Give the blind student ample time for accumulating finger knowledge. Instructor must aid student in moving fingers for gathering information.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 1,3,4,6,7,8 NUMBERS B 2a,b 4b,c,f, 5 APPLICATION C 3,5,6,7,8 PHYSICAL D 1a-f 2b,c,d 3a,c,e,f,g	Teacher-made transparencies "Universal Joint"	12	6
	Automechanics	13	12
	"Propeller Shafts, Wheels and Tires"	5	4
	Mockup of driveshaft and universal joint	2	

SUBCLUSTER: AUTO MECHANICS

: APS - AM13 TASK: Maintain and service driveshafts

Basic Information for Cooperative Teaching

Language of the Task

Needle bearings

Caps

Universal joint

Yoke

Driveshaft

Press

Balance

Constant velosity

Propeller shaft

Quantitative Concepts

Using a driveshaft with a universal joint, discuss the concept of force changing direction and observe the process.

Suggestions:

- Using the overhead projector, the student will be able to identify driveshaft components.
- With the aid of the auto manual, the student will list the service procedures.
- Drill deaf student extensively on language of the task.
- Informally encourage voluntary buddy system for assisting deaf or blind students (individualize without calling attention to the individual).
- Discuss the concept of "out-of-round".

Supportive Instructional Materials:

SUBCLUSTEF AUTO MECHANICS

Sheet 1 of 2

TASK: Maintain and service brake systems

: APS - AM14

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. identify the different types of brake systems.
2. describe the operation or function of specific components of brake systems.
3. recognize and observe specific safety precautions in servicing brakes.
4. perform the following job skills with accuracy to meet the accepted manufacturer's specifications:
   a. remove and replace front and rear brake drums.
   b. remove and replace brake shoes and self-adjusting mechanisms.
   c. measure brake drum with drum micrometer.
   d. turn drum on lathe.
   e. grind radius of brake shoes.
   f. rebuild wheel cylinders.
   g. rebuild disc brake calipers.
   h. replace disc brake pads.
   i. turn rotor on lathe.
   j. clean and inspect all components; hold down springs, self-adjusters, springs.
   k. lubricate self adjusting unit and backing pads.
   l. rebuild master cylinder unit.

Instructional Methods

- Teacher or resource person presents a demonstration on troubleshooting and servicing the brake systems.
- Students will be involved in the maintenance and service of brake systems - performing the identified job skills.
- Advanced student works individually with students on a specialized servicing job.
- Teacher designs and directs a series of performance tests for individual students on servicing brake systems.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 1,2,3,4,5, 6,7,8,9 NUMBERS B 2a,b 4c,f, 5 APPLICATION C 3,5,6,8 PHYSICAL D 1a,b,c,d,f 2b 3c,f,g	Mockups of different brake cutaways	2	
	"V.W. Brakes Manual"	M	33

SUBCLUSTER: AUTO MECHANICS

e: APS - AM14 TASK: Maintain and service brake systems

Basic Information for Cooperative Teaching

Language of the Task

Primary	Metering valve
Secondary	Warning light
Return springs	Rear drum
Star wheel	Disc brake
Hole down clips	Cotter pin
Drum	Pads
Spindle	Rotors
Bearings	Calipers
Race	Pressure
Hydraulics	Seals
Friction	Pistons
Line	Springs
Master cylinder	Dust covers
Wheel cylinder	Castle nut
Proportional valve	

Quantitative Concepts

Discuss pressure and volume relationships as they apply to wheel cylinders and a master cylinder.

Clarify the meaning of pounds per square inch (PSI).

Suggestions:

- Using the overhead projectors and transparencies dealing with the brake system, the student will learn to identify the brake components.
- Drill deaf student extensively on language of the task.
- Informally encourage voluntary buddy system for assisting deaf students (individualize without calling attention to the individual).
- Emphasize the importance of being thorough and accurate since poorly serviced brakes are dangerous.

Supportive Instructional Materials:

Manuals and labeled illustrations from auto instructor

SUBCLUSTER: AUTO MECHANICS

TASK: Maintain and service brake systems

Code: APS - AM14

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced	Involved	Productive	Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will m. check rotor for thickness, out-of-round and parallelism. n. check and adjust brakes. o. adjust emergency brake cable. p. bleed brakes manually or with pressure bleeder. q. troubleshoot malfunctions in the brake system. r. clean and repack front wheel bearings and check seals. s. adjust front wheel bearings to manufacturer's specifications. t. remove and replace brake lines and pressure hoses.	

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE			
NUMBERS			
APPLICATION			
PHYSICAL			

SUBCLUSTER:

___ - ___ TASK:

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	

Supportive Instructional Materials:

SUBCLUSTER: AUTO MECHANICS

Sheet 1 of 1

TASK: Maintain and service suspension systems

Code: APS - AM15

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will

1. identify the different types of suspension systems.
2. describe the operation or function of specific components of suspension systems.
3. recognize and observe specific safety precautions in servicing suspension systems.
4. perform the following job skills with accuracy to meet the accepted manufacturer's specifications:
   a. check and replace front end parts: tie rod ends, ball joints idler arm, pitman arm, stabilizer links, kingpins, upper and lower bushings.
   b. replace coil springs, leaf springs, torsion bars.
   c. check shock absorber and replace, if necessary.
   d. diagnose and repair basic power steering leaks or malfunctions.
   e. remove and replace power steering pump and bleed system.
   f. rotate tires on vehicle.
   g. mount and dismount tires from rim.
   h. inflate air to manufacturer's specifications.
   i. replace valve stem.
   j. repair tire flats.
   k. balance tire statically/dynamically.

Instructional Methods

- Students will be involved in the maintenance and service of suspension systems - performing the identified job skills.
- Teacher or resource person (local mechanic) presents a demonstration on troubleshooting and servicing suspension systems.
- Give the blind student ample time for accumulating finger knowledge. Instructor must aid student in moving fingers for gathering information.
- Advanced student works individually with students on a specialized servicing job.
- Students review and discuss illustrated texts, workbooks, service manuals, and visual materials related to the task.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 1,2,3,4,6, 7,8,9	Mockup of front end suspension system	2	
NUMBERS B 2a,b 4b,d,e, 5	"Progress in Suspension Systems"	10	35
APPLICATION C 3,5,6,7,8	"V.W. Front Axle Manual"	14	33
PHYSICAL D 1a,b,c,d,f 2b,c 3b,c,g			

SUBCLUSTER: AUTO MECHANICS

Code: APS - AM15 TASK: Maintain and service suspension systems

Basic Information for Cooperative Teaching

Language of the Task

Shocks
Springs
Ball joints
Tie rod ends
Idle arm
Pitman arm
Torsion bars
Spindle
Static balance
Dynamic balance
Tire
Core stem
Valve
Air pressure
Heat springs
Coil springs
Air
Vibration

Quantitative Concepts

Identify suspension system components.

Suggestions:

- Informally encourage voluntary buddy system for assisting deaf or blind students (individualize without calling attention to the individual).
- Work closely with vocational education teacher so timing of instruction is consistent with vocational education teacher's class experiences.

Supportive Instructional Materials:

SUBCLUSTER: AUTO MECHANICS

Sheet 1 of 1

TASK: Maintain and service hydraulic system components

Code: APS - AM16

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. identify different types of hydraulic systems.
2. identify and describe the function of hydraulic components of a given hydraulic system.
3. recognize and observe specific safety precautions in working with hydraulic fluids and systems.
4. perform the following job skills with accuracy to meet the manufacturer's specifications:
   a. remove and replace system parts, valves, pumps, and components.
   b. disassemble and rebuild hydraulic components.
   c. bleed a hydraulic system.
   d. perform preventive maintenance on hydraulic component/equipment.
   e. operate a hydraulic bleeder.
   f. remove and replace hydraulic hoses.
   g. cut and install hydraulic lines.
   h. remove and replace hydraulic seals.
   i. remove hydraulic lines.

Instructional Methods

- Students work in small groups or teams servicing hydraulic system components.
- Students review and discuss illustrated texts, workbooks, service manuals, and visual materials related to the task.
- Students handle and discuss the parts and components of the hydraulic system to become familiar with each name and function.
- Provide many tactile and hearing experiences for the blind student to reinforce task knowledges/skills.
- Give the blind student ample time for accumulating finger knowledge. Instructor must aid student in moving fingers for gathering information.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 1,2,3,4,5, 6,7,8,9 NUMBERS B 2a,b 4b,c,f, 5 APPLICATION C 3,5,6,8 PHYSICAL D 1a,b,c,d,f 2b 3c,f,g	Mockup of brake system Teacher-made transparencies	2 12	

SUBCLUSTER: AUTO MECHANICS

le: APS - AM16 TASK: Maintain and service hydraulic system components

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Volume Hydraulics Pressure Fluid P.S.I. (Pounds per square inch) Capacity Peservoir Piston Ble·:er screw Pressure bleeder	Understand the appropriate volume and pressure (P.S.I.) relationships.	• Drill deaf student extensively on language of the task. • Informally encourage voluntary buddy system for assisting deaf or blind students (individu..lize without calling attention to the individual). • Discuss "hydraulics" - transmission of power or force through oil.

Supportive Instructional Materials:

SUBCLUSTER: AUTO MECHANICS

Sheet 1 of 1

TASK: Maintain and service air conditioning systems

Code: APS - AM17

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. identify and describe the basic operations and function of the air conditioning components.
2. recognize and observe specific safety precautions relating to the maintenance and service of the air conditioning system.
3. demonstrate a degree of skill in manipulating and operating special tools and equipment for replacing and servicing an air conditioner unit.
4. perform the following job skills with accuracy to meet the accepted manufacturer's specifications:
   a. remove and replace a/c fan belt to specific tension.
   b. remove and replace components of an a/c system.
   c. check the refrigerant content of the system.
   d. check all connections for leaks with leak detector.
   e. recharge the a/c system.
   f. troubleshoot malfunctioning a/c components.
   g. visual inspection of possible inoperative components.
   h. disassembly and assembly of components.

Instructional Methods

- Teacher demonstrates the identified job skills on an air-conditioned vehicle.
- Students become acquainted with parts by handling parts models.
- Students view filmstrip/record: "Air Conditioning Diagnosis Refrigeration Air Temp II".
- Students working in teams will be involved in servicing air conditioning systems performing the identified job skills.
- Provide many tactile and hearing experiences for the blind student to reinforce task knowledges/skills.
- Give the blind student ample time for accumulating finger knowledge. Instructor must aid student in moving fingers for gathering information.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 1,2,3,4,6,7,9 NUMBERS B 2a,b 4c,f,h, 5 APPLICATION C 1a,b 3,4,5,6,7, PHYSICAL 8,9 D 1a,b,c,d,e f, 2b,c 3b,c,f,g	"Air Conditioning Diagnosis Refrigeration Air Temp II"	5	4
	"Cooling Systems and Air Conditioning"	13	4
	"V.W. Engine Manual"	14	33

SUBCLUSTER: AUTO MECHANICS

e: APS - AM17 TASK: Maintain and service air conditioning systems

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Compressor Evaporator Refrigerant Liquid Vapor Pressure Vacuum Receiver drier Fan belt Swtich Thermal fuse Leak detector Recharge Discharge	Fan Belt tension	Read pressure and temperature gauges.

- Informally encourage voluntary buddy system for assisting deaf or blind students (individualize without calling attention to the individual).
- Drill deaf student extensively on language of the task.
- Contact auto teacher for appropriate supportive role.

Supportive Instructional Materials:

SUBCLUSTER: AUTO MECHANICS

Sheet 1 of 1

TASK: Maintain and service emission control systems

Code: APS - AM18

Student Name: _____

Student Progress	Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced / Involved / Productive / Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify and describe the basic operation and function of the emission control systems. 2. recognize and observe specific safety precautions relating to the maintenance and service of the emission control system. 3. demonstrate a degree of skill in manipulating and operating special tools and equipment for replacing and servicing an emission control system. 4. perform the following job skills with accuracy to meet the accepted manufacturer's specifications: a. remove and replace components of the emission control system. b. adjust components to meet federal requirements. c. inspect and troubleshoot inoperative systems. d. interpret manufacturer's specification recommended for service.	• Teacher demonstrates the identified job skills on an emission control system. • Students become acquainted with parts by handling parts models. • Students view filmstrip/record: "Heated Air Intake and Vapor Saver" and "Evolution of the Cleaner Air System". • Students working in teams will be involved in servicing emission control system performing the identified job skills. • Teacher designs and directs a series of performance tests for individual students on servicing emission control systems.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,3,4,7,9	"Heated Air Intake and Vapor Saver"	5	4
NUMBERS B 2a,b 4f	"Evolution of the Cleaner Air System"	5	
APPLICATION C 1a,b 3,5,6,8	1972 Emission Control System	13	4
	"Air Pollution in Perspective"	8	
PHYSICAL D 1a,c,d,f 2a, 3b,c,g	Transparencies	12	6
	"V.W. Engine Manual"	14	33
	Motors: Auto Engines	14	40

SUBCLUSTER: AUTO MECHANICS

Code: APS - AM18 TASK: Maintain and service emission control systems

Basic Information for Cooperative Teaching

Language of the Task

Hydrocarbons
Pressure
Reactor
Exhaust
Vapor-separator
Positive crankcase ventilation
Draft tube
Solenoid
Air injection pump
Check valve
Diverter valve
Vacuum advance
Thermal air cleaner assembly
Canister
Fuel tank
Sealed fuel cap
Vacuum

Quantitative Concepts

Read pressure gauge.

Suggestions:

- Discuss the ecological purpose of emission control systems.
- Discuss and if possible observe someone using the instrument to detect impurity in emission.
- Informally encourage voluntary buddy system for assisting deaf or blind students (individualize without calling attention to the individual).
- Drill deaf student extensively on language of the task.

Supportive Instructional Materials:

SUBCLUSTER: AUTO MECHANICS

TASK: Maintain and service front end alignment

Sheet 1 of 1

Code: APS - AM19

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. identify and describe the basic operations and function of the front end alignment.
2. recognize and observe specific safety precautions relating to the maintenance and service of the front end alignment.
3. demonstrate a degree of skill in manipulating and operating selected tools and equipment for replacing and servicing a front end.
4. perform the following job skills with accuracy to meet the accepted manufacturer's specifications:
   a. visually inspect front end components.
   b. remove and replace front end components.
   c. balance wheels.
   d. align front end geometry to manufacturer's recommended specifications.
   e. measure ball joint axial or vertical movement.

Instructional Methods

- Teacher or resource person demonstrates the job skills on a front end alignment job.
- Students become acquainted with parts by handling parts models.
- Students review filmstrip/record/slides: "Front End Alignment".
- Students will be involved in servicing front end alignment performing the identified job skills.
- Advanced student works individually with students on a specialized servicing job.
- Students review and discuss illustrated texts, workbooks, service manuals, and visual materials related to the task.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 1,2,3,4,5, 6,7,8,9 NUMBERS B 2a,b 4a,b,e, 5 APPLICATION C 1a,b, 3,4, 5,6,7,8,9 PHYSICAL D 1a,b,c,d,e f, 2b, 3b,c,d,e,f g	"Front End Alignment"	4	
	Basic Principles of Wheel Alignment	13	4
	"Progress in Suspension Systems"	10	35

SUBCLUSTER: AUTO MECHANICS

APS - AM19 TASK: Maintain and service front end alignment

Basic Information for Cooperative Teaching

Language of the Task

Caster
Camber
Toe-in
Toe-out
Steering Wheel
Shim
Balance
Steering knuckle
King-pin inclination
Ball joint
Spindle
Alignment
Tie rods
Pitman arm
Center link
Idler arm
Steering box
Power steering

Quantitative Concepts

Ask vocational education instructor for number and/or chart relationships to be used.

Suggestions:

- Informally encourage voluntary buddy system for assisting blind or deaf students (individualize without calling attention to individual).
- Practice verbalizing the identified basic vocabulary words. (To be able to pronounce the word and form some mental picture would be very supportive.)
- Emphasize the importance of being accurate.

Supportive Instructional Materials:

SUBCLUSTER: AUTO MECHANICS

TASK: Lubricate vehicle chassis and change engine oil and filter

Code: APS - AM20

Student Name: _____

Student Progress					Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable		
					Given the necessary tools, materials, equipment, and requisite knowledge, the learner will 1. describe and demonstrate the operation of a hoist or floor jack. 2. identify and describe the applications of different types of greases. 3. lubricate the chassis and body components of a vehicle following a prescribed procedure. 4. describe and demonstrate the operation of a lubrication gun. 5. drain and replace engine crankcase oil. 6. remove, select, and replace engine oil filters, following a prescribed procedure. 7. remove, repack, and replace the front wheel bearings of a vehicle, following a prescribed procedure.

Instructional Methods

- Students view procedures as demonstrated by instructor on front end mockup.
- Teacher demonstrates vehicle lubrication procedures:
  1. front wheel bearing.
  2. lubrication system.
  3. front end steering components.
- Advanced student works individually with students on a specialized servicing job.
- Para-professional works individually with students having difficulty with this task.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 7,9	Teacher-made transparencies	12	
NUMBERS B 4c, 5	Front end mockup	2	
	"Engine Lubrication System"	12	10
APPLICATION	"Front Wheel Bearings"	12	36
	"Steering System"	12	36
C 3,5,6	"Oil Filter Replacement"	12	6
PHYSICAL D 1a,d 2e 3a,b,c,d,e			

SUBCLUSTER: AUTO MECHANICS

: APS - AM20 TASK: Lubricate vehicle chassis and change engine oil and filter

Basic Information for Cooperative Teaching

Language of the Task

Engine oil

Filter

Chassis

Zerk fitting

Front end

Tie rod end

Center link

Pitman arm

Idle arm

Ball joints

Chassis lub.

Wheel bearings

Quantitative Concepts

Determine parts for vehicle using parts reference.

Determine weight and type of oil from chart.

Determine the amount of oil for an oil change.

Use appropriate measuring utensils to measure that amount of liquid.

Suggestions:

- Drill deaf student extensively on language of the task.
- Informally encourage voluntary buddy system for assisting deaf students (individualize without calling attention to the individual).
- Emphasize the importance of maintaining proper oil level, eliminating oil leaks, replacing the filter, and having all grease fittings properly lubricated.

Supportive Instructional Materials:

Borrow equipment from vocational education department.

SUBCLUSTER: AUTO MECHANICS

Sheet 1 of 1

TASK: Mount, balance, and rotate tires

Code: APS - AM21

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. identify and describe the different types and sizes of lug nuts.
2. demonstrate a degree of skill in operating specific pieces of equipment for mounting, balancing, and rotating tires.
3. identify and describe the tire rotation sequence.
4. remove and replace vehicle wheels, exhibiting a degree of skill.
5. mount and dismount tires, exhibiting a degree of skill.
6. balance tires by the static and dynamic processes, exhibiting a degree of skill.

Instructional Methods

- Teacher or resource person (service station attendant) demonstrates the procedures and techniques for balancing and rotating tires.
- Students view charts and filmstrip/record.
- Students work in small groups or teams rotating and balancing a set of tires.
- Provide many tactile and hearing experiences for the blind student to reinforce task knowledges/skills.
- Give the blind student ample time for accumulating finger knowledge. Instructor must aid student in moving fingers for gathering information.
- Service station attendant visits class and discusses how to read tire wear.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 1	"Radial Tires"	5	4
	"V.W. Manual Wheels/Tires"	14	33
NUMBERS B 2	Delco-Remy Charts on Tires	16	7
	Teacher-made transparencies on balancing	12	
APPLICATION C 5,8	"Wheels and Tires Group X"	12	6
PHYSICAL D 1, 2b, 3			

SUBCLUSTER: AUTO MECHANICS

Code: APS - AM21 TASK: Mount, balance, and rotate tires

Basic Information for Cooperative Teaching

Language of the Task

Static
Dynamic
Mount
Tire
Bead
Machine
Rotate
Lug nuts
Torque Spec.
Rim
Stem
Wheel weights
Adapter
Wheel weight tool
Impact wrench
Wear
Belted
Radial

Quantitative Concepts

Discuss static and dynamic balance of tire.

Relate meaning of rotation of tires.

Review the concept of balance-equal weights.

Suggestions:

- Informally encourage voluntary buddy system for assisting deaf students (individualize without calling attention to the individual).
- Drill deaf student extensively on language of the task.
- Field trip to tire store and watch workman mount and balance tire.
- Stress the importance of tires being properly mounted (no leaks), balanced (no wheel vibration), rotated (extended wear).

Supportive Instructional Materials:

SUBCLUSTER: AUTO MECHANICS

TASK: Install auto accessories

Code: APS - AM22

Student Name: _____

Student Progress	Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced / Involved / Productive / Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. recognize faulty auto accessories and low fluid levels. 2. determine part numbers, sizes, models of parts to be replaced from part. 3. locate and determine part numbers, sizes, and models by using parts manual. 4. remove and replace defective or faulty accessory parts following prescribed procedures. 5. install, check and adjust accessory following a prescribed procedure: a. windshield wipers. b. aerials. c. air cleaners. d. gas filters.	• Teacher demonstrates the installation procedures for each specific accessory. • Students review and discuss illustrated texts, workbooks, service manuals, and visual materials related to the task. • Students handle and discuss the parts and components of automobile accessories to become familiar with each name and function. • Advanced student works individually with students on a specialized servicing job. • Teacher designs and directs a series of performance tests for individual students on servicing or installing automobile accessories.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,3,5,6,9 NUMBERS B 2a,b 4e,f,h, 5 APPLICATION C 3,4,5,6,7, 8 PHYSICAL D 1, 2a,b 3a,b,c,d,f g	Manufacturer's specification sheets.	14	

SUBCLUSTER: AUTO MECHANICS

e: APS - AM22 TASK: Install auto accessories

Basic Information for Cooperative Teaching

Language of the Task

Windshield wipers

Air cleaners

Battery terminals

Oil filter

Windshield solvent

Air breather

Fan belts

Latch adjustment

Mirrors

Various lights and bulbs

Seat belts

Fuses

Quantitative Concepts

Recognize sizes and types of accessories:
- windshield wiper blade
- fan belt
- light bulb and fuse
- oil filters

Suggestions:

- Stress employer/attendant/customer relations.
- When attendants get tools for auto repair, he also gets fender covers, shop towels, seat covers, for cleanliness.
- Remember to keep things clean for customer satisfaction.
- For any task sheet, a teaching method, have former students come back to talk to present students.
- Informally encourage voluntary buddy system for assisting deaf students (individualize without calling attention to the individual).
- Emphasize the importance of neatness.

Supportive Instructional Materials:

SUBCLUSTER: AUTO MECHANICS

TASK: Wash and wax cars

Code: APS - AM23

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. select the appropriate supplies for washing and waxing vehicles. 2. demonstrate a degree of skill in washing vehicles by hand method and by using a high pressure spray unit. 3. identify by name and clean specific areas or body components of a vehicle. 4. operate specific pieces of equipment for assisting in cleaning and/or waxing a vehicle. 5. follow a prescribed manufacturer's procedure in applying and removing waxes and simonizes, exhibiting a degree of skill.

Instructional Methods

- Students view AVIDesk series on Car Wash Helpers.
- Class lab assignment will involve scheduling, washing, and waxing cars daily.
- Students competent in this task provide instruction to school organizations planning car washes.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 1,7,9 NUMBERS B 5,6,8 APPLICATION C 4,6,8 PHYSICAL D 1a,b,d,f 2b 3a,c,g	Car Wash Helpers	5	2

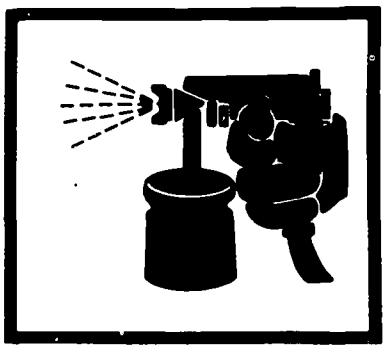
SUBCLUSTER: AUTO MECHANICS

Code: APS - AM23 TASK: Wash and wax cars

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Rag Wax Wash Vehicle description Water Soap Chamois Towels Hose Pail Sponge	Amounts of material needed: gallons of water ounces of soap ounces of wax Approximate the times/costs which would be reasonable.	• Sponser a class car wash so that students can organize the event, practice the procedures required, and develop a financial system.

Supportive Instructional Materials:

AUTO BODY REPAIR



INSTRUCTIONAL TASK MODULES

AB01 Remove, overhaul, and replace trim and hardware

AB02 Perform bumping operations

AB03 Remove and replace body components

AB04 Prepares surface for painting

AB05 Apply masking tape and paper

AB06 Operate spray paint equipment

AB07 Perform lacquer refinishing

AB08 Perform enamel refinishing

AB09 Remove and install glass

AB10 Preparing vehicle for delivery

AB11 Estimating damage repairs

AB12 Select and use appropriate materials and supplies

SUBCLUSTER: AUTO BODY REPAIR

Sheet 1 of 1

TASK: Remove, overhaul, and replace trim and hardware

Code: APS - AB01

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will

1. select the appropriate tools for removing, overhauling, and replacing time and hardware
2. follow specified safety precautions in removing, overhauling, and replacing trim and hardware
3. remove, overhaul, and replace the following trim and hardware components in accordance with time specified in the flat rate manual
   a. door locks
   b. inside door handle
   c. outside door handle
   d. front door ventilator
   e. electric door locks
   f. arm rest assemblies
   g. door trim panels
   h. headlining assembly
   i. weatherstrip
   j. hood chrome and letters
   k. fender chrome and letters
   l. aerials

Instructional Methods

- Teacher assists, directs, and/or monitors a student(s) in seeking and developing a need (reason) for initiating the task module.
- Student reviews the appropriate sections and illustrations in textbooks and related materials
- Students view individually or in small groups the appropriate instructional media materials
- Teacher provides a demonstration of special tools used in removing trim and hardware
- Students practice specific operation on obsolete materials or components, simulated components, models, or mock-ups
- Students develop competencies by actual practice of the identified task skills on personal car or customer's car

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,5,6,8,9 NUMBERS B 2b,4a,d,i APPLICATION C 2a,3,5,8 PHYSICAL D 1,2c,3	Auto Body Repairing and Repainting pp. 100-123	13	9

SUBCLUSTER: AUTO BODY REPAIR

: APS- AB01 TASK: Remove, overhaul, and replace trim and hardware

Basic Information for Cooperative Teaching

Language of the Task

Automotive body trim parts
- weatherstrip (around doors)
- door locks
- door handles
- electric door locks
- arm rest assemblies
- door trim panels
- headliner (inside of the roof)
- chrome and lettering
  - fenders
  - grille
- aerials

Quantitative Concepts

Chrome lettering often designates "model name" or "engine size"

Replacement trim
- part ordering information from tag number
  - trim color
  - paint color
  - body style

Suggestions:

- The concept of "trim"
- Special tools are needed to remove trim parts
- Have students interpret necessary ordering information by interpreting auto identification tag number and using the manufacturer's codebook (See the Auto Body instructor)
- Teacher and deaf student should cooperatively develop some simple signs
- Drill deaf student extensively on language of the task
- Provide many tactile and hearing experiences for the blind student to reinforce task knowledges/skills
- Give the blind student ample time for accumulating finger knowledge. Instructor must aid student in moving fingers for gathering information

Supportive Instructional Materials:

Blow-up of vehicle identification tag showing how to translate manufacturer's codes for paint color, body style, and trim colors

SUBCLUSTER: AUTO BODY REPAIR

TASK: Perform bumping operations

Sheet 1 of 1

Code: APS - AB02

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will

1. identify by name specific body fillers and equipment used in repairing surfaces or components
2. select the appropriate materials, tools, and equipment needed in specific operations
3. recognize and observe specific safety precautions in repairing surfaces
4. perform the following job skills with accuracy to meet the accepted manufacturer's design
   a. rough bumping
   b. straightening
   c. bump a simple dent
   d. bump a rolled dent
   e. bump a ridge
   f. shrink metal
   g. stretch metal
   h. remove dents with heat
   i. fill with lead
   j. fill with plastic
   k. apply appropriate putty for filling deep nicks or scratches in automobile bodies
5. finish the bumped sheetmetal panel to original condition using
   a. vixen file
   b. solder flow file
   c. pick hammer
   d. dolly block

Instructional Methods

- Teacher assists, directs, and/or monitors a student(s) in seeking and developing a need(reason) for initiating the task module.
- Student reviews the appropriate sections and illustrations in textbooks and related materials
- Students view individually or in small groups the appropriate instructional media materials
- Teacher provides a demonstration of products, safety precautions, and repair procedures
- Students practice specific operation on obsolete materials or components, simulated components, models, or mock-ups
- Students develop competencies by actual practice of the identified task skills on personal car or customer's car

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,3,5,7,9	Auto Body Repairing and Repainting pp 23-55	13	9
NUMBERS B 4b,c,d,f,5	"Hand Tools" (series)	12	15
	"Metal Preparation"	12	15
	"Filling Techniques" (series)	12	15
	"Hammer and Dolly"	12	15
APPLICATION C 5,8	"Simple Rolled Buckle"	12	15
	Instructional models (old fenders)	2	
PHYSICAL D 1a,d,e,f 2c,3a,c,f,g	Display board illustrating procedures for body filling and surface preparation	16	28

SUBCLUSTER: AUTO BODY REPAIR

APS- AB02 TASK: Perform bumping operations

Basic Information for Cooperative Teaching

Language of the Task	Quantitative Concepts
Common auto body deformations dent crease buckle twist	Concept of "shrinking" metal Concept of "stretching" metal Concept of "filling" dents or creases Concept of "straightening"

Suggestions:

- Teacher and deaf student should cooperatively develop some simple signs
- Be careful in using words with multiple meanings when talking to lip reading deaf students
- Use sample board illustrating dents, creases, buckle, twist
- Hand tool safety is extremely important
- Informally encourage voluntary buddy system for assisting blind students (individualize without calling attention to individual)
- Give the blind student ample time for accumulating finger knowledge. Instructor must aid student in moving fingers for gathering information

Supportive Instructional Materials:

SUBCLUSTER: AUTO BODY REPAIR

Sheet 1 of 1

TASK: Remove and replace body components

Code: APS - AB03

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will

1. select the appropriate tools and fasteners to remove and replace body components
2. select the appropriate tools for aligning body components
3. follow specified safety precautions in removing and replacing body components
4. remove, replace, and/or align the following body components in accordance with the time allowed in the flat rate manual
   a. bumpers
   b. grille
   c. headlights
   d. radiator support
   e. gravel deflector
   f. hood
   g. front fenders
   h. door assembly
   i. deck lid
   j. rear bumper and valence
   k. tail lights

Instructional Methods

- Teacher assists, directs, and/or monitors a student(s) in seeking and developing a need (reason) for initiating the task module
- Student reviews the appropriate sections and illustrations in textbooks and related materials
- Students view individually or in small groups the appropriate instructional media materials
- Teacher provides a demonstration of removal and replacement of all body components
- Students practice specific operation on obsolete materials or components, simulated components, models, or mock-ups
- Students develop competencies by actual practice of the identified task skills on personal car or customer's car

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,3,5,6,7,8,9 NUMBERS B 2b,3a,c,d,i 5 APPLICATION C 3,5,8 PHYSICAL D 1a,d,2d, 3a,c,e,f,g	Auto Body Repairing and Repainting pp. 74-77 and 88-99	13	9

SUBCLUSTER: AUTO BODY REPAIR

File: APS - AB03 TASK: Remove and replace body components

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Identification of the major automotive body components hood fenders doors quarter panels tail panels trunk lid (deck lid) lower valence	Location and spatial relationships of major body components fenders (right, left) quarter panels (right, left) doors (right, left, front, rear) tail panels (right left) deck lids (rear, front)	• See auto body instructor for illustrated diagram identifying and locating the major body components • Designation of right, left, front, rear is always given from driver's seat • Teacher and deaf student should cooperatively develop some simple signs • Informally encourage voluntary buddy system for assisting deaf students (individualize without calling attention to the individual) • Give the blind student ample time for accumulating finger knowledge. Instructor must aid student in moving fingers for gathering information • Encourage blind student to graciously accept help from others in learning this task

Supportive Instructional Materials:

SUBCLUSTER: AUTO BODY REPAIR

Sheet 1 of 1

TASK: Prepares surface for painting

Code: APS- AB04

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will

1. identify by name specific parts, components and equipment used in preparing surfaces for paint
2. recognize and observe specific safety precautions in preparing surface
3. select the appropriate materials and equipment needed in specific operations
4. perform the following job skills with accuracy to meet the accepted manufacturer's specifications and design
   a. prepare metal surface for finishing by preparing a smooth surface
   b. prepare metal surface for finishing by preparing clean, dust free surface
   c. prepare metal surface for finishing by conditioning metal to provide for adherance of finish to metal
   d. use a power sander using sanding materials appropriate for the job at hand
   e. hand sand surfaces of an automobile by using appropriate materials
   f. clean surface with a "tack" rag before area is sprayed
   g. remove and replace trim and letters
   h. apply sealer coat in preparation for recoating of lacquer or acrylic finishes

Instructional Methods

- Teacher assists, directs, and/or monitors a student(s) in seeking and developing a need (reason) for initiating the task module
- Student reviews the appropriate sections and illustrations in textbooks and related materials
- Students view individually or in small groups the appropriate instructional media materials
- Teacher provides a demonstration of techniques for preparing body surfaces for painting
- Students practice specific operation on obsolete materials or components, simulated components, models, or mock-ups
- Students develop competencies by actual practice of the identified task skills on personal car or customer's car

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,3,9	Auto Body Repairing and Repainting pp. 171-172	13	9
NUMBERS B 2	"Metal Preparation"	12	15
	"Feather Edging"	12	15
	"Surface Preparation"	12	15
APPLICATION C 3,8			
PHYSICAL D 1a,d,f,2c, 3c,f,g			

SUBCLUSTER: AUTO BODY REPAIR

e: APS - AB04 TASK: Prepares surface for painting

Basic Information for Cooperative Teaching	
Language of the Task	**Quantitative Concepts**
Dry Smooth Clean Dust-free Sanding/grinding Sand paper Feather edge	Grit sizes for featheredging 320-400 Grit sizes of abrasives range from 16 (coarse) to 400 (fine)

Suggestions:

- See auto body instructor for samples of the different grits of abrasive papers. Practice identifying each by number
- Be careful in using words with multiple meanings when talking to lip reading deaf students
  - sand
  - feather
- Informally encourage voluntary buddy system for assisting deaf students (individualize without calling attention to the individual)

Supportive Instructional Materials:

Different grit size abrasive papers
- 16.
- 34.
- 80.
- 320-400

SUBCLUSTER: AUTO BODY REPAIR

Sheet 1 of 1

TASK: Apply masking tape and paper

Code: APS - ABO5

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will

1. select the appropriate materials for the given masking application
2. clean surfaces before masking
3. mask the following body components in accordance with specifications
   a. trim and hardware
   b. molding and beading
   c. windshield
   d. body panel
   e. windows
   f. upholstery
   g. headlights
   h. wheels
   i. front end

Instructional Methods

- Teacher assists, directs, and/or monitors a student(s) in seeking and developing a need (reason) for initiating the task module
- Student reviews the appropriate sections and illustrations in textbooks and related materials
- Students view individually or in small groups the appropriate instructional media materials
- Teacher provides a demonstration of masking techniques
- Students practice specific operation on obsolete materials or components, simulated components, models, or mock-ups
- Students develop competencies by actual practice of the identified task skills on personal car or customer's car

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 6,9	Display board illustrating procedures for masking	16	28
NUMBERS B 5	Auto Body Repairing and Repainting pp. 159-165	13	9
APPLICATION C 3,5,8	"Masking"	12	15
PHYSICAL D 1a,d,e, 2c, 3a,c,f,g			

SUBCLUSTER: AUTO BODY REPAIR

e: APS - AB05 TASK: Apply masking tape and paper

Basic Information for Cooperative Teaching

Language of the Task

Common components needing masking when auto is to be painted
- trim and hardware
- molding
- windshield
- body panel
- windows
- headlights
- wheels
- front ends
- upholstery

Quantitative Concepts

The concept of masking -
- to cover areas not being painted so that they are protected from over-spray

Suggestions:

- Practice masking different objects in class. Increase masking difficulty gradually by selecting objects of complex shape
- Informally encourage voluntary buddy system for assisting deaf/blind students (individualize without calling attention to the individual)

Supportive Instructional Materials:

Paper
Masking Tape

SUBCLUSTER: AUTO BODY REPAIR

Sheet 1 of 2

TASK: Operate spray paint equipment

Code: APS - AB06

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will

1. identify by name specific parts, components and equipment used in operating spray paint equipment
2. select the appropriate materials and equipment needed in a specific spray paint operation
   a. enamel application
   b. lacquer application
3. recognize and observe specific safety precautions in operating spraying paint
4. perform the following job skills with accuracy to meet the manufacturer's specifications
   a. select and apply appropriate materials in paints and on finishes to overcome painting defects
   b. match colors of automobile finishes
   c. spot paint automobile finishes blending in the new finish to the original finish
   d. spray mist coats to increase gloss and reduce compounding
   e. spray mist coats to level over spray roughness
   f. spray mist coats to apply an additional coat
   g. prepare automotive finishes for application including mixing and stirring paint

Instructional Methods

- Teacher assists, directs, and/or monitors a student(s) in seeking and developing a need (reason) for initiating the task module
- Student reviews the appropriate sections and illustrations in textbooks and related materials
- Students view individually or in small groups the appropriate instructional media materials
- Teacher provides a demonstrations of use of spray equipment and safety precautions
- Students practice specific operation on obsolete materials or components, simulated components, models, or mock-ups
- Students develop competencies by actual practice of the identified task skills on personal car or customer's car

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,5,8,9	"Making the Most Use of Spray Equipment"	8	29
	"Matching the Hard Ones"	10	29
NUMBERS B2,4a,c,d,f	"Paint Problems"	10	29
APPLICATION C 5,8	"The Acrylic Story"	10	30
	"Color Match"	10	30
PHYSICAL D 1a,b,d,2c, 3c,f,g	Spray Gun Motion Study	13	31
	"Cleaning Spray Gun"	12	15

SUBCLUSTER: AUTO BODY REPAIR

: APS - AB06 TASK: Operates spray paint equipment

Basic Information for Cooperative Teaching

Language of the Task

Air spray gun

Extractor

Air inlet

Air hose

Siphon feed

Pressure feed

Cup regulator

Quantitative Concepts

Spray gun operation theory - a mixing of air and paint under pressure

Spray gun distance from painting surface
6"-12"

Deriving paint colors by mixing proportionally

Suggestions:

- Speak distinctly and slowly, use simple sentences, and look directly at lip leading deaf students
- This task may be particularly appropriate for deaf students
- Cleaning of equipment is important to this task. Equipment must be cleaned when different paints are being used
- Practice paint spraying with an aersol spray can
- Experiment with mixing paint colors

Supportive Instructional Materials:

SUBCLUSTER: AUTO BODY REPAIR

Sheet 2 of 2

TASK: Operate spray paint equipment

Code: APS - AB06

Student Name: _____

Student Progress					Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced	Involved	Productive	Employable		Given the necessary tools, materials, equipment, and requisite knowledge, the learner will h. prepares automobile finishes for application including reducing paint for spray painting i. clean spray gun after painting automobile j. identify colors using code numbers on the containers k. use lacquer removing solvent to identify lacquer finishes on car bodies l. prepare the metal and apply a prime coat on automobile bodies	

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE			
NUMBERS			
APPLICATION			
PHYSICAL			

SUBCLUSTER:

___: ___ - ____ TASK:

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	

Supportive Instructional Materials:

SUBCLUSTER: AUTO BODY REPAIR

Sheet 1 of 1

TASK: Perform lacquer refinishing

Code: APS - ABO7

Student Name: _____

Student Progress	Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced / Involved / Productive / Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will 1. distinguish between the different types of lacquers a. lacquer b. acrylic lacquer 2. determine paint code of original finish from vehicle identification tag 3. prepare surfaces to specifications 4. mix, prepare, and fill spray equipment according to specifications 5. apply paint within manufacturer's specifications a. 3-5 double wet coats	• Teacher assists, directs, and/or monitors a student(s) in seeking and developing a need (reason) for initiating the task module • Student reviews the appropriate sections and illustrations in textbooks and related materials • Students view individually or in small groups the appropriate instructional media materials • Teacher provides a demonstration of procedures and techniques for lacquer refinishing • Students practice specific operation on obsolete materials or components, simulated components, models, or mock-ups • Students develop competencies by actual practice of the identified task skills on personal car or customer's car

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,5,7,9	"Matching the Hard Ones"	10	29
	"Color Match"	10	30
NUMBERS B 2b,4a,c,f	Metal practice board	2	
APPLICATION C 2a,5,8	Auto Body Repairing and Repainting Chap. 29	13	9
PHYSICAL D 1a,c,e,2c, 3a,c,f,g	"Mixture, Lacquer and Acrylic"	12	15
	"Common Problems"	12	15

SUBCLUSTER: AUTO BODY REPAIR

File: APS - AB07 TASK: Perform lacquer refinishing

Basic Information for Cooperative Teaching

Language of the Task

Double wet coat
two full paint coats in succession - then allow for flash time

Types of lacquer-based finishes
lacquer
acrylic lacquer

Wet coat

Flash time

Tack rag

Viscosity meter (Zahn cup)

Painting problems
runs and sags
starved or thin film
orange peel
zebra effect

Quantitative Concepts

Flash time

Ratio of paint reducer/thinner mixtures
2:1 (enamel)
125-150% (lacquer)

Common gun spraying pressures
55-65 psi for enamel
30-45 psi for lacquer

Suggestions:

- Practice mixing specified ratios - verify with a No. 2 Zahn cup (viscosity meter) (see Auto Body inst. for materials)
- Associate identification of painting problems with pictures of each problem condition obtained from the Auto Body instructor
- This task may be particularly appropriate for deaf student

Supportive Instructional Materials:

Zahn cup
Pictures of paint problem conditions

SUBCLUSTER: AUTO BODY REPAIR

Sheet 1 of 1

TASK: Perform enamel refinishing

Code: APS - AB08

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will

1. distinguish between the different types of enamels
   a. enamel
   b. acrylic enamel
   c. polyurethane
2. determine paint code of original finish from vehicle identification tag
3. prepare surfaces to specifications
4. mix, prepare, and fill spray equipment according to specifications
5. apply paint within manufacturer's specifications
   a. tack coat
   b. two full wet coats allowing flash time between

Instructional Methods

- Teacher assists, directs, and/or monitors a student(s) in seeking and developing a need (reason) for initiating the task module
- Student reviews the appropriate sections and illustrations in textbooks and related materials
- Students view individually or in small groups the appropriate instructional media materials
- Teacher provides a demonstration of procedures and techniques for enamel refinishing
- Students practice specific operation on obsolete materials or components, simulated components, models, or mock-ups
- Students develop competencies by actual practice of the identified task skills on personal car or customer's car

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,5,7,9	"Making the Most Use of Spray Equipment"	8	29
NUMBERS B 2,4a,c,d,f	"Paint Problems"	10	29
APPLICATION C 5,8	Metal practice board	2	
PHYSICAL D 1a,d,f 2c,3c,f,g	Auto Body Repairing and Repainting Chap. 29	13	
	"Common Problems"	12	15

SUBCLUSTER: AUTO BODY REPAIR

APS - AB08 TASK: Perform enamel refinishing

Basic Information for Cooperative Teaching

Language of the Task

Flash time - time lapse necessary for evaporation of paint thinner or reducer between coats. Paint becomes tacky after flash time has elapsed

Types of enamel-based finishes
- enamel
- acrylic enamel
- polyurethane

Painting problems
- runs and sags
- starved or thin film
- orange peel
- zebra effect

Quantitative Concepts

Flash time

Students must determine appropriate paint ordering information from vehicle tag number

Interpret identification numbers and letters

Common gun spraying pressures
- 55-65 psi for enamel
- 30-45 psi for lacquer

Suggestions:

- Practice spraying enamels from an aerosal can. Mask and spray different shapes on a flat cardboard. Then expand to include spraying three dimensional cardboard shapes
- See Auto Body instructor for materials
- Associate an identification of each painting problem with a picture of each condition obtained from the Auto Body instructor
- Speak distinctly and slowly, use simple sentences, and look directly at lip reading deaf students
- This task may be particularly appropriate for deaf student

Supportive Instructional Materials:

Sample work problems on interpreting tag numbers for paint code information

SUBCLUSTER: AUTO BODY REPAIR

Sheet 1 of 1

TASK: Remove and install glass

Code: APS - AB09

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will

1. select the appropriate tools and materials for removal and installation of auto glass
2. follow specified safety precautions for glass removal and installation
3. remove and install glass according to time specified in flat rate manual
   a. vent windows
   b. side door glass (four door)
   c. side door glass (2 dr. Ht.)
   d. quarter glass
   e. rear window
   f. windshields

Instructional Methods

- Teacher assists, directs, and/or monitors a student(s) in seeking and developing a need (reason) for initiating the task module
- Student reviews the appropriate sections and illustrations in textbooks and related materials
- Student view individually or in small groups the appropriate instructional media materials
- Teacher provides a demonstration of procedures and techniques for specific glass removal and installation problems
- Students practice specific operation on obsolete materials or components, simulated components, models, or mock-ups
- Students develop competencies by actual practice of the identified task skills on personal car or customer's car

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 3,6,7,9	Auto Body Repairing and Repainting Chap. 19	13	9
NUMBERS B 4a,d,5	Auto Manufacturer's service manual	14	
APPLICATION C 3,5,8			
PHYSICAL D 1a,d,e,2c, 3a,c,f,g			

SUBCLUSTER: AUTO BODY REPAIR

e: APS - AB09 TASK: Remove and install glass

Basic Information for Cooperative Teaching	
Language of the Task	Quantitative Concepts
Vent wing Door glass Quarter glass Rear window Windshield *Right *Left *Front *Rear *Right, left, front, and rear is from driver's seat	Interpretation of manufacturer's service manual using a table of contents or index to locate needed information

Suggestions:

- Stress the safety factors associated with removing glass from carton and handling of auto glass
- Speak distinctly and slowly, use simple sentences, and look directly at lip reading deaf students
- This task may be particularly appropriate for deaf student

Supportive Instructional Materials:

SUBCLUSTER: AUTO BODY REPAIR

Sheet 1 of 1

TASK: Preparing vehicle for delivery

Code: APS - AB10

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will

1. identify the necessary jobs for preparing vehicle for customer
2. select the appropriate cleaning tools and supplies for a given cleanup job in the body shop
3. perform the following job skills with accuracy to meet the accepted customer's standards
   a. vacuum interior of automobile
   b. clean interior of automobile
   c. wash and wax automobile exterior
   d. rub and polish new finish in accordance with recommendations for the kind of finish
   e. replace front and rear mats
   f. use appropriate compound for finishing and polishing automobile bodies
   g. replace and/or cement loose weatherstripping
   h. touch-up or paint chipped or scratched areas
   i. locating air leaks

Instructional Methods

- Teacher assists, directs, and/or monitors a student(s) in seeking and developing a need (reason) for initiating the task module
- Student reviews the appropriate sections and illustrations in textbooks and related materials
- Students view individually or in small groups the appropriate instructional media materials
- Teacher provides a demonstration of procedures for vacuuming, cleaning, washing, and waxing automobiles
- Students practice specific operation on obsolete materials or components, simulated components, models, or mock-ups
- Students develop competencies by actual practice of the identified task skills on personal car or customer's car

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,3,7,9 NUMBERS B 4d APPLICATION C 3,8 PHYSICAL D 1a,d,e, 2b/c, 3c,f,g	Auto Body Repairing and Repainting Chap. 32	13	9

SUBCLUSTER: AUTO BODY REPAIR

: APS - AB10 TASK: Prepare vehicle for delivery

Basic Information for Cooperative Teaching	
Language of the Task	Quantitative Concepts
Floor mats Vacuum Wash Wax Polishing Interior cleaning	Front, rear, left and right location of floor mats

Suggestions:

- Sponsor a class car wash
- Speak distinctly and slowly, use simple sentences, and look directly at lip reading deaf students
- This task may be particularly appropriate for deaf student

Supportive Instructional Materials:

SUBCLUSTER: AUTO BODY REPAIR

Sheet 1 of 1

TASK: Estimating damage repairs

Code: APS - AB11

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will

1. identify specific names of parts of an automobile construction design
2. select the proper materials to determine the estimated costs
3. perform the following job skills with accuracy to meet the accepted manufacturer's specifications
   a. analyze damage, making a repair procedure
   b. estimate cost of repair
   c. use parts replacement manuals, figuring equipment costs and percentage for labor costs
   d. photograph damaged area
   e. answer telephone calls and set-up appointments

Instructional Methods

- Teacher assists, directs, and/or monitors a student(s) in seeking and developing a need (reason) for initiating the task module
- Student reviews the appropriate sections and illustrations in textbooks and related materials
- Students view individually or in small groups the appropriate instructional media materials
- Teacher provides a demonstration of the sequence of estimating and use of estimating guide
- Students practice specific operation on obsolete materials or components, simulated components, models, or mock-ups
- Students develop competencies by actual practice of the identified task skills on personal car or customer's car

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 1,2,5,6,8,9	Estimating guide	14	
NUMBERS B 2a,b,5,6	Sample estimating forms	20	
APPLICATION C 1a,b,2b,3,4,5,6,7,8,9			
PHYSICAL D 1a,d,e,f,2a,3b,c,f,g			

SUBCLUSTER: AUTO BODY REPAIR

e: APS - ABll TASK: Estimating damage repairs

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Customer estimate information name address phone number insurance company Labor cost Parts cost Total	Interpretation of the flat rate manual to determine the number of hours needed for a given job Listing of replacement part costs Listing of labor costs (from the flat rate manual) Addition of costs to determine total costs	• Practice adding columns of figures from an estimating form with a small adding machine • Stress importance of communication

Supportive Instructional Materials:

Estimating forms
Estimating guide

SUBCLUSTER: AUTO BODY REPAIR

Sheet 1 of 1

TASK: Select and use appropriate materials and supplies

Code: AFS - AB12

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	
				Given the necessary tools, materials, equipment, and requisite knowledge, the learner will 1. identify by commercial name each of the following auto body materials/supplies a. masking tape b. paper c. water sandpaper d. polishing wheels e. interior cleaners f. exterior cleaners g. paint h. reducer i. surface primer j. sealer k. putty l. wax grease remover m. rubbing compound n. metal conditioning/rust inhibitor

Instructional Methods

- Teacher assists, directs, and/or monitors a student(s) in seeking and developing a need (reason) for initiating the task module
- Student review the appropriate sections and illustrations in textbooks and related materials
- Students view individually or in small groups the appropriate instructional media materials
- Teacher provides a demonstration of techniques for identifying specific label information
- Students practice specific operation on obsolete materials or components, simulated components, models, or mock-ups
- Students develop competencies by actual practice of the identified task skills on personal car or customer's car

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,3,6,7,8,9 NUMBERS B 2a APPLICATION C 1a,3,4,5,6,7,8 PHYSICAL D 1a,b,c,d,e,f,2b,3c,d,e,f	Promotional films from companies DuPont Three M Promotional brochures from companies	8,10 14	 29 15

SUBCLUSTER: AUTO BODY REPAIR

: APS - AB12 TASK: Select and use appropriate materials and supplies

Basic Information for Cooperative Teaching

Language of the Task

Trade names of materials and supplies listed on opposite side

Quantitative Concepts

Evaporation time of paint thinner and reducers
- fast and slow evaporation relates to drying times of paint (dependent upon temperature or condition)

Common sizes of masking tape
- 3/4" width

Common widths of masking paper
- 6" and 12"

Sandpaper grits
- 36 (course sandpaper)
- 600 (fine sandpaper)

Heavier grits of rubbing compound are used to buff rough surfaces, mainly acrylic lacquer surfaces while lighter grits of compound for hand application for cleaning purposes

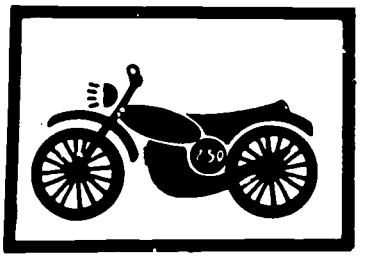
Suggestions:

- Get samples of fast and slow drying thinner or reducer from Auto Body instructor. Spray these samples on opposite ends of a sheet of masking paper and compare evaporation times
- Be sure students relate narrow width paper to masking small areas and wide width paper to masking large areas
- There are a wide variety of sandpaper grits
- Drill deaf student extensively on language of the task

Supportive Instructional Materials:

Slow/fast drying thinners and reducers
Sandpaper (various grit sizes)
Masking tape and paper rubbing compound (various grades)

SMALL ENGINE REPAIR



INSTRUCTIONAL TASK MODULES

SE01 Remove and replace engine flywheel

SE02 Clean the engine and chassis

SE03 Remove and replace the blower housing

SE04 Service the mechanical and air vane governor

SE05 Service the ignition system

SE06 Service the connecting rod

SE07 Service the cylinder

SE08 Service the piston

SE09 Service the valves

SE10 Service the crankshaft

SE11 Service the main bearings

SE12 Service the camshaft

SE13 Service the crankshaft bearing seals

SE14 Service the cylinder head

SE15 Remove and replace engine

SE16 Service the rotary mower blade

SE17 Service the impulse and rewind starter

SE18 Service the lubricating system

SE19 Service the fuel system

SE20 Service the exhaust system

SE21 Service the cooling system

SE22 Prepare engine for winter storage

SE23 Complete engine check-up procedures

SE24 Perform engine tune-up procedure

SUBCLUSTER: SMALL ENGINE REPAIR

Sheet 1 of 1

TASK: Remove and replace engine flywheel

Code: APS - SE01

Student Name: _____

Student Progress	Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced / Involved / Productive / Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify the parts of the flywheel puller by visual and tactual examination. 2. by tactual, visual and auditory means, observe the teacher demonstration using the flywheel puller to remove engine flywheel. 3. practice safety precautions by using flywheel puller according to specified safety instructions. 4. perform the following job skills properly so that the engine will operate: a. remove flywheel nut and washer. b. use flywheel puller to remove flywheel. c. replace flywheel in position with key. d. replace washer and nut. e. use torque wrench to tighten nut to specifications.	• Students become acquainted with this area of the engine by handling engines and parts. • Teacher provides a demonstration of job skills on different types of engines with directed observation for individual students. • Students will be involved in tear down and assembly of engines performing the identified job skills. • Students handle and discuss components and parts as they learn the name and function of each. • Para-professional provides individual instruction for the identified task.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 9 NUMBERS B 2, 4e,g APPLICATION C 5 PHYSICAL D 1a,d 2c 3a,c,g	Service manuals	14	16,17 18,19 21
	Engine parts	1	
	Manufacturer's slides	11	16,17
	"Suggested Job Completion Times"	14	25

SUBCLUSTER: SMALL ENGINE REPAIR

: APS - SEQ1 TASK: Remove and replace engine flywheel

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Engine Flywheel Puller Nut Washer Key Torque wrench	Concept of torque - twisting force on the head of the bolt unit or component to be tightened. Measured in in/lbs. and ft/lbs. Reading torque measurements on a dial or micrometer indicator.	• Provide many tactile and hearing experiences for the blind student to reinforce task knowledges/skills. • Informally encourage voluntary buddy system for assisting blind or deaf students (individualize without calling attention to the individual). • It is very important for the special education teacher to check with the vocational education teacher.

Supportive Instructional Materials:

SUBCLUSTER: SMALL ENGINE REPAIR

Sheet 1 of 1

TASK: Clean the engine and chassis

Code: APS- SE02

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. identify by tactual and visual examination all the components of the cooling system according to the manufacturer's engine manual.
2. describe verbally the operation of the cooling system.
3. explain verbally the importance of a clean engine and chassis.
4. observe safety precautions relating to the cleaning of the engine and chassis by following the prescribed safety rules.
5. perform the following job skills with accuracy to meet the manufacturer's specifications:
   a. remove blower housing and disconnect spark plug wire.
   b. direct compressed air around cooling fins, engine block, and chassis.
   c. work out any solid objects blocking air flow around cylinder.
   d. wipe off engine and chassis.
   e. scrape grass from underside of chassis.

Instructional Methods

- Students read assignment covering this task description. Teacher leads class discussion covering this reading assigrment.
- Teacher provides a demonstration of job skills on different types of engines with directed observation for individual students.
- Students handle and discuss components and parts as they learn the name and function of each.
- Students become acquainted with this area of the engine by handling engines, models, and parts.
- Students will be involved in tear down and assembly of engines performing the identified job skills.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 9	Power Technology, Unit 6	13,20	20
NUMBERS B 2 4b,c,d,e,f	Service manuals	14	16,17 18,19
APPLICATION C 3,4,8	Engines	1	
PHYSICAL D 1a,d,f 2b 3c,f,g			

SUBCLUSTER: SMALL ENGINE REPAIR

le: APS - SE02 TASK: Clean the engine and chassis

Basic Information for Cooperative Teaching

Language of the Task

Compressed air

Cooling fins

Blower housing

Spark plug

Spark plug wire

Engine

Chassis

Engine block

Cylinder

Air flow

Cleaning liquids

Quantitative Concepts

Read pressure and temperature gauges on compressor equipment.

Basic concept:
engine temperatures run higher on dirty engines.

Suggestions:

- Special education teacher must contact vocational education teacher to meet area needs.
- Safety is extremely important. See the Small Engine's teacher.
- Informally encourage voluntary buddy system for assisting blind or deaf students (individualize without calling attention to the individual).
- Speak distinctly and slowly, use simple sentences, and look directly at lip reading deaf students.

Supportive Instructional Materials:

SUBCLUSTER: SMALL ENGINE REPAIR

Sheet 1 of 1

TASK: Remove and replace the blower housing

Code: APS - SE03

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. identify tactually and visually the blower housing on a given engine.
2. recognize its function in relation to the cooling system.
3. identify specific blower housing attachments to be loosened or removed.
4. identify model and serial numbers, if located on the housing, according to the manufacturer's instruction manual.
5. practice safety precautions related to the removal and replacement of the blower housing.
6. perform the following job skills with accuracy to meet the manufacturer's specifications:
   a. remove and replace the blower housing.
   b. remove and replace specific attachments as necessary.
   c. clean the blower housing.
   d. check the housing for cracks and bends.

Instructional Methods

- Students become acquainted with this area of the engine by handling engines, models, and parts.
- Teacher and/or resource person provides a demonstration of job skills on different types of engines with directed observation for individual students.
- Students will be involved in tear down and assembly of engines performing the identified job skills.
- Students handle and discuss components and parts as they learn the name and function of each.
- Para-professional provides individual instruction for the identified task.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,9	Power Technology, Unit 6	13	20
NUMBERS B 2 4a,e,f,g	Service manuals	14	16,17 18,19 21
APPLICATION C 2,5,8	Engine and parts	1	
PHYSICAL D 1a,c,d 2b 3a,c,f,g			

SUBCLUSTER: SMALL ENGINE REPAIR

: APS - SE03 TASK: Remove and replace the blower housing

Basic Information for Cooperative Teaching

Language of the Task	Quantitative Concepts
Blower housing Shroud Bolt Lock washer Attachment Serial number Loosen Remove Replace Manufacture	Recognize fine and coarse threads. Recognize hole sizes of washers: i.d. 1/4, o.d. 3/8 Recognize common bolt sizes: 1/4" (diameter) 5/16" 3/8" 1/2"

Suggestions:

- Informally encourage voluntary buddy system for assisting blind students or deaf students (individualize wihtout calling attention to the individual).
- Speak distinctly and slowly and allow time for visually impaired student to repeat pertinent information.

Supportive Instructional Materials:

SUBCLUSTER: SMALL ENGINE REPAIR

TASK: Service the mechanical and air vane governor

Code: APS - SE04

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. identify tactually and visually the type and model of engine according to previous experience and the manufacturer's instruction manual.
2. identify the basic type of governor mechanism used on the engine.
3. practice safety precautions relating to servicing the mechanical governor.
4. perform the following job skills with accuracy to meet the manufacturer's specifications:
   a. remove and replace engine parts necessary to expose governor.
   b. check governor and levers for obstructions.
   c. check governor and lever action for free movement.
   d. operate engine to check proper governor operation.
   e. remove, replace and adjust governor assembly.

Instructional Methods

- Students read assignment covering this task description. Teacher leads class discussion covering this reading assignment.
- Teacher leads demonstration of job skills on different types of engines with directed observation for individual students.
- Students become acquainted with this area of the engine by handling engines, models, and parts.
- Students will be involved in tear down and assembly of engines performing the identified job skills.
- Teacher demonstration with slides and transparencies.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 7,9	Power Technology, Unit 4	13, 20	20
NUMBERS B 2 4a,d,e	Service manuals	14, 20	16,17 18,19 21
APPLICATION C 2,3,5,8	Engine and parts	1	
PHYSICAL	Manufacturer's slides	11	16,17
D 1a,c,d,f 2b 3a,c,f,g	"Suggested Job Completion Times:	14	25

SUBCLUSTER: SMALL ENGINE REPAIR

e: APS - SEQ4 TASK: Service the mechanical and air vane governor

Basic Information for Cooperative Teaching

Language of the Task

Governor

Air vane

Mechanical

Obstructions

Dirt

Grass

Oils (heavy)

Lever

Free movement

Quantitative Concepts

Recognize principles of ample levers.

Recognize gear principles and ratios.

Basic concept:
Air movement is generated by flywheel fins and pushes against the air vane.

Suggestions:

- Define centrifugal force.
- Important for cooperating teacher to contact vocational education teacher to determine the need in view of the school or center's curriculum focus and equipment.
- Discuss concept of equal and opposite reactions.
- Informally encourage voluntary buddy system for assisting blind or deaf students (individualize without calling attention to the individual).
- Contact Michigan School for the Blind for braille and large print materials.

Supportive Instructional Materials:

SUBCLUSTER: SMALL ENGINE REPAIR

TASK: Service the ignition system

Code: APS - SE05

Student Name: _____

Student Progress	Behavioral Task Knowledges/Task Skills
Introduced / Involved / Productive / Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify tactually and verbally describe the function, relationship and construction of each of the ignition system components. 2. diagram the ignition system on paper or tactually trace it on an engine (for blind student). 3. recognize the condition of spark plug firing tip as an indicator of engine condition. 4. practice safety precautions related to the servicing of the ignition system. 5. perform the following job skills with accuracy to meet the manufacturer's specifications: a. remove and replace spark plugs. b. clean spark plug and set gap. c. check for spark plug cracked porcelain and burned electrode. d. remove and replace flywheel. e. check flywheel for cracks and broken fins. f. check condition of flywheel screen. g. remove and replace breaker points cover. h. check breaker points cover for distortion and proper fit.

Instructional Methods

- Students review slides or transparencies on the ignition system.
- Teacher provides a demonstration of the job skills on different types of engines with directed observation for individual students.
- Students become acquainted with this area of the engine by handling engines, models, and parts.
- Students will be involved in tear down and assembly of engines performing the identified job skills.
- Students read assignment covering this task description. Teacher leads class discussion covering this reading assignment.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,3,9	Power Technology, Unit 7	13,20	20
NUMBERS B 2 4a,f	Small engine service manual	14	21
APPLICATION C 2,3,5,8	Service manuals	14	16,17 18,19
PHYSICAL D 1a,c,f 2b 3a,c,f,g	DCA Transparencies	12	24
	Manufacturer's slides	11	16,17
	Engine, models and parts	1,2	
	"Suggested Job Completion Times"	14	25

SUBCLUSTER: SMALL ENGINE REPAIR

: APS - SE05 TASK: Service the ignition system

Basic Information for Cooperative Teaching

Language of the Task

Ignition system
Spark plug
Electrode
Porcelain
Breaker points and cover
Magnet
Plunger
Braker cam lobe
Continuity checker
Light
Meter needle
Audio
Coil
Condenser
Armature plate assembly
Core
Air gap
Magneto
Top dead center
Timing

Quantitative Concepts

Measure spark plug gap sizes: .025-.030"

Measure points gap: .020"

Measure air gap - .008 - .011"

Suggestions:

- Important concept: Ignition has to be "timed" to fire at a certain point in the piston travel.
- Drill deaf student extensively on language of the task.
- Informally encourage voluntary buddy system for assisting deaf or blind students (individualize without calling attention to the individual).
- Be aware of the key word interpretation which lip reading deaf students make from your speech.
- Discuss "engine testing procedures" with the small engines instructor.

Supportive Instructional Materials:

SUBCLUSTER: SMALL ENGINE REPAIR

Sheet 2 of 2

TASK: Service the igrition system

Code: APS - SE05

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced	Involved	Productive	Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will i. remove and replace breaker points. j. check breaker points for pitting or burning. k. set breaker points gap. l. check breaker points plunger and plunger hole. m. check wires, remove and replace if necessary. n. check breaker cam lobe for dirt, cracks, roughness, and proper installation. o. use continuity checker to check proper breaker points installation and operation. p. remove and replace coil and condenser. q. test coil and condenser using electronic small engine tester. r. perform a spark check. s. remove and replace armature plate assembly. t. retime armature plate assembly to engine. u. check and adjust armature air gap.	

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE			
NUMBERS			
APPLICATION			
PHYSICAL			

SUBCLUSTER:

___ - ___ TASK:

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	

Supportive Instructional Materials:

SUBCLUSTER: SMALL ENGINE REPAIR

TASK: Service the connecting rod

Code: APS - SE06

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced	Involved	Productive	Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify the type and model of specific engine. 2. explain the operation and function of the connecting rod. 3. use safety precautions in servicing the connecting rod. 4. perform the following job skills with accuracy to meet the manufacturer's specifications: a. check crankpin bearing surface condition. b. measure crankpin bearing bore. c. remove and reinstall connecting rod to piston. d. measure piston pin diameter. e. check rod cap alignment marks. f. torque connecting rod cap bolts to specifications.	• Students become acquainted with this area of the engine by handling engines, models, and parts. • Teacher provides demonstration of job skills on different types of engines with directed observation for individual students. • Students will be involved in tear down and assembly of engines performing the identified job skills. • Students handle and discuss components and parts as they learn the name and function of each.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,3,9	Power Technology, Unit 3	13,20	20
NUMBERS B 2 4c,e	Service manuals	14,20	16,17 18,19
APPLICATION C 2,3,4,7	Engine and parts	1	
PHYSICAL D 1a,c,d,f 2b 3c,f,g	DCA Transparencies	12	24
	Manufacturer's slides	11	16,17
	"Suggested Job Completion Times"	14	25

SUBCLUSTER: SMALL ENGINE REPAIR

e: APS - SE06 TASK: Service the connecting rod

Basic Information for Cooperative Teaching		
Language of the Task	**Quantitative Concepts**	**Suggestions:**
Connecting rod Crankpin Bore Alignment marks Circle clips Scoring Piston pin Reinstall Oversize	Torque specifications: i.e. 100 in/lbs. Measure diameters of crankpins.	• Informally encourage voluntary buddy system for assisting deaf students (individualize without calling attention to the individual). • Drill deaf student extensively on language of the task. • Important concept: Connecting rod transfers the force of the burning and expansion of fuel to the crankshaft.

Supportive Instructional Materials:

SUBCLUSTER: SMALL ENGINE REPAIR

Sheet 1 of 1

TASK: Service the cylinder

Code: APS - SE07

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will

1. identify tactually and visually the type and model of specific engine.
2. explain the fucntion of the cylinder.
3. use prescribed safety precautions in servicing the cylinder.
4. perform the following job skills with accuracy to meet the manufacturer's specifications:
   a. check surface condition of cylinder walls.
   b. measure cylinder bore.
   c. ridge ream cylinder.
   d. hone cylinder walls.
   e. resize cylinder.
   f. clean exhaust ports (two cycle)

Instructional Methods

- Teacher concentrates his effort with students having difficulty.
- Teacher provides demonstration of job skills on different types of engines with directed observation for individual students.
- Students will be involved in tear down and assemble of engines performing the identified job skills.
- Students become acquainted with this area of the engine by handling engines, models, and parts.
- Students view slides or transparencies on servicing the cylinder.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 9	Power Technology, Unit 3	13	20
NUMBERS B 2 4a	Service manuals	14	16,17 18,19 21
APPLICATION	Engine and parts	1	
C 2,5,7	DCA Transparencies	12	24
PHYSICAL	Manufacturer's slides	11	16,17
D 1a,d,f 2c 3a,c,f,g	"Suggested Job Completion Times"	14	25

SUBCLUSTER: SMALL ENGINE REPAIR

e: APS - SE07 TASK: Service the cylinder

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Cylinder bore Cylinder wall Ridge Ream Hone Deglaze Resize	Measure bore with micrometer tools: common bore sizes - 500-3000	• Be careful in using words with multiple meanings so that blind/deaf student form the correct concept. • Informally encourage voluntary buddy system for assisting blind or deaf students (individualize without calling attention to the individual). • Servicing the cylinder involves preparing the cylinder surface to establish a seal between piston rings and the cylinder wall. • Resizing involves boring the cylinder to a larger diameter.

Supportive Instructional Materials:

SUBCLUSTER: SMALL ENGINE REPAIR

TASK: Service the piston

Code: APS - SE08

Student Name: _____

Student Progress: Introduced | Involved | Productive | Employable

Behavioral Task Knowledges/Task Skills

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. identify tactually and visually the type and model of specific engine.
2. explain the operation and function of the piston and piston rings.
3. use prescribed safety precautions in servicing the piston.
4. perform the following job skills with accuracy to meet the manufacturer's specifications:
   a. remove and re-install piston rings on piston.
   b. check piston ring end gap.
   c. clean piston ring grooves.
   d. check piston ring side clearance.
   e. check piston surface condition.
   f. compress piston rings and install piston in cylinder.

Instructional Methods

- Students will be involved in tear down and assembly of engines performing the identified job skills.
- Teacher provides a demonstration of job skills on different types of engines with directed observation for individual students.
- Para-professionals provide sustained involvement with students having difficulty with this task.
- Students become acquainted with this area of the engine by handling engines, models, and parts.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 9	Power Technology, Unit 3	13	20
NUMBERS B 2 4a	Service manuals	14	16,17 18,19 21
APPLICATION C 2,5,7	Engine and parts	1	
PHYSICAL D 1a,d,f 2c 3a,c,f,g	DCA Transparencies	12	24
	Manufacturer's slides	11	16,17
	"Suggested Job Completion Times"	14	25

SUBCLUSTER: SMALL ENGINE REPAIR

APS - SE08 TASK: Service the piston

Basic Information for Cooperative Teaching	
Language of the Task	**Quantitative Concepts**
Ring groove Piston rings Ring gap Side clearance Carbon ridge Ridge reamer Cylinder walls Ring expander Lands	Read a feeler gauge in checking ring gap: .035", .045" Lands sizes: .007"

Suggestions:

- Be careful in using words with multiple meanings so that blind or deaf students form the correct concept.
- Encourage blind or deaf student to graciously accept help from others in learning this task.

Supportive Instructional Materials:

SUBCLUSTER: SMALL ENGINE REPAIR

TASK: Service the valves

Code: APS - SE09

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will :

1. identify tactually and visually the parts of the valve train and camshaft.
2. explain the operation of the valves and how the cams and valve train work together.
3. use prescribed safety precautions in servicing the valves.
4. perform the following job skills with accuracy to meet the manufacturer's specifications:
   a. remove and install valves.
   b. check valves for burning and wear on face.
   c. check valve guide clearance.
   d. recondition valve seats.
   e. reface valves
   f. lap in valves to seats
   g. adjust valve tappet clearance
   h. check reed valves (two cycle)

Instructional Methods

- Students review assignment covering this task. Teacher leads class discussion covering this reading assignment.
- Teacher encourages small peer group cooperation and interaction.
- Teacher demonstrates job skills on different types of engines with directed observation for individual students.
- Students become acquainted with this area of the engine by handling engines, models, and parts.
- Students will be involved in tear down and assembly of engines performing the identified job skills.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 9	Power Technology, Unit 3	13	20
NUMBERS B 2 4a	Service manuals	14	16,17 18,19 21
APPLICATION	Engine & parts	1	
C 2,5,7	DCA Transparencies	12	24
PHYSICAL	Manufacturer's slides	11	16,17
D 1a,d,f 2c 3a,c,f,g	"Suggested Job Completion Times"	14	25

SUBCLUSTER: SMALL ENGINE REPAIR

e: APS - SE09 TASK: Service the valves

Basic Information for Cooperative Teaching

Language of the Task

Expander	Diameter
Assembly	Keeper
Valve train	Position
Tolerances	Compress
Compression	Intake
Valve seat	Exhaust
Lapp-in	Block
Grinding compound	Clearance
Breather assembly	Grind
Valve guide	
Valve spring	
Nomenclature	
Valve stem	
Pitting	
Burning	

Quantitative Concepts

Use feeler gauge to measure size of valve tappet clearance: .005"-.007", .009" - .011"

Recognize angle of valve face and seat: 44° - 45°

Check valve edge margin with any common measuring device: 1/32" - 1/64"

Suggestions:

- It is important that there be good communication between the cooperating teacher and the vocational education teacher if the cooperating teacher does in fact assist in the student's effectiveness.
- Drill deaf student extensively on language of the task.
- Speak distinctly and slowly and allow time for visually impaired student to repeat pertinent information.
- Contact Michigan School for the Blind for braille and large print materials.

Supportive Instructional Materials:

SUBCLUSTER: SMALL ENGINE REPAIR

Sheet 1 of 1

TASK: Service the crankshaft

Code: APS - SE10

Student Name: _____

Student Progress	Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced / Involved / Productive / Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify tactually and visually the type or model of the specific engine. 2. explain the basic function of the crankshaft. 3. use prescribed safety precautions in servicing the crankshaft. 4. perform the following job skills with accuracy to meet the manufacturer's specifications: a. check crankshaft end play. b. tear down engine to remove crankshaft. c. inspect journal surface condition. d. measure crank journals reject specifications and out-of-round. e. check crankshaft for straightness. f. check auxiliary drive gears. g. correct crankshaft end play according to engine service manual. h. assemble engine to operating condition.	• Students review illustrated text, slides, or transparencies. • Teacher provides a demonstration of the job skills on different types of engines with directed observation of individual students. • Para-professionals provide sustained involvement with students having difficulty with this task. • Students become acquainted with this area of the engine by handling engines, models, and parts. • Students are involved in tear down and assembly of engines performing the identified job skills.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 3,9 NUMBERS B 2, 4a APPLICATION C 2,5,7 PHYSICAL D 1a,d,f 2c 3a,c,f,g	Power Technology, Unit 3	13	20
	Service manuals	14	16,17 18,19 21
	Engine and parts	1	
	DCA Transparencies	12	24
	Manufacturer's slides	11	16,17
	"Suggested Job Completion Times"	14	25

SUBCLUSTER: SMALL ENGINE REPAIR

e: APS - SE10 TASK: Service the crankshaft

Basic Information for Cooperative Teaching	
Language of the Task	**Quantitative Concepts**
Crankshaft Journal Reject Out-of-round Auxiliary gears End play	Measure the following with a micrometer: PTO Journal - .8726 Mag. Journal - .8726 Crankpin - .9963

Suggestions:

- Crankshaft changes linear motion to rotary motion.
- Valve timing is important.
- Encourage blind student to graciously accept help from others in learning this task.
- Be careful in using words with multiple meanings so that blind or deaf students form the correct concept.

Supportive Instructional Materials:

SUBCLUSTER: SMALL ENGINE REPAIR

TASK: Service the main bearings

Sheet 1 of 1

APS - SE11

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. identify tactually and visually the type and model of specific engine.
2. identify tactually and visually the type of bearings used in the engine.
3. explain the function of the engine bearings.
4. use prescribed safety precautions in servicing the main bearings.
5. perform the following job skills with accuracy to meet the manufacturer's specifications:
   a. tear down engine to bear block.
   b. check bearing surface conditions.
   c. remove and replace bearings.
   d. line ream bearings to specifications.
   e. assemble engine to operating conditions.

Instructional Methods

- Students become acquainted with this area of the engine by handling engines, models, and parts.
- Resource person and/or teacher provides demonstration of the job skills on different types of engines with directed observation for individual students.
- Students are actually involved in tear down and assembly of engines performing the identified job skills.
- Students review illustrated materials covering this task description. Teacher leads class discussion covering this assignment.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,3,9	Power Technology, Unit 5	13	20
NUMBERS B 2, 4a	Service manuals	14	16,17 18,19 21
APPLICATION C 2,5,8	Engine and parts	1	
PHYSICAL D 1a,c,d,f 2c 3a,c,f,g	DCA Transparencies	12	24
	Manufacturer's slides	11	16,17
	"Suggested Job Completion Times"	14	25

SUBCLUSTER: SMALL ENGINE REPAIR

: APS - SE11 TASK: Service the main bearings

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Bearing Line ream Oil part Oil passage Side plate Sump	Bearing sizes are related to PTO and magneto journal sizes on SE10.	• Drill deaf student extensively on language of the task. • Speak distinctly and slowly and allow time for visually impaired students to repeat pertinent information.

Supportive Instructional Materials:

SUBCLUSTER: SMALL ENGINE REPAIR

TASK: Service the camshaft

Code: APS - SE12

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. identify tactually and visually the type or model of the specific engine.
2. explain the operation and function of the camshaft.
3. use prescribed safety precautions in servicing the camshaft.
4. perform the following job skills with accuracy to meet the manufacturer's specifications:
   a. tear down engine to remove camshaft.
   b. measure cams and journals, check against reject specifications.
   c. inspect gear teeth and journal surface conditions.
   d. install cam gear to crank gear timing alignment.
   e. assemble engine to operating condition.

Irstructional Methods

- Teacher encourages small peer group cooperation and interaction.
- Teacher provides a demonstration of the job skills on different types of engines with directed observation for individual students.
- Students become acquainted with this area of the engine by handling engines, models, and parts.
- Students are involved in tear down and assembly of engines performing the identified job skills.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,3,9	Power Technology, Unit 3	13,20	20
NUMBERS B 2 4a,e	Service manuals	14,20	16,17 18,19 21
APPLICATION	Engine and parts	1	
C 2,5,8	DCA Transparencies	12	24
PHYSICAL	Manufacturer's slides	11	16,17
D 1a,c,d,f 2c 3a,c,f,g	"Suggested Job Completion Times"	14	25

SUBCLUSTER: SMALL ENGINE REPAIR

File: APS - SE12 TASK: Service the camshaft

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Direction Shaft Tappets Gear Teeth Lobes Cam Timing Drive Alignment	Measure camshaft lobes and journal sizes with a micrometer: cam gear or shaft journals - .4985 cam lobe size - .883 Recognize ratio relationship between revolution of the crankshaft and camshaft and lifting of the valves (2:1).	• Informally encourage voluntary buddy system for assisting blind or deaf students (individualize without calling attention to the individual). • Drill deaf student extensively on language of the task.

Supportive Instructional Materials:

SUBCLUSTER: SMALL ENGINE REPAIR

Sheet 1 of 1

TASK: Service the crankshaft bearing seals

Code: APS - SE13

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. identify the type and model of engine tactually and visually.
2. select the appropriate method of servicing the bearing seals as listed in the manufacturer's service manual.
3. use prescribed safety precautions in servicing the crankshaft seals.
4. perform the following job skills to meet the manufacturer's specifications and so the oil seals do not leak:
   a. power take-off bearing seal:
      1) drain engine oil.
      2) clean shaft of rust, dirt, burrs.
      3) remove base sump bolts.
      4) remove base from engine block.
      5) remove seal.
      6) install new seal.
      7) replace sump base.
      8) torque bolts to specifications.
      9) check for free movement of crankshaft.
      10) service with oil
      11) check oil seal and sump gasket for leaks.
   b. magneto bearing seal:
      1) remove blower housing, flywheel, and magneto parts as necessary.
      2) remove seal, install new seal.
      3) reassemble housing, flywheel, parts

Instructional Methods

- Para-professionals provide sustained involvement with students having difficulty with this task.
- Teacher provides demonstration of the job skills on different types of engines with directed observation for individual students.
- Students become acquainted with this area of the engine by handling engines, models, and parts.
- Students are involved in tear down and assembly of engines performing the identified job skills.
- Students review illustrated slides or transparencies covering crankshaft bearing seals.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE			
A 2,3,9	Service manuals	14,20	16,17 18,19 21
NUMBERS			
B 2 4a,g	Engine and parts	1	
APPLICATION	Manufacturer's slides	11	16,17
C 2,5,8	"Suggested Job Completion Times"	14	25
PHYSICAL			
D 1a,c,f,g 2c 3a,c,f,g			

SUBCLUSTER: SMALL ENGINE REPAIR

e: APS- SE13 TASK: Service the crankshaft bearing seals

Basic Information for Cooperative Teaching	
Language of the Task	**Quantitative Concepts**
Oil seals Base sump Power take-off Lubricate Specification Emery cloth	Recognize common torque specifications on oil sump or side plate assembly: i.e. 75 in-lbs.

Suggestions:

- Be careful in using words with multiple meanings so that blind student or deaf student form the correct concept.
- Informally encourage voluntary buddy system for assisting blind or deaf students (individualize wihtout calling attention to the individual).
- Seals prevent the oil from leaking past the crankshaft bearings.

Supportive Instructional Materials:

SUBCLUSTER: SMALL ENGINE REPAIR

Sheet 1 of 1

TASK: Service the cylinder head

Code: APS - SE14

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will :

1. identify the type and model of engine tactually and visually.
2. compare the cylinder head design and construction tactually and visually to previously examined cylinder heads.
3. interpret the cylinder compression gauge readings according to trouble-shooting charts in the engine manufacturer's service manual.
4. use prescribed safety precautions in servicing the cylinder head.
5. perform the following job skills to meet the manufacturer's specifications and so the engine has full compression without leaks:
   a. remove blower housing
   b. remove cylinder head bolts.
   c. clean carbon from combustion area-engine block and head.
   d. check head warpage.
   e. install cylinder head with new gasket.
   f. torque head bolts to specifications.
   g. replace blower housing.
   h. start engine, check for leaks around gasket.
   i. re-torque head bolts after running engine and take compression test.

Instructional Methods

- Students are involved in tear down and assembly of engines performing the identified job skills.
- Teacher directs a demonstration of the job skills on different types of engines with directed observation for individual students.
- Students become acquainted with this area of the engine by handling components of the cylinder head.
- Students review illustrated materials covering this task description.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,3,9 NUMBERS B 2 4a,e,f,g APPLICATION C 2,5,8 PHYSICAL D 1a,c,f,g 2c 3a,c,f,g	Power Technology, Unit 3	13	20
	Service manuals	14	16,17,18,19,21
	Engine and parts	1	
	Manufacturer's slides	11	16.17
	"Suggested Job Completion Times"	14	25

SUBCLUSTER: SMALL ENGINE REPAIR

APS - SE14 TASK: Service the cylinder head

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Cylinder head Heat transfer Dissipation Cooling fins Compression Head bolts Head bolt tightening sequence Torque Warp Engine block Carbon Align Gasket Surface block	Recognize common compression gauge readings: 60 psi Recognize torque specification for cylinder head: 140 in-lbs.	• Cleaning interior and exterior of cylinder head is important. • Teacher and deaf student should cooperatively develop some simple signs related to language of the task. • Informally encourage voluntary buddy system for assisting blind or deaf students (individualize without calling attention to the individual).

Supportive Instructional Materials:

SUBCLUSTER: SMALL ENGINE REPAIR

TASK: Remove and replace engine

Sheet 1 of 1

Code: APS - SE15

Student Name: _____

Student Progress	Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced / Involved / Productive / Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify by tactual and/or visual means the engine and auxiliary drive components to be removed as listed in the manufacturer's instruction manual. 2. explain verbally the procedure sor separating the engine from the chassis referring to the previously identified engine and auxiliary drive components. 3. practice safety precautions relating to the removal and replacement of the engine. 4. perform the following job skills with accuracy to meet the manufacturer's specifications: a. remove engine from chassis: 1) disconnect spark plug wire. 2) unfasten control wires. 3) remove blade and any auxiliary drive components. 4) remove engine mounting bolts. b. replace engine on chassis: 1) place engine on chassis in proper alignment. 2) install engine mounting bolts. 3) install and align auxiliary drive components. 4) install blade and attach and adjust control wires. 5) check entire installation.	• Students are involved in tear down and assembly of engines performing the identified job skills. • Students review an illustrated service manual covering this task. Teacher leads discussion covering this assignment. • Para-professionals provide sustained involvement with student having difficulty with this task. • Teacher encourages small peer group cooperation and interaction.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,3,9	Service manuals	14	16,17 18,19
NUMBERS B 2 4a,f,g,i	"Suggested Job Completion Times"	14	25
APPLICATION C 2,5,8			
PHYSICAL D 1a,c,d,f 2c 3c,f,g			

SUBCLUSTER: SMALL ENGINE REPAIR

Code: APS - SE15 TASK: Remove and replace engine

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Alignment Torque Speed tools Mounting bolts Spark plug wire Control wire Auxiliary drive component Chassis	Recognize common bolt types and sizes: 5/16" - 3/8", coarse thread, hex head Alignment of pulleys/belts	• Contact Michigan School for the Blind for braille and large print materials. • Have tape recorder available for "note-taking" for the blind student. • Informally encourage voluntary buddy system for assisting blind or deaf students (individualize without calling attention to the individual).

Supportive Instructional Materials:

SUBCLUSTER: SMALL ENGINE REPAIR

Sheet 1 of 1

TASK: Service the rotary mower blade

[illegible]: APS - SE16

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced	Involved	Productive	Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify visually and/or tactually the type and style of blade. 2. identify verbally the procedure for sharpening the specific blade type. 3. practice prescribed safety precautions in servicing the rotary mower blade. 4. perform the following job skills with accuracy so that the blade will be sharp and well balanced: a. remove and replace the blade. b. check blade-to-shaft mounting adapter. c. clean blade with wire brush hand and powered. d. check blade for dangerous cracks or abnormal bending. e. set sharpening angle on grinder blade support. f. sharpen blade. g. balance blade.	• Teacher directs a demonstration of the job skills with directed observation for individual students. • Students become acquainted with this area of the engine by handling engines and blades. • Students will be involved in performing the identified job skills associated with servicing the rotary mower blade. • Para-professionals provide sustained involvement with students having difficulty with this task.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 3,9 NUMBERS B 2 4a,e,g APPLICATION C 2,8 PHYSICAL D 1a,b,d,f 2c 3a,c,f,g	Engine parts and blades "Suggested Job Completion Times"	1 14	 25

SUBCLUSTER: SMALL ENGINE REPAIR

Code: APS - SE16 TASK: Service the rotary mower blade

Basic Information for Cooperative Teaching

Language of the Task	Quantitative Concepts
Sharpening	Cutting edge angles must be sharp.
Balance	Recognize the safe RPM for the grinding wheel being used.
Rotary	Recognize the importance of blade balancing on a fulcrum.
Grind	
Grinder	
Blade	
Vibrate	
Vibration	
Cutting edge	
Adapter	

Suggestions:

- Speak distinctly and slowly, use simple sentences, and look directly at lip reading deaf students.
- Informally encourage voluntary buddy system for assisting deaf students or blind students (individualize without calling attention to the individual).
- Provide many tactile and hearing experiences for the blind student to reinforce task knowledges/skills.

Supportive Instructional Materials:

SUBCLUSTER: SMALL ENGINE REPAIR

Sheet 1 of 1

TASK: Service the impulse and rewind starter

Code: APS - SE17

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced	Involved	Productive	Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify visually and/or tactually the components of the impulse and rewind starter. 2. describe verbally the operation of the impulse and recoil starter. 3. utilize prescribed safety precautions related to the servicing of starter systems. 4. perform the following job skills with accuracy to meet the accpeted manufacturer's specifications and so the starter will operate: a. remove and replace starter. b. remove and replace starter cup. c. remove old starter rope. d. install new starter rope. e. remove and replace impulse and rewind springs. f. remove, check, clean, and replace starter clutch assembly. g. service the remaining mechanical parts of the starter. h. start engine and check operation of starting components.	• Students will be involved in tear down and assembly of rewind and impulse starters performing the identified job skills. • Teacher provides a demonstration of the job skills on different types of engines with directed observation for individual students. • Students become acquainted with this area of the engine by handling the parts. • Teacher encourages small peer group cooperation and interaction.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE			
A 7,9	Service manuals	14	16,17,18,19,21
NUMBERS			
B 2	Engine parts	1	
APPLICATION	Manufacturer's slides	11	16,17
C 2,5,8	"Suggested Job Completion Times"	14	25
PHYSICAL			
D 1a,c,d,f			

SUBCLUSTER: SMALL ENGINE REPAIR

: APS - SE17 TASK: Service the impulse and rewind starter

Basic Information for Cooperative Teaching

Language of the Task	Quantitative Concepts
Component	Recognize winding directions for springs and starter cords.
Rotation	Clockwise
Starter pulley	Counterclockwise
Housing	Determine in/lbs of torque in assembling the starter unit to manufacturer's torque specifications.
Assembly	
Solvent	
Spring tension	
Starter clutch	
Ratchet gear	
Retaining plate	
Unravelling	
Clockwise	
Counterclockwise	
Impulse	

Suggestions:

- Informally encourage voluntary buddy system for assisting blind or deaf students (individualize without calling attention to the individual).
- Drill deaf student extensively on language of the task.

Supportive Instructional Materials:

SUBCLUSTER: SMALL ENGINE REPAIR

Sheet 1 of 1

TASK: Service the lubricating system

Code: APS- SE18

Student Name: _____

Student Progress	Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced / Involved / Productive / Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify verbally the basic operation and function of the lubricating system. 2. identify types and grades of oil for specific engines as specified in engine service manuals. 3. practice prescribed safety precautions in servicing the lubricating system. 4. perform the following job skills with accuracy to meet the accepted manufacturer's specifications: a. check oil level and adjust, if necessary. b. drain oil and reservice with proper A.P.I. rated lubricant. c. lubricate parts of engine and chassis which require manual lubrication. d. check oil pump operation. e. rebuild or replace oil pump. f. check dipper or slinger for wear and working condition. g. check clearance of oil passages. h. check operation of oil breather assembly. i. assemble engine to operating conditions.	• Oil company's representative speaks to class. • Teacher provides a demonstration of the job skills on different types of engines with directed observation for individual students. • Students become acquainted with this area of the engine by handling engine parts. • Students are involved in performing the identified job skills. • Teacher encourages small peer group cooperation and interaction.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,9	Power Technology, Unit 5	13	20
NUMBERS B 2 4c,f	Service manuals	14	16,17 18,19 21
APPLICATION C 2,8	Engine parts	1	
PHYSICAL D 1a,d 2b 3a,f,g	Oil company literature	14	
	"Suggested Job Completion Times"	14	25

SUBCLUSTER: SMALL ENGINE REPAIR

e: APS - SE18 TASK: Service the lubricating system

Basic Information for Cooperative Teaching

Language of the Task

System	Viscosity
Anti-friction	Detergent
Oil	Oxidation
Blow-by	Quality
Dissipate	Splasher
Microscopic pieces	Splash
Cushion	Pump
Corrosive	Barrel
Corrosion	Plunger
Corrode	Pressure
Journal bearing	Slinger
Guide bearing	Trough
Thrust bearing	Passage
Rolling friction	Suspension
Sliding friction	Droplets

Quantitative Concepts

Interpret American Petroleum Institute (A.P.I.) numbers, and Society of Automotive Engineers (S.A.E.) numbers.

See the vocational education instructor for an interpretation of the code.

Suggestions:

- Speak distinctly and slowly and allow time for visually impaired students to repeat pertinent information.
- Informally encourage voluntary buddy system for assisting blind or deaf students (individualize without calling attention to the individual).
- Be careful in using words with multiple meanings so that blind or deaf student form the correct concept.
- Discuss the jobs of oil in engine operation.
- Supportive teacher should present language of task relative to the experience of that student in the vocational class. Keep contact with vocational instructor.

Supportive Instructional Materials:

SUBCLUSTER: SMALL ENGINE REPAIR

TASK: Service the fuel system

Code: APS - SE19

Student Name: _____

Student Progress	Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced / Involved / Productive / Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify tactually and/or visually the component parts of the fuel system. 2. describe verbally the specific operation of each component. 3. explain the relationship of each component to the functioning of the total fuel system. 4. use prescribed safety precautions in servicing the fuel system. 5. perform the following job skills with accuracy to meet the manufacturer's specifications: a. remove, check, clean and/or replace fuel filter, sediment bowl, fuel pump and carburetor. b. remove, check, clean and replace air filter element, air cleaner housing and mounting screw of bolts. c. test fuel pump pressure, volume and vacuum. d. measure, cut, bend and flare tubing to make fuel lines. Install on engine. e. measure and cut rubber tubing for fuel lines. Install on engine. f. check for leaks (gaskets, seals, fittings, lines), in fuel system.	• Para-professional directs a demonstration of job skills on different types of fuel systems with directed observation for individual students. • Students become acquainted with this area of the engine by handling engines, models, and parts. • Students are involved in tear down and assembly of engines performing the identified job skills. • Students review illustrated texts, slides, or transparencies. • Teacher concentrates his effort with students having difficulty.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,3,7,9 NUMBERS B 2 4c,f,i APPLICATION C 5,8 PHYSICAL D 1a,d 2c 3a,c,f,g	Power Technology, Unit 4	13	20
	Service manuals	14	16,17 18,19 21
	Engine parts	1	
	DCA Transparencies	12	24
	Manufacturer's slides	11	16,17
	"Suggested Job Completion Times"	14	25

SUBCLUSTER: SMALL ENGINE REPAIR

Code: APS - SE19 TASK: Service the fuel system

Basic Information for Cooperative Teaching

Language of the Task

Diaphragm
Actuator
Chaffing
Gum
Filter
Fuel pump
Element
Housing
Flare
Tubing
Gasket
Seal
Float level
Gauge
Needle
Linkage
Governor
Grounding
Vaporization
Compressed air
Sediment bowl
Distortion
Butterfly
Neoprene
Jet
Nozzel
Seat
Choke
Nylon
Viton
Acceleration
Techometer
Tune
Vacuum
"O" ring
Mixture
Calibrate
Rich
Lean
Assembly
Disassembly
Automatic
Grommet
Chock-a-matic
Pulse-a-matic
Flo-jet
Meter
Distort
Idle
Flooding

Quantitative Concepts

Recognize and interpret feeler gauge sizes.

Measure engine R.P.M.

Interpret turns of a needle: 1/8, 1/4, 1 1/2 turn.

Discuss the concept of vacuum.

Suggestions:

- Work with vocational instructor so "language" can correlate with vocational class work.
- Drill deaf student extensively on language of the task.
- Informally encourage voluntary buddy system for assisting deaf or blind students (individualize without calling attention to the individual).
- Be careful in using words with multiple meanings so that blind or deaf student form the correct concept.

Supportive Instructional Materials:

SUBCLUSTER: SMALL ENGINE REPAIR

TASK: Service the fuel system

Code: APS - SE19

Student Name: _____

Student Progress	Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced / Involved / Productive / Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will g. check float level and float needle valve. h. remove, repair and replace gas tank. i. test and replace fuel gauge and/or sending unit. j. overhaul carburetor including: disassembly, clean, install new parts, make adjustment, assemble and test. k. adjust high speed needle valve, idle needle valve and idle speed. l. test and adjust automatic choke. m. check and adjust remote control cables. n. check and adjust governor linkages. o. check and adjust ignition grounding wire.	

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE			
NUMBERS			
APPLICATION			
PHYSICAL			

SUBCLUSTER:

___ - ___ TASK:

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	

Supportive Instructional Materials:

SUBCLUSTER: SMALL ENGINE REPAIR

TASK: Service the exhaust system

Sheet 1 of 1

Code: APS - SE20

Student Name: _____

Student Progress	Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced / Involved / Productive / Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will : 1. explain the basic principles of operation of the exhaust system. 2. use prescribed safety precautions in servicing the exhaust system. 3. perform the following job skills with accuracy to meet the manufacturer's specifications: a. remove and install muffler and gasket. b. remove and install engine extension pipes and clamps. c. retap mounting bolt threads. d. check for exhaust system leaks or cracks.	• Teacher encourages small peer group cooperation and interaction. • Teacher directs a demonstration of the job skills on different types of engines with directed observation for individual students. • Students become acquainted with this area of the engine by handling engine parts. • Students will be involved in servicing the exhaust system by performing the identified job skills.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,9	Power Technology, Unit 3	13	20
NUMBERS B 2	Service manuals	14	16,17 18,19 21
APPLICATION C 2,5,8	Engine parts	1	
PHYSICAL D 1a,d 2c 4a,c,f,g	"Suggested Job Completion Times"	14	25

SUBCLUSTER: SMALL ENGINE REPAIR

e: APS - SE20 TASK: Service the exhaust system

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Exhaust System Muffler Gasket Extension Pipe Mounting Bolt Threads Mounting bolts	Recognize common pipe thread sizes, i.e. 3/4" pipe. Recognize common bolt sizes (thread, diameter, length). Identify type of bolt head: hex head, square head, slotted head.	• Encourage blind student to graciously accept help from others in learning this task. • Drill deaf student extensively on language of the task. • Read and interpret service manuals for small engines.

Supportive Instructional Materials:

SUBCLUSTER: SMALL ENGINE REPAIR

Sheet 1 of 1

TASK: Service the cooling system

Code: APS - SE21

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. identify by visual and/or tactual means the individual parts of the cooling system.
2. explain the basic operation of the cooling system and engine temperature regulation.
3. relate basic heat transfer and dissipation principles to the functioning of the cooling system.
4. practice prescribed safety precautions in serving the cooling system.
5. perform the following job skills to allow free air passage over the engine and correct operation of the cooling system:
   a. check for broken fins on the flywheel.
   b. clean cooling fins on the cylinder head and engine block.
   c. clean screen on the flywheel.
   d. check engine block for accumulation of grass and/or oily materials.

Instructional Methods

- Students become acquainted with this area of the engine by handling engines, models, and parts.
- Teacher provides a demonstration of the job skills on different types of engines with directed observation for individual students.
- Students will be involved in tear down and assembly of engines performing the identified job skills.
- Students review slides and transparencies.
- Para-professionals provide sustained involvement with students having difficulty with this task.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 7,9	Power Technology, Unit 6	13,20	20
NUMBERS B 2 4f	Service manuals	14,20	16,17 18,19 21
APPLICATION C 2,5,8	Engine parts	1	
	DCA Transparencies	12	24
PHYSICAL D 1a,c 2c 3a,c,f,g	Manufacturer's slides	11	16,17
	"Suggested Job Completion Times"	14	25

SUBCLUSTER: SMALL ENGINE REPAIR

e: APS - SE21 TASK: Service the cooling system

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Cooli Temperature Regulation Heat transfer Dissipation Fins Flywheel Screen Accumulation	Recognize the relationship of engine temperatures to oil vescosity, air passage blockage, and type of work engine is performing.	• Drill deaf student extensively on language of the task. • Informally encourage voluntary buddy system for assisting deaf or blind students (individualize without calling attention to the individual). • Contact Michigan School for the Blind for braille and large print materials.

Supportive Instructional Materials:

SUBCLUSTER: SMALL ENGINE REPAIR

Sheet 1 of 1

TASK: Prepare engine for winter storage

Code: APS - SE22

Student Name: _____

Student Progress	Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced / Involved / Productive / Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. explain the reasons for careful storage of the engine over the winter season. 2. use prescribed safety precautions in preparing the engine for storage. 3. perform the following job skills to meet the manufacturer's suggestions and so the engine is prepared correctly: a. drain the fuel system or use special gas storage additives. b. inject oil into the cylinder. c. clean engine and chassis. d. change oil in crankcase. e. check and clean spark plug. f. cover engine and store in dry place.	• Students are involved in performing the identified job skills. • Teacher provides a demonstration of the job skills with directed observation for individual students. • Teacher encourages small peer group cooperation and interaction. • Para-professionals provide sustained involvement with students having difficulty with this task.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 9	Power Technology, Unit 8	13	20
NUMBERS B 2 4b,c,f	Service manuals	14,20	16,17 18,19 21
APPLICATION C 2,8	Additive information material	14,16	
PHYSICAL D 1a,c,d 2c 3a,c,f,g			

SUBCLUSTER: SMALL ENGINE REPAIR

APS - SE22 TASK: Prepare engine for winter storage

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Storage Additive Inject Crankcase	Read thermometers and temperature gauges.	• Contact Michigan School for the Blind for braille and large print materials. • Informally encourage voluntary buddy system for assisting blind or deaf students (individualize without calling attention to the individual).

Supportive Instructional Materials:

SUBCLUSTER: SMALL ENGINE REPAIR

Sheet 1 of 2

TASK: Complete engine check-up procedures

Code: APS - SE23

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. explain the meaning of cylinder compression readings.
2. relate verbally the results of engine cylinder leakage tests to examples given in service manual.
3. identify the possible conditions affecting the ignition system by comparing results of a spark test to related conditions given in the service manual.
4. explain verbally the results of a carburetion check according to information given in the service manual.
5. explain verbally the possible conditions causing hard starting, no starting, kick back, vibration, power loss, unusual noises in engine and other related situations.
6. practice prescribed safety precautions in performing engine check-up procedures.
7. perform the following job skills with accuracy so that usuable results are obtained to diagnose engine operation problems:
   a. take compression readings.
   b. perform a spark test.
   c. perform a carburetor test.

Instructional Methods

- Students become acquainted with engine check-up procedures by handling engine parts.
- Para-professional directs a demonstration of the job skills on different types of engines with directed observation for individual students.
- Students are involved in performing the identified job skills on customer's engine.
- Teacher encourages small peer group cooperation and interaction.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 3,9 NUMBERS B 2 4b,d,f APPLICATION C 2,5,8 PHYSICAL D 1a,c,d,f 2c 3a,c,f,g	Power Technology	13	20
	Service manuals	14	16,17 18,19 21
	Engine parts and chassis	1	
	"Suggested Job Completion Times"	14	25

SUBCLUSTER: SMALL ENGINE REPAIR

e: APS - SE23 TASK: Complete engine check-up procedures

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Cylinder Leakage Vibration Procedures Carburetion Ignition	Interpret compression readings, i.e. scale readings, 50-60 PSI, dial readings, 50-60 P.S.I.	• Informally encourage voluntary buddy system for assisting deaf or blind students (individualize without calling attention to the individual). • Teacher and deaf student should cooperatively develop some simple signs related to language of the task.

Supportive Instructional Materials:

SUBCLUSTER: SMALL ENGINE REPAIR

Sheet 2 of 2

TASK: Complete engine check-up procedures

CODE: APS - SE23

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced	Involved	Productive	Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: d. operate starter to check for hard starting, no starting, and kickback. e. check for vibration with engine running. f. check for power loss with engine under load. g. check for noises in engine while pulling starter and while engine is running.	

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE			
NUMBERS			
APPLICATION			
PHYSICAL			

SUBCLUSTER:

___ - ___ TASK:

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	

Supportive Instructional Materials:

SUBCLUSTER: SMALL ENGINE REPAIR

Sheet 1 of 1

TASK: Perform engine tune-up procedure

Code: APS - SE24

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. identify the procedure for an engine tune-up.
2. practice prescribed safety precautions related to performing an engine tune-up.
3. perform the following job skills with accuracy so that the engine starts, runs well, and has a good appearance:
   a. clean engine and chassis.
   b. remove and replace blade.
   c. sharpen and balance blade.
   d. change engine oil.
   e. remove and replace ignition breaker points. Set points gap.
   f. perform a spark check.
   g. remove and replace cylinder head.
   h. clean and scrape carbon from cylinder head and engine block.
   i. clean and gap spark plug or install new plug.
   j. check starter operation, replace rope if necessary.
   k. start engine.
   l. adjust carburetor settings; fast and slow speed, idle adjustment and acceleration.
   m. clean air filter
   n. lubricate necessary parts on engine chassis.
   o. take a compression test.

Instructional Methods

- Teacher and/or para-professional reviews the procedure with individual students.
- Students refer to previous work compiled in a notebook.
- Students will be involved in performing the identified job skills.
- Teacher encourages small peer group cooperation and interaction.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 3,9	Power Technology, Unit 9	13	20
NUMBERS B 2b,f	Service manuals	14	16,17 18,19 21
APPLICATION C 2,5,8	Engines and chassis	1	
PHYSICAL D 1a,d 2c 3c,f,g	"Suggested Job Completion Times"	14	25

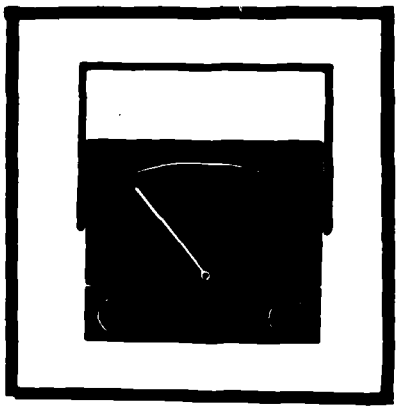
SUBCLUSTER: SMALL ENGINE REPAIR

e: APS - SE24 TASK: Perform engine tune-up procedure

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Tune-up Sharpen Balance Breaker points Ignition Gap Cylinder head Carbon Adjustment Acceleration Lubricate Chassis Compression	This task represents a combination of the preceeding tasks. Selected quantitative concepts may need be reinforced as students encounter specific problems. Keep in close contact with the Small Engine instructor.	• Give the blind student ample time for accumulating finger knowledge. Instructor must aid student in moving fingers for gathering information. • Informally encourage voluntary buddy system for assisting blind or deaf students (individualize without calling attention to the individual).

Supportive Instructional Materials:

APPLIANCE REPAIR



INSTRUCTIONAL TASK MODULES

AR01 Service small appliances

AR02 Service disposers

AR03 Service room air conditioners

AR04 Service refrigerators

AR05 Service dryers

AR06 Service automatic washers

AR07 Service ranges

AR08 Service dishwashers

SUBCLUSTER: APPLIANCE REPAIR

TASK: Service small appliances

Code: APS - AR01

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced	Involved	Productive	Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will : 1. describe operational characteristics of the following: a. perculators b. toasters c. irons d. grills e. heaters f. mixers g. fans h. vacuum cleaners 2. interpret electrical diagrams 3. remove, test and replace components 4. give the function of each component 5. complete the procedures for locating and repairing troubles	• Students review and discuss illustrated texts, workbooks, service manuals, and visual materials related to the task. • Teacher or resource person (local Appliance Serviceman) presents a demonstration on troubleshooting and servicing of small appliances. • Teacher designs and directs a series of performance tests for individual students on servicing small appliances.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,3,7,8,9 NUMBERS B 1,2b,4d,h APPLICATION C 3,5,6,8 PHYSICAL D 1a,b,c,d,f 2a, 3c	How to Repair Small Appliances Vol. I and Vol. II	13	37

SUBCLUSTER: APPLIANCE REPAIR

e: APS- AR01 TASK: Service small appliances

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Switch Motor Condenser Knob Handle Heating element Thermostat Brushes Contact points Cord Plug Vacuum cleaner Iron Toaster Grill Heater Mixer	Read electrical meters and gauges well enough to recognize the difference between normal and abnormal performance of the part or component being tested.	• Ask vocational education teacher for suggestions on special education needs. • Games or puzzles that teach disassembly/assembly procedures would help the student prepare for small appliance repair.

Supportive Instructional Materials:

SUBCLUSTER: APPLIANCE REPAIR

TASK: Service disposers

Sheet 1 of 1

: APS - ARO2

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced	Involved	Productive	Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. install disposer with safety 2. describe operational characteristics 3. explain function of components 4. remove, test and replace components 5. describe procedures for locating problems	• Teacher or resource person (local Appliance Serviceman) presents a demonstration on troubleshooting and servicing disposers. • Students handle and discuss the parts and components of the disposers to become familiar with each name and function. • Advanced student works individually with students on a specialized servicing job. • Students work in small groups or teams servicing disposers.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,3,7,8,9 NUMBERS B 2, 4a,h,i APPLICATION C 3,5,6,8 PHYSICAL D 1a,c,d 2a/b 3c,d,e,f,g	How to Repair Major Appliances	13	37

SUBCLUSTER: APPLIANCE REPAIR

: APS - ARO2 TASK: Service disposers

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	• Ask vocational education teacher for suggestions on special education needs.
Impeller Centrifugal force Reversing switch Motor Start relay Capacitor		

Supportive Instructional Materials:

SUBCLUSTER: APPLIANCE REPAIR

TASK: Service room air conditioners

Sheet 1 of 1

CODE: APS - AR03

Student Name: _____

Student Progress	Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced / Involved / Productive / Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. interpret electrical system diagram 2. describe operational characteristics and sequences of controls and components 3. remove, test, and replace components 4. describe procedures for locating troubles	• Teacher or resource person (local Appliance Serviceman) present presents a demonstration on troubleshooting and servicing of the room air conditioners. • Students work in small groups or teams servicing room air conditioners. • Paraprofessional works individually with students having difficulty with this task. • Advanced student works individually with students on a specialized servicing job. • Teacher designs and directs a series of performance tests for individual students on servicing of room air conditioners.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,3,7,8,9 NUMBERS B 2,4a,h,i APPLICATION C 3,5,6,8 PHYSICAL D 1a,c,d 2a/b 3c,d,e,f,g	How to Repair Major Appliances	13	37
	Refrigeration service manual	14	

SUBCLUSTER: APPLIANCE REPAIR

Code: APS - AR03 TASK: Service room air conditioners

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Thermostat Evaporator Condenser Freon High Pressure Low pressure Sensible heat Latent heat Compressor Starting relay Dryer Suction line Discharge line	Work on procedures for interpreting a service manual.	• Ask vocational education teacher for suggestions on special education needs. • Students identify sample parts.

Supportive Instructional Materials:

SUBCLUSTER: APPLIANCE REPAIR

TASK: Service refrigerators

Sheet 1 of 1

: APS - AR04

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced	Involved	Productive	Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. install refrigerator with safety 2. check and test refrigeration system 3. test run a refrigerator 4. interpret electrical system diagram 5. describe operational characteristics and sequences of controls and components 6. remove, test and replace controls and components 7. describe procedures for locating problems 8. give operational analysis of system	• Advanced student works individually with students on a specialized servicing job. • Students review and discuss illustrated texts, workbooks, service manuals, and visual materials related to the task. • Students handle and discuss the parts and components of the refrigerator to become familiar with each name and function. • Teacher designs and directs a series of performance tests for individual students on servicing of refrigerators.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,3,7,8,9 NUMBERS B 2,4a,h,i APPLICATION C 3,5,6,8 PHYSICAL D 1a,c,d 2a/b 3c,d,e,f,g	Slide film and cassette tape on refrigeration	4	39
	How to Repair Major Appliances	13	37
	Refrigeration service manual	14	
	Overhead visuals	18	

SUBCLUSTER: APPLIANCE REPAIR

APS - AR04 TASK: Service refrigerators

Basic Information for Cooperative Teaching

Language of the Task

Thermostat
Evaporator
Condenser
Defrost thermostat
Mullion heater
Capillary tube
Freon
High pressure
Low pressure
Sensible heat
Latent heat
Compressor
Starting relay
Defrost heater
Suction line
Dryer
Discharge line

Quantitative Concepts

Procedures for interpreting service manuals

Measure temperature of refrigerator.

Read voltage with meter.

Suggestions:

- Ask vocational education teacher for suggestions on special education needs.
- Students practice interpreting manual.
- Students identify sample parts.

Supportive Instructional Materials:

Sample parts with identifying labels

SUBCLUSTER: APPLIANCE REPAIR

TASK: Service dryers

Sheet 1 of 1

Code: APS - AR05

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. install dryer with proper safety
2. test run and time the operation
3. explain operational characteristics and sequences
4. interpret electrical diagram
5. explain operation and function of components
6. remove, test and replace components
7. demonstrate procedures for locating problems
8. diagnose and remedy problems

Instructional Methods

- Teacher or resource person (local Appliance Serviceman) presents a demonstration on troubleshooting and servicing the dryers.
- Students work in small groups or teams servicing dryers.
- Students handle and discuss the parts and components of the dryers to become familiar with each name and function.
- Teacher designs and directs a series of performance tests for individual students on servicing the dryers.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,3,7,8,9	Slide film and cassette tape on dryer	4	39
NUMBERS B 2,4d,f,h,i	Dryer service manual	14	
APPLICATION C 2,5,6,8	How to Service Major Appliances	13	37
PHYSICAL D 1a,c,d,e 2a/b 3c,d,e,f,g	Overhead visuals	18	

SUBCLUSTER: APPLIANCE REPAIR

: APS - ARQ5 TASK: Service dryers

Basic Information for Cooperative Teaching

Language of the Task

Switch
Timer
Belt
Wiring diagram
Continuity
Voltage
Resistance
Contact
Ohmeter
Voltmeter
Electrical
Thermostat
Heat unit
Blower assembly
Power
Current
Ground

Quantitative Concepts

Measure voltage and resistance.

Interpret charts and diagrams in manual.

Suggestions:

- Ask vocational education teacher to explain manual.
- Students could practice interpreting manual.

Supportive Instructional Materials:

Service manual
Textbook

SUBCLUSTER: APPLIANCE REPAIR

TASK: Service automatic washers

Code: APS - AR06

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. install washer with proper safety
2. test run and time the operation
3. explain operational characteristics and sequences
4. interpret wiring diagram and timer cam chart
5. explain operation and function of components
6. remove, test and replace components
7. demonstrate procedures for locating problems
8. diagnose and remedy problems

Instructional Methods

- Students handle and discuss the parts and components of automatic washers to become familiar with each name and function.
- Students work in small groups or teams servicing automatic washers.
- Teacher or resource person (local Appliance Serviceman) presents a demonstration on troubleshooting and servicing of automatic washers.
- Teacher designs and directs a series of performance tests for individual students on servicing automatic washers.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,3,7,8,9	Slide film and cassette tape on washer	4	
NUMBERS B 2,4d,h,i	Washer service manual	14	
APPLICATION C 3,5,6,8	How to Repair Major Appliances	13	37
PHYSICAL D 1a,c,d 2a/b 3c,d,e,f,g	Teacher-made overhead visuals	18	

SUBCLUSTER: APPLIANCE REPAIR

E: APS - AR06 TASK: Service automatic washers

Basic Information for Cooperative Teaching

Language of the Task

Switch
Clutch
Solenoid
Pump
Timer
Water valve
Cam chart
Water level switch
Continuity
Voltage
Resistance
Wiring diagram
Contact
Ohmeter
Voltmeter
Electrical
Ground
Transmission
Belt

Quantitative Concepts

Measure voltage and resistance.

Develop procedures for interpreting charts and guides of service manual.

Suggestions:

- Have student interpret meter readings on copy of meter dial.
- Ask vocational education teacher to explain interpretation of manual.
- Student practice interpreting manual.

Supportive Instructional Materials:

Service manual
Textbook
Copy of meter dial

SUBCLUSTER: APPLIANCE REPAIR

TASK: Service ranges

Sheet 1 of 1

Code: APS - AR07

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. install range with proper safety
2. test surface units and oven element on electric ranges
3. check operation of gas burners
4. check and adjust automatic controls on oven and burners
5. check operation of timers
6. interpret electrical and gas systems
7. explain operational characteristics and sequences of components
8. explain function of components
9. remove, test and replace components
10. diagnose and remedy problems

Instructional Methods

- Teacher or resource person (local Appliance Serviceman) presents a demonstration on troubleshooting and servicing of ranges.
- Students handle and discuss the parts and components of ranges to become familiar with each name and function.
- Advanced student works individually with students on a specialized servicing job.
- Teacher designs and directs a series of performance tests for individual students on servicing of ranges.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,3,7,8,9 NUMBERS B 2, 4a,h,i APPLICATION C 3,5,6,8 PHYSICAL D 1a,c,d 2a/b 3c,d,e,f,g	Slide film and cassette on range	4	6
	How to Repair Major Appliances	13	37
	Teacher-made overhead visuals	18	

SUBCLUSTER: APPLIANCE REPAIR

e: APS - AR07 TASK: Service ranges

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Switch	Measure voltage and resistance.	• Ask vocational education teacher for suggestions on how to measure and interpret the following: 1. resistance 2. voltage 3. oven temperature
Bake unit	Measure oven temperature.	
Broil unit		
Oven		
Burner		
Thermostat		
Minute minder		
Terminal		
Pigtail		
Ground		
Wiring diagram		
Timer		
Wattage		

Supportive Instructional Materials:

SUBCLUSTER: APPLIANCE REPAIR

TASK: Service dishwashers

Sheet 1 of 1

Code: APS - AR08

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills
Introduced	Involved	Productive	Employable	

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. install dishwasher with proper safety
2. test run and time the operation
3. interpret the electrical, mechanical and water diagrams
4. explain operational characteristics and sequences
5. explain operation and function of components
6. remove, test and replace components
7. demonstrate procedures for locating problems
8. diagnose and remedy problems

Instructional Methods

- Paraprofessional works individually with students having difficulty with this task.
- Teacher or resource person (local Appliance Serviceman) presents a demonstration on troubleshooting and servicing dishwashers.
- Students review and discuss illustrated texts, workbooks, service manuals, and visual materials related to the task.
- Teacher designs and directs a series of performance tests for individual students on servicing dishwashers.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,3,7,8,9	How to Repair Major Appliances	13	37
NUMBERS B 2,4d,h,i	Teacher-made overhead visuals	17	
APPLICATION C 3,5,6,8			
PHYSICAL D 1a,c,d 2a/b 3c,d,e,f,g			

SUBCLUSTER: APPLIANCE REPAIR

e: APS - AR08 TASK: Service dishwashers

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Spray arm Inlet valve Pressure switch Solenoid valve Timer Impeller Filter Wiring diagram Timer sequence chart Pump Cycle	Measure voltage and resistance. Read thermometers and gauges.	• Ask vocational education teacher for suggestions on following: A. measure 1. voltage 2. resistance 3. water temperature 4. water pressure B. interpret manual

Supportive Instructional Materials:

Manual
Textbook

AIR CONDITIONING

INSTRUCTIONAL TASK MODULES

AC01 Perform basic wiring

AC02 Cut, thread, and install iron and copper piping systems

AC03 Measure and record refrigerant temperature

AC04 Install refrigerant filter and drier

AC05 Replace metering devices

AC06 Charge and test a refrigeration system

AC07 Service refrigerators and freezers

AC08 Apply principles of refrigeration

AC09 Apply principles of basic electricity

SUBCLUSTER: AIR CONDITIONING

TASK: Perform basic wiring

Sheet 1 of 1

e: APS - AC01

Student Name: _____

Student Progress	Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced / Involved / Productive / Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify the basic types of electrical circuits and basic symbols 2. identify wire size by using wire guage 3. identify circuits by using color code 4. identify and use different types of conduit 5. be able to splice circuits 6. be able to properly ground circuits 7. be able to properly install circuit breakers	• Teacher or resource person (local refrigeration mechanic) provides a demonstration of procedures for installing and grounding circuit breakers. • Students make an on-site observation of a worker installing conduit. • Students review and discuss illustrated specification sheets and circuit prints. • Students work in teams of two installing basic wiring circuits on a mock wall section. • Paraprofessional provides individual instruction for the identified task.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 2,3,5,7,9 NUMBERS B 2, 4a APPLICATION C 2,3,5,8 PHYSICAL D 1a,c,d 2c 3a,b,c,f,g	Manufacturer's specification sheets Circuit prints (drawings)	14 17	

SUBCLUSTER: AIR CONDITIONING

: APS - AC01 TASK: Perform basic wiring

Basic Information for Cooperative Teaching

Language of the Task

Circuit

Junction box

Coding

Color code

Conduit
flexible
rigid

Wire strippers

Shipping

Terminal

Cutters

Splice

Wire gauge

Screw driver

Pliers

Electrical tape

Friction tape

Tester

Quantitative Concepts

Simple measurement of distances in feet and inches.

Identify wire size by number*.

*Get sample of #10-2 and #12-2 and #12-3 from vocational instructor so students can relate number code to wire size.

Suggestions:

- Color coding is not standard except as it applies to each model.
- Check with vocational education teacher for area codes, if any.
- Field trip to construction job where wiring is being installed.

Supportive Instructional Materials:

Kit of hand tools and equipment from vocational education department.

SUBCLUSTER: AIR CONDITIONING

Sheet 1 of 1

TASK: Cut, thread, and install iron and copper piping systems

e: APS - AC02

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced	Involved	Productive	Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify different iron and copper pipe types and sizes 2. identify iron and copper fittings, types, and sizes 3. read and use piping blue prints 4. measure, cut, and thread iron pipe and install it with the proper fittings 5. measure, cut, and install copper pipe with the proper fittings 6. purge and pressure test piping systems	• Teacher or resource person (local refrigeration mechanic) provides a demonstration of cutting, threading, and installing. • Students handle and discuss components and parts as they learn the name and function of each. • Paraprofessional provides individual instruction for the identified task. • Students work in teams of two practicing the techniques for cutting, threading, and assembling piping systems.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 7,9 NUMBERS B 2, 4a,e,i APPLICATION C 2,5,8 PHYSICAL D 1a,c,d 2c 3a,b,c,f,g			

SUBCLUSTER: AIR CONDITIONING

: APS - AC02 TASK: Cut, thread, and install iron and copper piping systems

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	• Check with vocational teacher for proper hand tools to use.
Thread Flaring Flange Soldering-sweating Elbows Couplings Unions Tee's Vise Cutting tool Flaring tool	Simple measurement of lengths of pipe, thread sizes of pip fittings Taper dimensions Practice inside measurement of pipe.	

Supportive Instructional Materials:

SUBCLUSTER: AIR CONDITIONING

TASK: Measure and record refrigerant temperatures

Sheet 1 of 1

: APS - AC03

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced	Involved	Productive	Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify the different types of thermometers used in refrigeration 2. identify the different types of condensers used in refrigeration 3. identify the different types of evaporators used in refrigeration 4. locate temperature change points 5. determine appropriate temperature range scales 6. adjust equipment for desired temperature changes using: a. motor controls b. liquid controls 7. record temperature and pressure changes accurately	• Students work in teams of two recording control settings and temperature and pressure changes on a time interval basis. • Teacher or resource person (local refrigeration mechanic) provides a demonstration of the procedures for measuring refrigerant temperatures and pressures. • Students handle and discuss components and parts as they learn the name and function of each. • Teacher designs and directs a series of performance tests to evaluate the student's progress.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 3,9,10 NUMBERS B 2, 4f,i APPLICATION C 2,3,8 PHYSICAL D 1a,d,f 2c 3c,f,g			

SUBCLUSTER: AIR CONDITIONING

APS - AC03 TASK: Measure and record refrigerant temperatures

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	• Have available different type of thermometers.
Condense Evaporate Gas Refrigerant Freons Thermometers dial alcohol mercury electronic Finned tube evaporators Plate evaporators	Read temperature and pressure gauges supplied by the air conditioning instructor.	

Supportive Instructional Materials:

Examples of different types of thermometers

SUBCLUSTER: AIR CONDITIONING

TASK: Install refrigerant filter and drier

Sheet 1 of 1

: APS- AC04

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced	Involved	Productive	Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. select the appropriate location for installation 2. identify the types and ratings of driers 3. connect discharging and recharging units 4. make tubing connections 5. check drier installation for leaks by pressurizing the system	• Students handle and discuss components and parts as they learn the name and function of each. • Students work in teams of two installing refrigerant filters and driers on test equipment. • Paraprofessional provides individual instruction for the identified task. • Teacher designs and directs a series of performance tests to evaluate the student's progress.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 8,9 NUMBERS B 2 APPLICATION C 2,5,8 PHYSICAL D 1c,d 2c 3c	Manufacturer's specification sheets	14	

SUBCLUSTER: AIR CONDITIONING

Code: APS- AC04 TASK: Install refrigerant filter and drier

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Filter-Drier Tubing cutter Flare Flaring tube Copper tubing Pressurize Sweat joint Flare joint	Use gauge manifold. Check service manual to determine the appropriate amount of refrigerant and appropriate pressures and temperatures.	• Acquire used gauges and other equipment from vocational teacher. • Gather manufacturer's spec sheets from vocational instructor. • Refer also to AC05

Supportive Instructional Materials:

SUBCLUSTER: AIR CONDITIONING

TASK: Replace metering devices

Code: APS - AC05

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced	Involved	Productive	Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify the types of metering devices 2. size and replace capillary tubes 3. determine capacities and refrigerant charge	• Paraprofessional provides individual instruction for the identified task. • Teacher or resource person (local refrigeration mechanic) provides a demonstration of how to replace metering devices. • Students review and discuss illustrated specification sheets. • Teacher designs and directs a series of performance tests to evaluate the student's progress.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 3,9 NUMBERS B 2 APPLICATION C 2,3,5,8 PHYSICAL D 1a,b 2c 3c	Manufacturer's specification sheets	14	

SUBCLUSTER: AIR CONDITIONING

: APS - AC05 TASK: Replace metering devices

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Capillary tube Expansion valve Metering devices Refrigerant Evaporator Capacity B.T.U. Refrigerant charge Freon	Read manufacturer's specifications Use of gauge manifold and thermometers	• It may be worthwhile for the special education teacher to teach the basic technique of sweating and flaring joints. Should check with vocational instructor on techniques and materials. This should be a hands-on activity, if possible.

Supportive Instructional Materials:

Butane torch
Solder
Flaring tool
Emory cloth
Flux

SUBCLUSTER: AIR CONDITIONING

Sheet 1 of 1

TASK: Charge and test a refrigeration system

Code: APS - AC06

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced	Involved	Productive	Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will 1. identify the different types of refrigerants 2. select the proper equipment for charging and testing 3. describe different methods of testing for leaks 4. locate and repair leaks 5. discharge and charge a unit	• Students review and discuss illustrated manufacturer's literature. • Teacher or resource person (local refrigeration mechanic) provides a demonstration of the total process of charging and testing a refrigeration system. • Paraprofessional provides individual instruction for the identified task. • Students handle and discuss components and parts as they learn the name and function of each. • Teacher designs and directs a series of performance tests to evaluate the student's progress.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 7,9 NUMBERS B 2, 4f APPLICATION C 2,5,8 PHYSICAL D 1a,c,d 2c 3c	Manufacturer's literature	14	

SUBCLUSTER: AIR CONDITIONING

APS - ACOG TASK: Charge and test a refrigeration system

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	• Resource person to show proper tools and explain their use.
Refrigerant Charging Discharging	Study and read pressure regulators.	

Supportive Instructional Materials:

SUBCLUSTER: AIR CONDITIONING

TASK: Service refrigerators and freezers

File: APS - AC07

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced	Involved	Productive	Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. adjust and/or replace thermostats 2. test, repair, and/or replace compressors 3. test, repair and/or replace evaporators 4. repair and/or replace relays 5. repair and/or replace defroster controls and heater 6. repair and/or replace condensers 7. remove and install door gaskets or mullions	• Students handle and discuss components and parts as they learn the name and function of each. • Paraprofessional provides individual isntruction for the identified task. • Students work in teams of two performing the identified task skills. • Students make an on-site observation of refrigerator serviceman on a service call.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 7,9 NUMBERS B 2,4a,f,i APPLICATION C 2,5,8 PHYSICAL D 1a,c,d 2c 3c,f,g			

SUBCLUSTER: AIR CONDITIONING

e: APS- AC07 TASK: Service refrigerators and freezers

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	• Refer to AC08
Mullions Defroster Heater Condenser Gaskets Evaporator Compressors Thermostats	Reading of gauges and thermostats	

Supportive Instructional Materials:

SUBCLUSTER: AIR CONDITIONING

TASK: Apply principles of refrigeration

Sheet 1 of 1

CODE: APS - AC08

Student Name: _____

Student Progress				Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced	Involved	Productive	Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. describe the practical application of the following theories in relation to refrigerants a. heat b. temperature and pressure c. condensation d. process of evaporation 2. recognize the different types of refrigeration systems 3. assess the characteristics and effects of sensible heat 4. assess the characteristics and effects of latent heat	• Students work in teams of two performing teacher-designed experiments to demonstrate the principles of refrigeration. • Paraprofessional provides individual instruction for the identified task. • Local refrigeration mechanic speaks to the class describing the principles of refrigeration in an applied practical sense.

Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 9 NUMBERS B 2,4f,i APPLICATION C 2,5,8 PHYSICAL D 1a, 2a			

SUBCLUSTER: AIR CONDITIONING

APS - AC08 TASK: Apply principles of refrigeration

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	• Emphasis should be place here. Understanding relation between temperature and pressure is important.
Sensible heat Latent heat P.S.I.G. (pounds per sq. in. gauge) B.T.U. (British Thermal Unit)	Reading a thermometer Reading charts Convert Fahrenheit to Centigrade Reading pressure gauges	

Supportive Instructional Materials:

SUBCLUSTER: AIR CONDITIONING

TASK: Apply principles of basic electricity

e: APS - AC09

Student Name: _____

Student Progress	Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced / Involved / Productive / Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify the basic types of electrical circuits and basic symbols 2. recognize the relationship between voltage, current, and resistance in an electrical circuit 3. solve basic problems using Ohm's law 4. describe common applications of the electromagnet 5. illustrate and demonstrate the practical applications of transformers 6. demonstrate and describe the operation of an induction coil 7. describe the application and construction of solenoids and relays 8. describe the operation of an electrical motor 9. measure wire size using wire gauge 10. draw series and parallel circuits using appropriate symbols 11. interpret and discuss a schematic drawing of a residential wiring plan	• Paraprofessional provides individual instruction for the identified task. • Construction electrician visits class to discuss the principles of electricity in an applied, practical sense. • Students review and discuss illustrated materials. • Students handle and discuss components and parts as they learn the name and function of each.

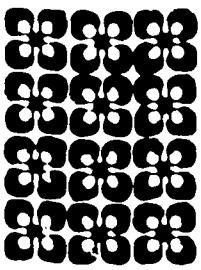
Task-Related Competencies	Instructional Materials		
	Title	Media	Bib.
KNOWLEDGE A 7,8,9 NUMBERS B 2,4f,h,5,6 APPLICATION C 2,3,5,8 PHYSICAL D 1a 2c 3c			

SUBCLUSTER: AIR CONDITIONING

APS- AC09 TASK: Apply principles of basic electricity

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Electromagnet Transformer Induction Solenoid Wire gauge Parallel Schematic Circuit	Teach application of different types of gauges- depth, electrical, wire, thickness, pressure, etc. Work out solutions to some problems involving Ohm's Law.	• Special education teacher should have all different types of gauges available. Special education teacher should check with various vocational instructors for need and use of gauges. (If the supportive teacher is unable to understand the relationship, that teacher should then stress identification of tools and word recognition. Don't confuse the student by trying to teach something that is not understood.)

Supportive Instructional Materials:



INSTRUCTIONAL MATERIALS BIBLIOGRAPHY

INSTRUCTIONAL MATERIALS BIBLIOGRAPHY

AUTOMOTIVE AND POWER SERVICE CLUSTER

Bib. Ref. No.	Company Name/Address	Title
1.	Allen Electric Kalamazoo, Michigan	"Cooling System" "Ignition System" "Cranking System" "Fuel System" "Electricity" "Charging System" "Automatic Transmission" "Internal Combustion Engine"
2.	Avid Corporation, AVIDesk P.O. Box 4263 East Providence, R.I. 02914	Automotive Occupation Series
3.	Bennett Book Company 809 W. Deweller Drive Peoria, Illinois 61614	Engine Rebuilding and Maintenance
4.	Chrysler Corporation Department of Public Relations P.O. Box 1919 Detroit, Michigan	Record and Filmstrip "Service Operations for Auto Mechanics" (usually received by local dealer)
5.	Clinton Book Company New York, New York	National Service Data Clinton Service Manual
6.	DCA Educational Products Newman Visual Ed. Inc. 400 32nd Street, S.E. Grand Rapids, Michigan 49508	Automotive Mechanics (twelve separate sections of transparencies)
7.	Delco-Remy Corporation Division of GMC Anderson, Indiana	Flip Charts for Auto Mechanics
8.	General Motors Film Library General Motors Building Detroit, Michigan 48202	"ABC'S of Handtools" #69A7 Part 1 & 2 ABC'S of the Automobile Engine

9.	Goodheart-Wilcox Co., Inc. 123 W. Taft, Drive South Holland, Illinois	Auto Service and Repair Auto Mechanics Fundamentals Auto Body Repair and Repainting Metalwork Technology and Practice
10.	Jam Handy School Service 2781 E. Grand Boulevard Detroit, Michigan 48211	Automotive Technician Series #4300
11.	McGraw Hill Book Company 330 West 42nd Street New York, New York 10036	Automechanics Automotive Fuel, Lubricating & Cooling Systems Automotive Chassis and Body Automotive Transmission and Power Transmission Automotive Electrical Equipment
12.	Raybestos Brake Co. Bridgeport, Conn. 06603	Raybestos Brake Text
13.	Sealed Power Company Muskegon, Michigan	"Detailed Make the Difference
14.	Shell Oil Company 2843 E. Paris Grand Rapids, Michigan 49508	Service Guide to Lubrication
15.	Minnesota Mining and Manufacturing Co. 2501 Hudson Road St. Paul, Minnesota 55119	Automotive Master Transparencies "Arc Welding" "Hand Tools" (series) "Filing Techniques" (series) "Hammer and Dolly" "Simple Rolled Buckle" "Metal Preparation" "Featheredging" "Masking" "Cleaning Spray Gun" "Common Problems" "Mixture, Lacquer and Acrylic

16.	Briggs and Stratton Company Milwaukee, Wisconsin 53201	Repair Instructions IV (Large Print Michigan School for the Blind) Master Parts Manual General Theory of Operation 35mm slides, Engine Repair
17.	Lauson-Power Products Parts Depot Division Grafton, Wisconsin	Master Parts Manual Mechanics Manual 35mm slides, Engine Repair
18.	Clinton Engines Corporation Maquaketa, Iowa 52060	Manual of Maintenance and Overhaul
19.	Outboard Marine Corporation Galesburg, Illinois	Lawn Boy Service Manual
20.	Delmar Publishers, Inc. Montainview Avenue Albany, New York 12205	Power Technology (Large Print and Braille for the Blind, Lansing)
21.	Technical Publications, Inc. 1014 Wyandotte St. Kansas City, Missouri 64105	Small Engine Service Manual 9th Edition (Cassettes and tape #MCBV 1728 Michigan State Library Lansing, Michigan)
22.	McCullock Corporation Los Angeles, California	The Two-Cycle Engine (Large Print, Michigan School for the Blind, Lansing)
23.	Automobile Electric Association Detroit, Michigan	A.E.A. Training Manual, TM-6
24.	DCA Educational Products, Inc. 4865 Stanton Ave. Philadelphia, Pa 19144	Small Gasoline Engine Transparencies
25.	Technical Publications Division Intertec Publishing Corporation 1014 Wyandotte Street Kansas City, Missouri 64105	Small Engines and Chain Saws Flat Rate Pricing Guide (5th Edition)
26.	Hobart Bros. Company Box EW-416 Troy, Ohio 45373	Hobart Welder's Pocket Guide

27.	J.C. Whitney Co. Chicago, Illinois	Catalogues
28.	Bill Schell, Auto Body Instructor Bay-Arenac Skill Center 4155 Monitor Road Bay City, Michigan 48706	Display boards
29.	E.I. DuPont de Nemours and Co., Inc. Refinish Division Wilmington, Delaware 19898	"Matching the Hard Ones" "Paint Problems" "Making the Most Use of Spray Equipment" "Surface Preparation"
30.	Rinshed-Mason Detroit, Michigan	"The Acrylic Story" "Color Match"
31.	The DeVilbiss Company Division of Champion Spark Plug Co. Toledo, Ohio 43692	Spray Gun Motion Study
32.	Snap On Tool Co. 20750 Chesley Drive Farmington, Michigan 48024	Wall charts on tools
33.	See your local Volkswagen dealership for all pertinent technical manuals and literature.	
34.	Ford Motor Company Educational Affairs Dept. The American Road Dearborn, Michigan 48121	
35.	Dana Parts Co. Box 500 Hagerstown, In 47346	"Progress in Suspension Systems"
36.	Eye Gate House, Inc. 146-01 Archer Avenue Jamaica, New York 11435	"Front Wheel Bearings" "Steering System"

37.	Howard W. Sams and Co., Inc. 4300 W. 62nd Street Indianapolis, Ind. 46268	How to Repair Small Appliances How to Repair Major Appliances
38.	Michigan School for the Blind 715 Willow Street Lansing, Michigan	Frank Richards and Hank Tyszka are the Small Engines and Volkswagen teachers at M.S.B. Each has developed several teaching aids for visually impaired students in their respective programs.
39.	Whirlpool Corporation Training Center Benton Harbor, Michigan	Slide/film and cassette Programs on: Refrigerators Dryers Washers Ranges
40.	Herst Corporation 250 West 55th Street New York, N.Y. 10019	Motor's Manuals

APPENDIX

- INSTRUCTIONAL MATERIALS CODE
- TASK-RELATED COMPETENCIES CODE

INSTRUCTIONAL MATERIALS CODE

MEDIA CODE/INDEX

Code	Media	Probable Learning Sensations					
		Vis.	Aud.	Tac.	Kin.	Ole.	Sav.
1	Demonstration with real objects/materials	x	x	x	x	x	x
2	3-D models - Mockups	x	x	x	x	x	x
3	Games - Simulators	x	x	x	x	x	x
4	Sound/Slide Programs	x	x				
5	Filmstrip - Cassette/Record	x	x				
6	TV - Broadcast, Closed Circuit	x	x				
7	Video and/or Audio Recorder	x	x				
8	Film, 16mm - BW/Color, Sound	x	x				
9	Film loop, 8mm	x					
10	Filmstrip	x					
11	Slides	x					
12	Overhead transparencies	x					
13	Books, Magazines, Texts, Booklets	x					
14	Pamphlets, Brochures, Manuals, Workbooks	x					
15	Newspapers, Cartoons	x					
16	2-D Displays, Charts, Graphs, Posters	x					
17	Drawings, Photographs, Schematics, Maps	x					
18	Opaque Projectuals	x					
19	Telephone, Intercom		x				
20	Other, specify						

BIBLIOGRAPHY REFERENCE

. . . complete ordering information for each of the commercially or teacher-produced instructional materials may be obtained by checking this reference number in the Instructional Materials Bibliography located in the back of the Cluster Guide.

TASK-RELATED COMPETENCIES

The task-related competencies are a summation of the specific skills, understandings, and/or attitudes that are necessary to satisfactorily accomplish the instructional tasks found in the ten cluster guides. The following listing is used for interpreting the Task-Related Competency code numbers found on each task sheet. A more detailed description of each of the identified competencies can be found either in the Program Guide or the Project Handbook.

A. SKILLS BASED ON KNOWLEDGE

1. Name one or more items
2. Request supplies and/or equipment
3. Check for accuracy and, if necessary, require correction of self and/or others
4. Discriminate sound cues, recognize normal sound as opposed to abnormal sound
5. Identify color
6. Identify form, size, shape, texture
7. Sequencing - Respond by pre-determined plan
8. Write identifying information of persons, places, and/or objects, serial no., weight, and/or types of products on slips or tags, etc.
9. Obtain information through sight, shape, size, distance, motion, color, and other unique characteristics
10. Discriminate olfactory cues

B. CONCEPT OF NUMBERS BASED ON KNOWLEDGE

1. Ordinal
2. Cardinal
   a. read numbers and/or copy
   b. count and/or record
3. Make change (money)
4. Measure
   a. distance
   b. weights - volume - balance
   c. liquids - solids
   d. time (measurement of)
   e. degrees of circle
   f. temperature, pressure and humidity
   g. torque
   h. electricity
   i. vertical-horizontal
5. Perform simple addition and/or subtraction
6. Perform simple multiplication and/or division

TASK-RELATED COMPETENCIES, continued. . .

C. COMPREHENSION AND PERFORMANCE

1. Forms
   a. write
   b. file, post and/or mail
2. Match
   a. duplicate
   b. sort
3. Check lists and/or fill out report forms
4. Time awareness
5. Follow verbal symbol and/or written direction
6. Recognize words (not numbers) or ability to read and/or write
7. Depth perception
8. Ability to select most appropriate solution
9. Concept of distance

D. SKILLS BASED ON PHYSICAL ABILITIES

1. Fine Coordination
   a. coordinate eyes and hands or fingers accurately
   b. make precise movement
   c. move fingers to manipulate objects
   d. move hands skillfully - placing and turning motion
   e. coordinate hand and foot
   f. feeling - perceiving objects and materials as to size, shape, temperature, moisture content, or texture by means of touch
2. Strength (lifting, carrying, pushing, and/or pulling)
   a. sedentary work, 10# occasionally lifting and/or carrying small items such as tools, etc.
   b. light work, 20#, requires a significant amount of standing or walking
   c. medium work, lifting 50#, frequent lifting and carrying objects weighing 25#
   d. heavy work, frequent lifting and/or carrying up to 50#
   e. very heavy work - lifting objects in excess 100#, lifting and/or carrying objects weighing 50# or more
3. Gross Coordination (climbing and/or balancing)
   a. maintain body equilibrium to prevent falling when walking, standing, crouching, or running on narrow, slippery or moving surfaces
   b. ascend and descend ladders, stairs, scaffolding, ramps, poles, ropes, using feet and legs and/or hands and arms
   c. reaching - extending hands and arms in any directions
   d. crawling - moving on knees or hands and feet
   e. kneeling - bend legs at knees to rest on knee or knees
   f. stooping - bend downward and forward by bending legs and spine
   g. bending - downward and forward by bending at the waist