DOCUMENT RESUME

ED 262 197 CE 042 576

TITLE	Automotive Technology Objectives. Career Education. DS Manual 2870.1.
INSTITUTION	Dependents Schools (DOD), Washington, D.C.
PUB DATE	Apr 84
NOTE	66p.
PUB TYPE	Guides - Classroom Use - Guides (For Teachers) (052)
EDRS PRICE	MF01/PC03 Plus Postage.
DESCRIPTORS	*Auto Mechanics; Behavioral Objectives; *Career Exploration; Classroom Techniques; Competency Based Education; Consumer Education; Course Content; Course Descriptions; Definitions; Disabilities; Employment Opportunities; Energy Education; Engines; Equipment Maintenance; Equipment Utilization; Facility Requirements; Guidelines; Hand Tools; Mainstreaming; *Mechanics (Process); *Power Technology; Program Evaluation; Questionnaires; Records (Forms); School Safety; Secondary Education; *Small Engine Mechanics; Teaching Methods; *Trade and Industrial Education

ABSTRACT

This guide is designed for use in helping junior and senior high school students explore the field of automotive technology as a potential career area. Included in the manual are the following materials: definitions, a key to the organization and numbering code and symbols used in the lists of objectives, lists of general and program objectives with recommended instructional levels, a flow chart detailing the organizational pattern of the course of study to prepare students for careers in automotive technology, descriptions of pertinent required and elective courses, suggested facilities layouts, guidelines for classroom safety and health, a discussion of strategies for mainstreaming disabled students through the development of individualized educational programs (IEPs), a competency profile for vocational teachers instructing sensory and physically impaired students, a self-assessment evaluation form for teachers, a sample certificate of completion, and a brief list of basic textbooks. (MN)

Automotive Technology Objectives

career education

DS Manual 2870.1
April 1984

AUTOMOTIVE TECHNOLOGY OBJECTIVES

Department of Defense Dependents Schools

CAREER EDUCATION

FOREWORD

Automotive Technology in the Department of Defense Dependents Schools (DoDDS) is a career education discipline which provides junior high and high school students with exploratory experiences, consumer knowledge, industrial, and technical skills through hands-on learning experiences, problem solving, and the use of tools and equipment.

This manual has been prepared as a guide for the Automotive Technology curriculum.

Steve Motta
Deputy Director

ACKNOWLEDGEMENTS

The Automotive Technology Objectives Manual is a revised version of the 1980 document. We appreciate the efforts of the many DoDDS educators who helped prepare that original document.

During SY 1983-84, educators from the five regions (Atlantic, Mediterranean, Germany, Panama, and the Pacific) were tasked to review and revise the Automotive Technology Objectives. DoDDS is indebted to the many persons from throughout the system who contributed to this document and particularly to the following educators:

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Nino DiGiovanni
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INTRODUCTION

Automotive technology is an exciting and challenging area of study. Never before in the history of mankind has one invention caused so much international controversy, economic, and social upheaval. The ever-increasing demand for our nonrenewable energy resources, coupled with global air pollution, has added new perspectives to the study of Automotive Technology.

A large portion of the population is affected by automotive-related fields (i.e., manufacturing, sales, service, maintenance, repair). The explosion of technology such as diesel engines, electric vehicles, steam cars, electronic engine control systems, turbines, alcohol additives, and fuel cells are but a few of today's realities that must be included in any study of automotive technology.

This manual outlines a program designed to provide the student with entry-level skills for numerous jobs in the broad field of Automotive Technology. The program also provides a substantial base for students who decide to extend their career potential by continuing professional study at a community college, a four-year college, or technical-trade school.

PHILOSOPHY

We believe the goal of education is to produce self-actualizing, self-supporting individuals capable of using their talents and skills to the utmost. This goal can be implemented by early orientation to a career.

The automotive field is well suited to this goal because we live in a highly technical and mobile society.

Our aim is to introduce students to the ideals, standards, and work attitudes of the automotive field and to provide excellent human resources for the automotive industry.

DEFINITION OF AUTOMOTIVE TECHNOLOGY

Automotive Technology as a curriculum area is defined as:

> That phase of education in which students deal with the history, development, and maintenance of various modes of transportation, its organization, materials, occupations, processes, and projects; and with the benefits and problems resulting from technology and the mobile nature of society.

In order to provide for programs at various levels, the terms within the definition are further defined to provide specificity and direction to the content. Technology and power are the basis of study for the application and systems by which tools, materials, machines, human abilities, and knowledge are utilized and organized for the purpose of changing one's life and environment.

> Evolution - The developmental growth of technology and the resulting inventions.
>
> Utilization - The use of technology toward meeting the needs of society.
>
> Significance - The contributions of technology toward improving society.

Automotive Technology includes:

> Organization - The operational structure or framework of transportation. The systematic arrangement and relationship of the interdependent parts required for service and repair to be productive;
>
> Materials - Manufactured materials used in the automotive industry;
>
> Occupations - The personnel of automotive industry; the positions of management and the classifications of labor (professional, skilled, semiskilled, and unskilled workers), their importance, functions, responsibilities, relationships, and contributions to the automotive industry;
>
> Processes - The operations of industry; the development, planning, and manipulations (selection and utilization of machines, tools, and materials) necessary for maintaining and servicing vehicles;
>
> Projects - Their purpose is to promote understanding of automotive service and repair. A project may be either a direct, hands-on experience or a mental operation which may enhance the student's knowledge of the multitude of job opportunities in the automotive field. They facilitate development and improvement of self-reliance, self-confidence and motor skills; and
>
> Benefits and Problems - Technological and industrial contributions and deterrents to the fulfillments of individual, societal, and environmental needs.

POINT OF VIEW OF AUTOMOTIVE TECHNOLOGY OBJECTIVES

The distinctive characteristic of the program is the extensive use of activity-associated learning. The laboratory provides unique opportunities for each individual to experience concrete application and development of COGNITIVE LEARNING (thinking and knowing) coupled to EXTENSIVE PSYCHOMOTOR ACTIVITIES (planning, designing, fabricating, and manipulating) and AFFECTIVE DOMAIN ACTIVITIES (attitudes and values).

1. CONTENT DEVELOPMENT - The content development deals with the breadth of past, present, and future automotive technological accomplishments. As a study of technology, automotive technology learning activities involve its evolution, utilization, and significance as individuals have taken on the role of producer, consumer, and modifier. As a study, automotive technology learning activities involve organizations, materials, occupations, products, processes, and contributions. Automotive technology deals with the benefits and problems (e.g., environmental impact) that result from the technological and mobile nature of society.

The design of automotive technology programs suggest two broad content areas:

a. Energy and Transportation Technology - Energy and transportation technology as a content area is the study of fuels, energy, and controls essential to power production and use. The experience-centered laboratory activities are designed to clarify function and application concepts, such as energy sources, energy conversion, and energy transmission.

   Example areas are transportation in the areas of land, sea, air, and space; automotives; power mechanics; and small engines.

b. Automotive production technology as a content area is the study of the automobile from conception to finished product. This includes research and design, assembly, testing, mass production, sales, and service.

2. PROCESS DEVELOPMENT - Process development is the meaningful and realistic application of content. Following are some significant educational potentials inherent in an automotive technology program related to process development. It provides--

   a. for the application of the most widely accepted theories of learning, such as individualization of instruction, feedback system, motivational factors, multisensory involvement, differentiated programming, individual interests, reinforcement, and multiple role identification.

   b. tangible materials through which the student may apply creativity and individuality for self-expression.

c. opportunity for success and accomplishment for individuals at all levels of ability.

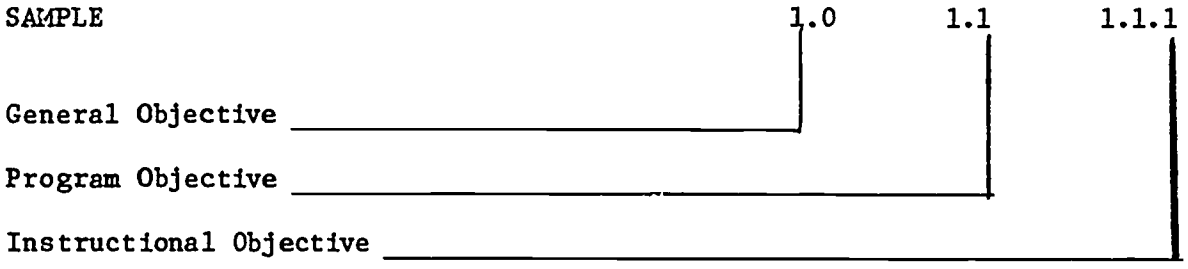
d. first-hand experience growing out of simulated and real situations.

e. self-exploration through endless varieties of experiential activities.

3. PROGRAM DEVELOPMENT - The blending of process and content allows the teacher to use the laboratory to develop competencies, such as valuing, decisionmaking, knowing, communicating, and creating. Experiential activities afford the learner opportunities to explore, create, achieve, express, challenge, and grow through the use of verbal, manipulative, visual, and kinesthetic processes.

ORGANIZATION AND NUMBERING CODE

The numbering code is used to indicate the levels of the objective.



The first digit of the number of each statement refers to the general objective.

The second digit refers to the program objective.

The third digit refers to the instructional objective.

Instructional objectives are not to be considered inclusive, but are only presented as examples.

The numbering code is used to facilitate:

- Identification of objectives.
- Correlation of objectives with textbook and instructional materials.
- Matching of test items to objectives.

USE OF SYMBOLS

Within the recommended instructional levels, the letter E represents the suggested entry point at which instruction begins.

The letter P indicates the level at which proficiency would normally be expected.

All General, Program, and Instructional Objectives should be read with the understanding that they are preceded by the phrase, "The learner should..."

Sample Objectives		Recommended Instructional Levels 6-8	9-12
2.1.2	Explain how the diesel engine functions.	E	P
2.5.1	Identify brake system components.	E	P

GENERAL AND PROGRAM OBJECTIVES

GENERAL OBJECTIVE: 1.0 APPRECIATE THE ROLE OF AUTOMOTIVE TECHNOLOGY AND RELATED SUBJECTS IN OUR CULTURE.

PROGRAM OBJECTIVE: 1.1 Explain the history of the automotive and small engines industry, give information on careers, and state qualifications of the automotive and small engine mechanic.

INSTRUCTIONAL OBJECTIVE		RECOMMENDED INSTRUCTIONAL LEVELS 6 - 8	9 - 12
1.1.1	Identify the inventions associated with automotive history to the inventor.	E	P
1.1.2	Recognize the historical importance of the small engine.	E	P
1.1.3	Identify career opportunities in the auto and small engine fields.	E	P

GENERAL OBJECTIVE: 2.0 INTEGRATE SKILLS, ATTITUDES, AND KNOWLEDGE NECESSARY FOR SUCCESS AND ADVANCEMENT OF AN INDUSTRIALLY-RELATED JOB OR EDUCATION.

PROGRAM OBJECTIVE: 2.1 Understand the theory of the internal combustion engine.

INSTRUCTIONAL OBJECTIVE		RECOMMENDED INSTRUCTIONAL LEVELS 6 - 8	9 - 12
2.1.1	Explain the principles of the four- and two-stroke cycle engines.	E	P
2.1.2	Explain how the diesel engine functions.	E	P
2.1.3	Describe the operation of the rotary engine.	E	P

PROGRAM OBJECTIVE: 2.2 Recognize the construction of the internal combustion engine.

INSTRUCTIONAL OBJECTIVE		RECOMMENDED INSTRUCTIONAL LEVELS 6 - 8	9 - 12
2.2.1	Identify the components of the four- and two-cycle engine.	E	P
2.2.2	Describe components of the rotary engine.	E	P
2.2.3	List the components of the diesel engine.	E	P

PROGRAM OBJECTIVE: 2.3 Distinguish various systems of internal combustion engines.

INSTRUCTIONAL OBJECTIVE		RECOMMENDED INSTRUCTIONAL LEVELS 6 - 8	9 - 12
2.3.1	Explain the functions of the fuel system.	E	P
2.3.2	Describe the function of the ignition system.	E	P
2.3.3	Illustrate the function of the electrical system.	E	P
2.3.4	Explain the role of the cooling system.	E	P
2.3.5	Explain the role of the lubrication system.	E	P
2.3.6	Discuss how the exhaust system functions.	E	P
2.3.7	Explain how the valve train functions.	E	P
2.3.8	List steps involved in performing a tune-up.	E	P
2.3.9	Explain general steps involved in disassembly and assembly of an internal combustion engine.	E	P

PROGRAM OBJECTIVE: 2.4 Distinguish various applications of the internal combustion engines.

INSTRUCTIONAL OBJECTIVE		RECOMMENDED INSTRUCTIONAL LEVELS 6 - 8	9 - 12
2.4.1	List various power-driven lawn and garden equipment	E	P
2.4.2	Identify systems in marine application of internal combustion.	E	P
2.4.3	Identify systems in motorcycle application.	E	P

PROGRAM OBJECTIVE: 2.5 Recognize components of the chassis and body.

INSTRUCTIONAL OBJECTIVE		RECOMMENDED INSTRUCTIONAL LEVELS 6 - 8	9 - 12
2.5.1	Identify brake system components.	E	P
2.5.2	Describe how typical brake system components function.	E	P
2.5.3	Describe the operation of typical brake system components and their relationship to the system as a whole.	E	P
2.5.4	Differentiate between disc brake and drum brake system components.	E	P
2.5.5	Identify suspension and steering system components.	E	P
2.5.6	Describe how suspension and steering components function.	E	P
2.5.7	Explain how camber, caster, toe-in, toe-out on turns affect the steering system.	E	P
2.5.8	Identify the components of the drive line.	E	P

PROGRAM OBJECTIVE: 2.6 Demonstrate techniques in welding.

INSTRUCTIONAL OBJECTIVE		RECOMMENDED INSTRUCTIONAL LEVELS 6 - 8	9 - 12
2.6.1	Identify the welding flames and their characteristics.	E	P
2.6.2	Use welding and cutting torches.	E	P
2.6.3	Identify electrodes and their application.	E	P
2.6.4	Use electrodes.	E	P
2.6.5	Differentiate between the size of wire and rate of feed in MIG and TIG welding.	E	P

GENERAL OBJECTIVE: 3.0 EXPLAIN THE PRINCIPLES AND SKILLS RELATED TO CONSUMERISM.

PROGRAM OBJECTIVE: 3.1 Understand the concepts of parts and service manuals.

		RECOMMENDED INSTRUCTIONAL LEVELS	
INSTRUCTIONAL OBJECTIVE		6 - 8	9 - 12
3.1.1	Use service manuals.	E	P
3.1.2	Prepare a parts order.	E	P

PROGRAM OBJECTIVE: 3.2 Apply basic concepts related to automotive consumerism.

INSTRUCTIONAL OBJECTIVE		RECOMMENDED INSTRUCTIONAL LEVELS 6 - 8	9 - 12
3.2.1	List the major physical considerations in the purchase of a vehicle.	E	P
3.2.2	Describe the automobile insurance coverages and finance systems.	E	P
3.2.3	Demonstrate the operation of vehicle controls and utilization of the instruments.	E	P
3.2.4	Identify the rules that govern the safe operation of a vehicle.	E	P
3.2.5	Recognize the need for automobile maintenance and service.	E	P

GENERAL OBJECTIVE: 4.0 DEMONSTRATE THE USE OF COMMON AUTOMOTIVE TOOLS, MACHINES, AND SAFETY PROCEDURES.

PROGRAM OBJECTIVE: 4.1 Apply standard safety procedures.

		RECOMMENDED INSTRUCTIONAL LEVELS	
INSTRUCTIONAL OBJECTIVE		6 - 8	9 - 12
4.1.1	Describe by name and location all the safety services found in the laboratory.	E___P	
4.1.2	Use hand and power tools safely.	E___P	
4.1.3	Demonstrate clean-up procedures.	E___P	
4.1.4	Complete a safety test in auto mechanics.	E___P	

PROGRAM OBJECTIVE: 4.2 Operate common automotive tools and machines.

INSTRUCTIONAL OBJECTIVE		RECOMMENDED INSTRUCTIONAL LEVELS 6 - 8	9 - 12
4.2.1	Identify fasteners.	E	P
4.2.2	Use basic hand tools.	E	P
4.2.3	Use power tools.	E	P
4.2.4	Use measuring instruments.	E	P
4.2.5	Use diagnostic equipment.	E	P
4.2.6	Perform maintenance on tools and instruments.	E	P

PROGRAM OBJECTIVE: 4.3 Apply maintenance procedures to power-driven lawn and garden equipment, outboard engines, and motorcycles.

INSTRUCTIONAL OBJECTIVE		RECOMMENDED INSTRUCTIONAL LEVELS 6 - 8	9 - 12
4.3.1	Practice preventive maintenance on power-driven lawn and garden equipment.		E___P
4.3.2	Repair outboard engines.		E___P
4.3.3	Demonstrate repair procedures on motorcycles.		E___P

PROGRAM OBJECTIVE: 4.4 Perform maintenance operations on automotive systems.

INSTRUCTIONAL OBJECTIVE		RECOMMENDED INSTRUCTIONAL LEVELS 6 - 8	9 - 12
4.4.1	Perform service and repair on an ignition system.		E___P
4.4.2	Perform service and repair on the electrical system.		E___P
4.4.3	Maintain and service the lubrication system.		E___P
4.4.4	Service the valve train.		E___P
4.4.5	Maintain the exhaust system.		E___P
4.4.6	Repair the fuel system.		E___P
4.4.7	Repair the cooling system.		E___P
4.4.8	Replace defective components found during a tune-up.		E___P
4.4.9	Perform service and overhaul operations on the brake system.		E___P
4.4.10	Repair the components of the suspension and steering systems.		E___P
4.4.11	Repair the drive line system.		E___P
4.4.12	Apply proper techniques used in body repair and refinishing.		E___P
4.4.13	Perform service and repair on the air conditioning system.		E___P

PROGRAM OBJECTIVE: 4.5 Apply techniques and procedures in welding.

		RECOMMENDED INSTRUCTIONAL LEVELS	
INSTRUCTIONAL OBJECTIVE		6 - 8	9 - 12
4.5.1	Perform a gas weld.		E___P
4.5.2	Perform electric arc weld.		E___P
4.5.3	Show basic joint preparation and position welding. (MIG and TIG systems)		E___P

GENERAL OBJECTIVE: 5.0 DEVELOP PROBLEM SOLVING ABILITIES INVOLVING MATERIALS, PROCESSES, AND PRODUCTS OF THE AUTOMOTIVE INDUSTRY.

PROGRAM OBJECTIVE: 5.1 Perform skills necessary for preventive maintenance of automobiles, lawn and garden equipment, motorcycles, and marine engines.

INSTRUCTIONAL OBJECTIVE		RECOMMENDED INSTRUCTIONAL LEVELS 6 - 8	9 - 12
5.1.1	Identify factors which must be checked to perform maintenance of the automobile, garden equipment, motorcycles, and marine engines.		E___P
5.1.2	Perform test operations using the applicable test equipment.		E___P
5.1.3	Determine if components are in need of repair or replacement.		E___P
5.1.4	Perform necessary tasks to effect repair.		E___P

TIME ALLOTMENTS FOR AUTOMOTIVE TECHNOLOGY

The determination of time allotments needed for the study of automotive technology at various levels is an important consideration in the development of course offerings within the total school program. The fact that these courses can contribute significantly to the development of each individual student necessitates their inclusion in the curriculum.

The following consideration for the middle/junior high and senior high school program lengths is based on content. The content of the general programs in automotive technology should be structured to permit individual student participation regardless of any prior mechanical experiences. Such considerations as the social, psychological, and psychomotor needs of the individual must be built into the time allotment at the local level. The following are the recommended minimum time requirements for all students:

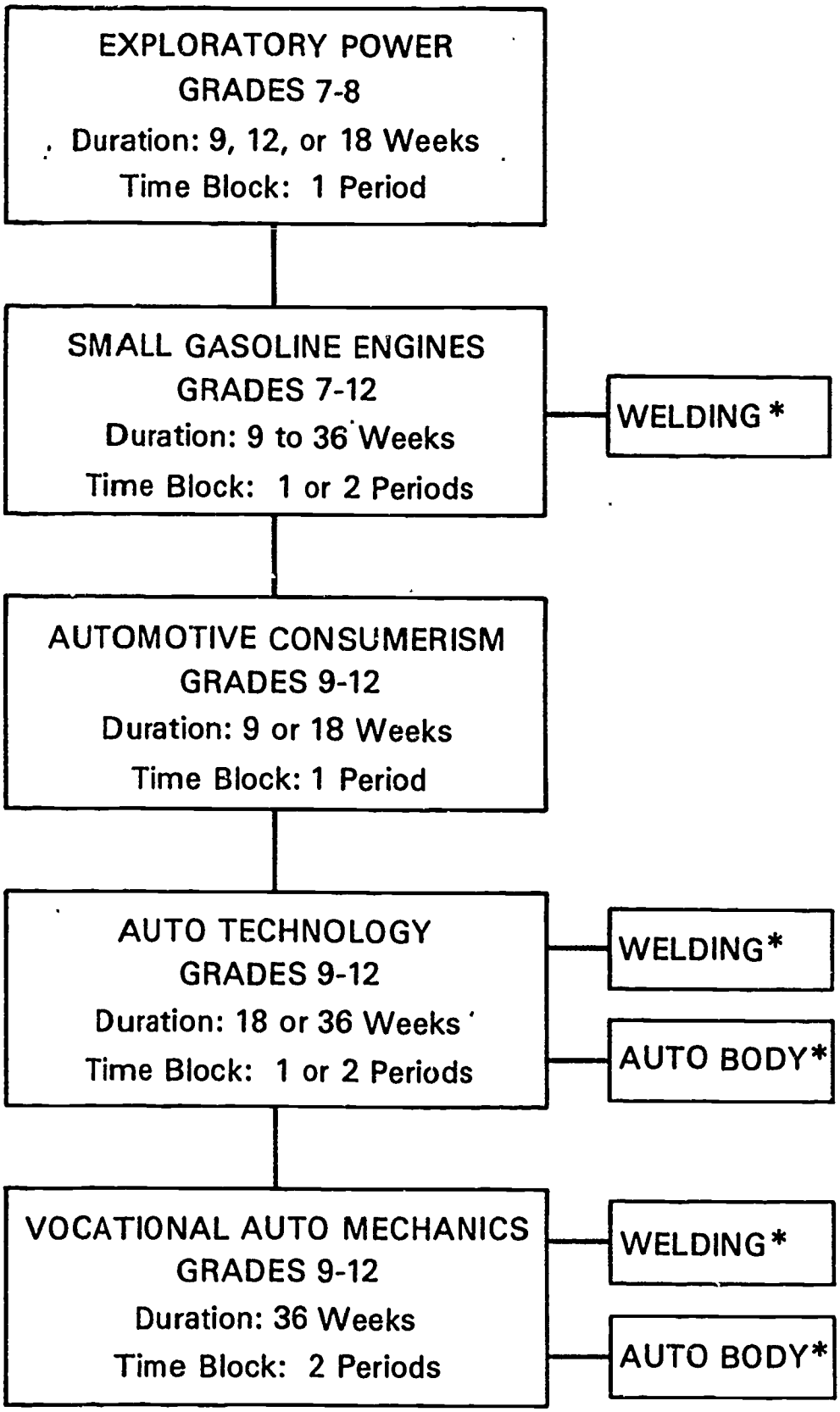
1. MIDDLE/JUNIOR HIGH SCHOOL - Program should provide continuity and breadth.

   A minimum of 90 hours should be provided in the content areas of energy, transportation, and industry. Elective courses of either a semester or a year in length are recommended.

2. SENIOR HIGH SCHOOL - Program should provide both breadth and depth.

   High school experiences for students should include mechanical courses which provide and utilize continuing and in-depth experiences in the suggested areas of automotive repair, power mechanics, maintenance, and ownership/operation.

Organizational Pattern for Automotive Technology Courses



*OPTIONAL UNITS - Implemented as separate courses at schools where facilities are available.

COURSE DESCRIPTIONS

EXPLORATORY POWER

This is a basic course covering areas of shop safety, hand tools, equipment and machines, small gas engines, hydraulics, electricity, welding, manual and power-driven units. This course is designed to provide students with basic skills and technical knowledge needed for practical use and as a basis for future mechanical course work.

(Recommended for grades 7-8, 9, 12,or 18 weeks, 1-hour block.)

SMALL GASOLINE ENGINES

This course can provide the student with skills to repair the simple small engine and more complex engines such as the motorcycle. The student will become familiar with the use of hand tools, special tools, precision measuring instruments and electronic testing devices; both two-and four-cycle engines as utilized on lawn and garden equipment, outboard engines, chainsaws, mini-bikes, mopeds, and motorcycles. Furthermore, the course is designed to provide the student with entry-level job skills.

(Recommended for grades 7-12, 9-36 weeks, 1- or 2-hour block.)

AUTOMOTIVE CONSUMERISM

Laboratory activities include basic automotive servicing that all owners of cars should be able to accomplish. Topics such as basic automobile theory, driver education theory, how to purchase new or used cars, financing cars, and buying insurance are also included. An informed consumer is the primary objective of this special course, and, in addition, it serves as an introduction for the student who pursues a career in automotive technology. The course is highly recommended for every high school student.

(Recommended for grades 9-12, 9 or 18 weeks, 1-hour block.)

AUTOMOTIVE TECHNOLOGY

This basic exploratory course covers a wide range of career opportunities in the mechanics field. A general orientation is offered for the study of gas and arc welding, auto body repair, diesel and gasoline engines. A study of the basic automobile systems includes hands-on activities in safety inspection, lubrication, tune-up, brakes, exhaust systems, suspensions, drive line, tire and wheel service, and basic auto body service. This course is a prerequisite for continued study in automotive technology.

(Recommended for grades 9-12, 18 or 36 weeks, 1- or 2-hour block.)

A prerequisite for Vocational Automotive Mechanics is Automotive Technology.

VOCATIONAL AUTOMOTIVE MECHANICS

This vocational course is designed to provide students with entry-level job skills for occupations in the automotive service trades. The emphasis is on servicing and repair of transmission, ignition, fuel, cylinder block, cylinder head, brakes, suspension, and electrical systems. All classes at this level require a 2-hour block of instruction.

(Recommended for grades 9-12, 36 weeks, 2-hour block.)

REQUIREMENTS FOR AUTOMOTIVE TECHNOLOGY LABORATORIES

The automotive mechanics laboratory will house vocational courses in general auto mechanics which provide essential entry-level skills in the auto mechanics industry. The general environment, layout, and equipment should simulate a modern, fully-equipped auto garage for major and minor repairs, lubrication, wheel alignment, brake service, etc.

The total space allocation for this area is approximately 3,000 square feet in a 30- by 100-foot configuration. This multipurpose laboratory is designed to operate as one continuous unit even though it is composed of several rather distinctive functional zones. One instructor could operate in this laboratory with a full class because he has visual access to all spaces except into parts and storage, which can be secured. The area is broken into the following general zones:

LIVE AUTO AND MOTORCYCLE LABORATORY AREA. This area is composed of two 14- by 30-foot stations where full-size automobiles could be driven through the 12-foot-wide doors and three or four students could work in each stall at one time. One of the stalls could be provided with three or four motorcycle racks. The area should have a sealed concrete floor, sloped drain to a central sump consistent with local codes, and provided with 110 volt and 220 volt electrical service and compressed air. One stall should be provided with a hoist. The ceiling height should be a minimum of 14 or 15 feet to accommodate vehicles, such as a Volkswagen bus on the lift. Overhead retractable 110-volt electrical reels and retractable fluorescent lights should be provided at each stall.

The spaces are supported by a work bench area immediately in front of each automobile stall. The work benches should be metal with storage below and electrical service outlets on the back splash of the counter.

Positive air movement must be provided to minimize carbon monoxide danger. Each vehicle bay must have a duct system to remove fumes from running engines. In addition, three duct connection points must be provided in the general work area to remove fumes from engines in motor mock-up units. An underground system, at least 8 inches in diameter, is preferred; however, an overhead system may be used. If an overhead system is used, the main exhaust stack should extend above the highest point on the roof line.

LUBRICATION, CAR SERVICE, AND TIRE REPAIR AREA. This area is composed of a single stall and should be provided with a portable hoist. It is supported with a lockable lubrication equipment cabinet, electrical and compressed air service from overhead reels, a tube testing tank, and tire repair equipment.

PARTS CLEANUP. This area should be provided with a general curb around it and a drain in the center for the elimination of waste material. It is provided with a portable steam cleaner and parts washer. The back wall should be protected from water and stains by the use of an impervious material.

ALIGNMENT, WHEEL BALANCE AREA. This area consists of one full stall equipped with a portable wheel alignment rack and a wheel balancing machine. The space can also double as a live auto repair stall.

ENGINE AND SMALL ENGINE AREA. This area should be provided with an underground or overhead exhaust system to remove exhaust fumes from the engines that are operated on the movable engine stands. These stands are portable and can be arranged in the area to suit the instructor and students. The engine stand area is supported by two lockable tool cabinets. It is also in proximity to the testing units. Some open space is available and will be used for equipment that is used in the basic laboratory area, such as hoists.

SECURE PARTS AND STORAGE AREA. This complete room is lockable for security of parts and supplies. The door can be operated as a dutch door for issue purposes. The room should be provided with a variety of open shelving for bulk materials and for smaller parts. One cabinet should be provided for hand and other small tools that are used for issue purposes.

SELF-STUDY AND CLEAN AREA. This area is provided with two carrels that can be used for single-loop type instructional materials or other prerecorded materials for instructing students in performing certain operations involved in auto mechanics. It also has a work bench with an oscilloscope and can be used for carburetor or electrical work.

SUPPORT MACHINE SHOP AREA. This area is intended to be a support area with a lathe, valve grinder, buffer, drill press, and similar equipment used for repairing parts and equipment worked on by students in other areas within the total laboratory.

LOCKER AND CLEAN-UP AREA. It is desirable that the sinks be shop sinks and accessible from both sides. The area is open to the rest of the laboratory intentionally. The lockers adjacent to the office should be kept below approximately 36- to 48-inch level in order to allow supervision from the office.

OUTSIDE OF THE LABORATORY. A fenced area should be provided outside the laboratory to accommodate at least 10 cars. This area should be provided with good access and a sloped drain which can be used for car washing. It should be ample for storage of automobiles coming to the laboratory and waiting for repairs.

GENERAL. There should be a drinking fountain in the general work area. Artificial illumination should provide 60- to 70-foot candles 30 inches above floor level. There should be 110- and 220-volt, double socket electrical outlets on 8-foot centers on all walls and on any support posts throughout the shop area. Provision must be made for a chain hoist to remove engines in at least one vehicle bay. Roof members may have to be reinforced above this bay. A moveable engine hoist may be used in lieu of a chain hoist.

A compressed air system, delivering a maximum of 120 pounds of pressure per square inch must be provided with outlets in each vehicle bay and one in the general work area. Walls in the automotive shop, except for those areas where overhead doors are required, should have high-level windows with bottom edge approximately 6 feet above floor level. This permits maximum use of wall areas for tool and equipment placement.

SUGGESTED FACILITIES LAYOUTS

The following facilities descriptions and layout sketches are intended only as guides. Any number of alternative facility plans could work equally well. For some schools, facilities for this program may already exist. In such cases, the following material may offer the instructor and administration some suggestions for making the facility more effective through minor alterations.

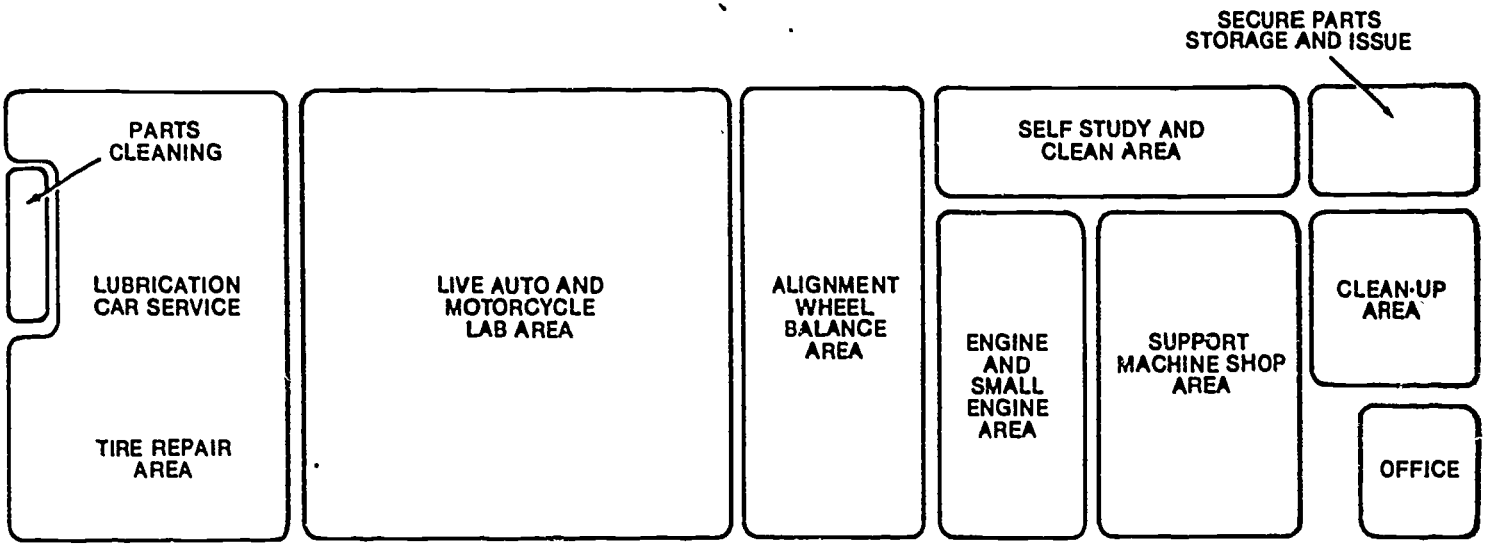
For other schools starting up a new program, it may be necessary to remodel existing facilities. In such cases, it should not be expected that the remodeled facilities will offer every advantage that can be achieved with new facilities.

If new facilities are to be provided, a school may be unable to support a complete laboratory either because of enrollment, space, staff, or financial limitations. In such cases, decisions must be made regarding minimum program essentials and facilities designed to fit.

Whether new or remodeled, facilities may serve multiple or joint functions. Thus, business and graphics production areas may be combined, art and graphics study areas could be shared, welding can be done in an auto shop, small engine and automotive shops can be combined, computer and business programs may share spaces, the various health and cosmetology programs can share a common suite, and the electronics laboratory could be combined with a physical science laboratory.

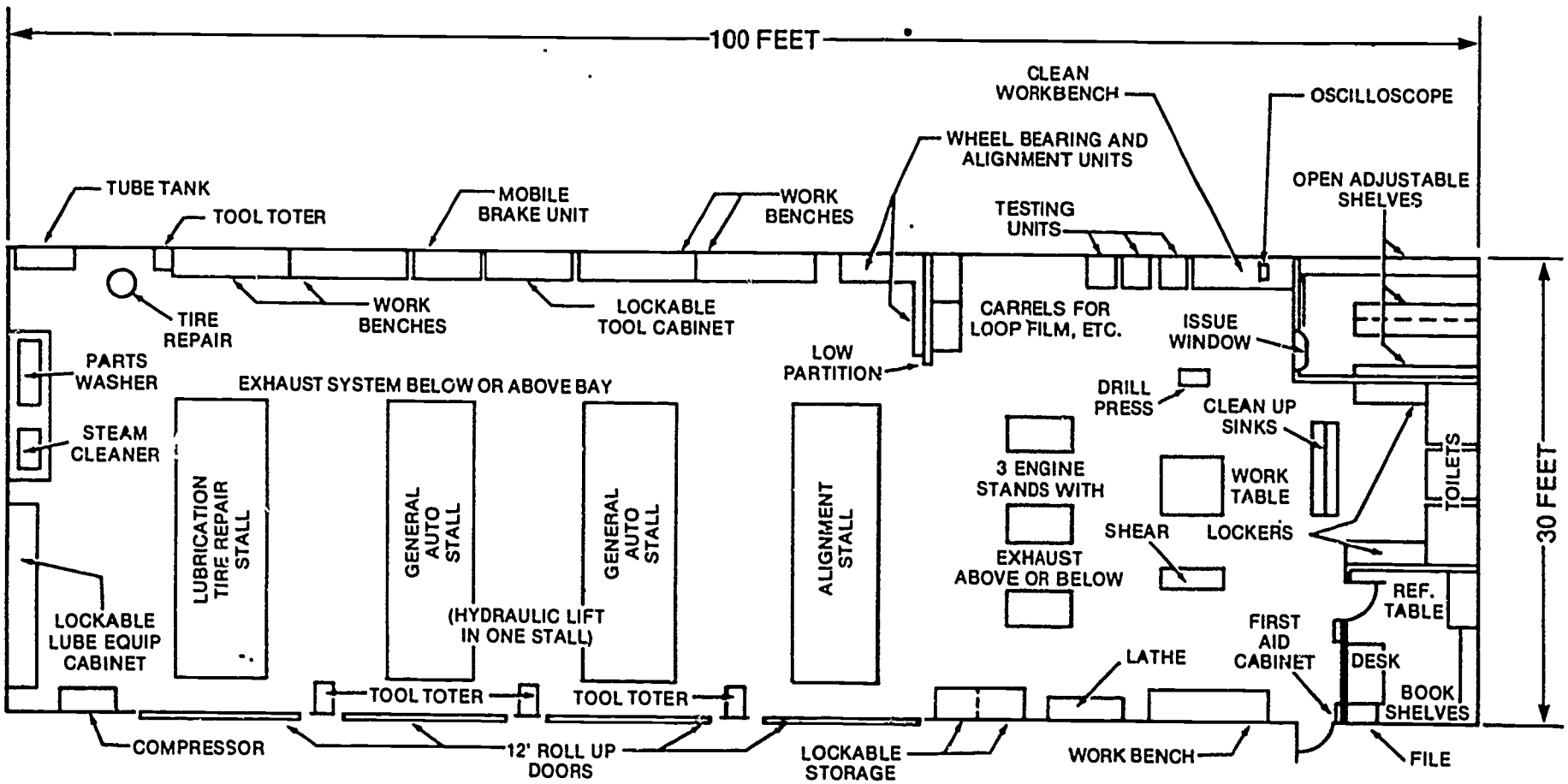
Such combinations have served to strengthen both programs. Students see the direct relationship of various and parallel career fields. Faculty finds professional stimulation and mutual support in working with colleagues in previously artificially separated disciplines.

Suggested Auto Mechanics Laboratory Functional Zones

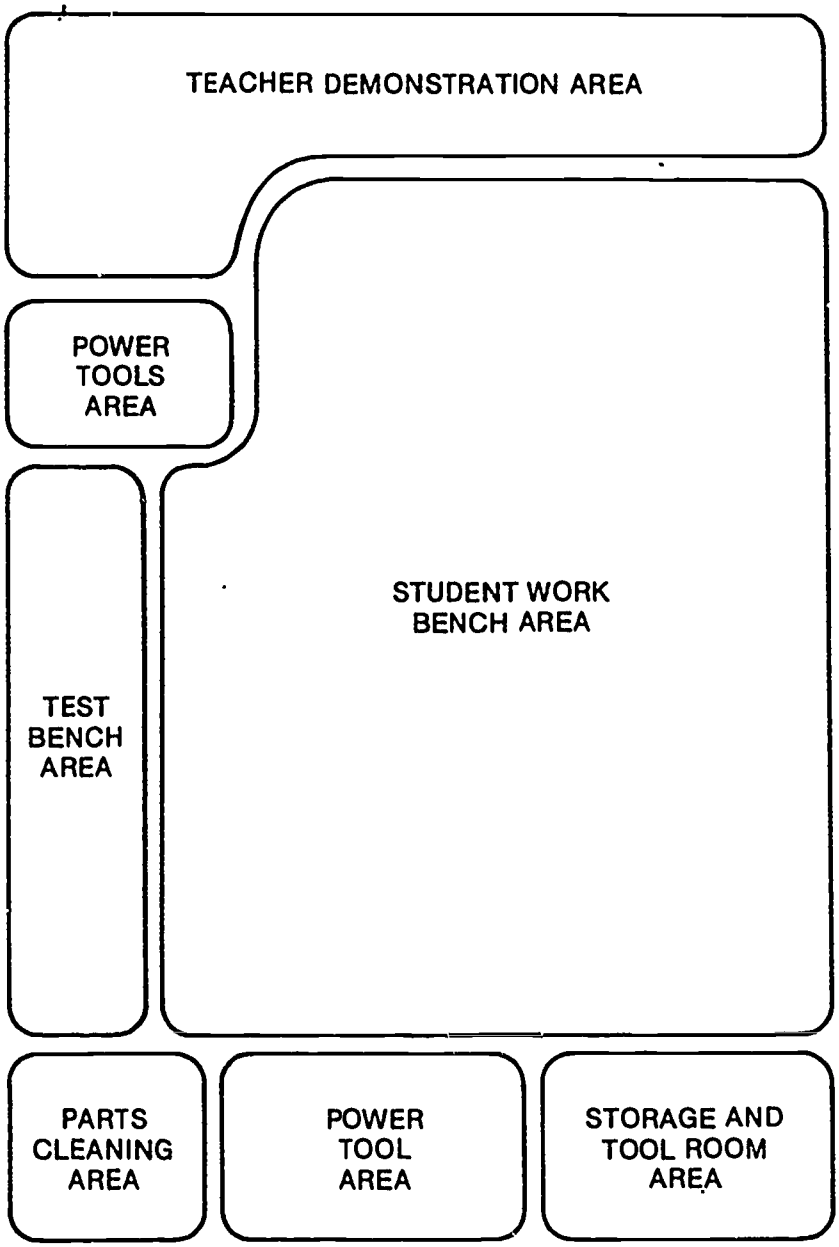


Suggested Auto Mechanics Laboratory

(30' X 100')

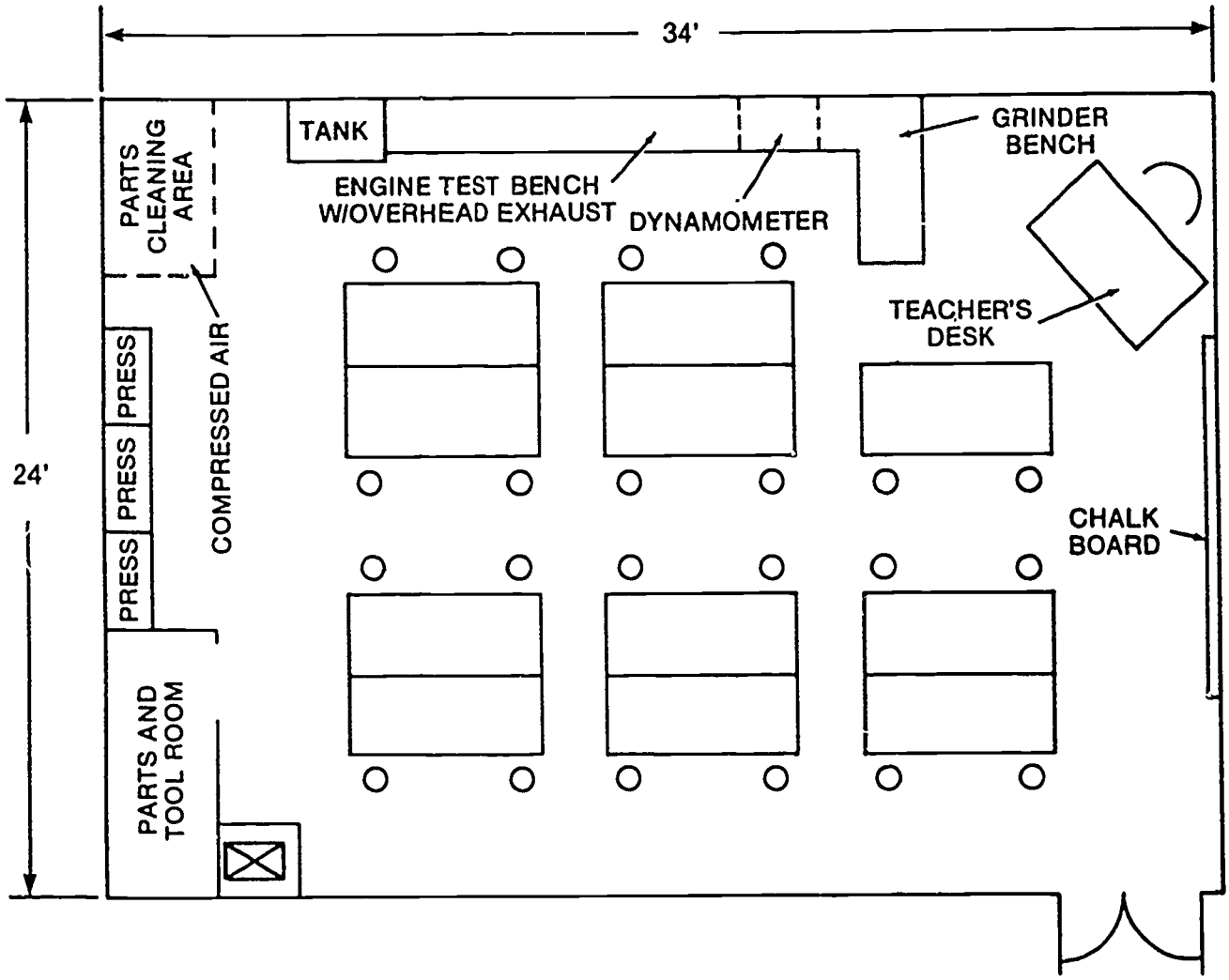


Suggested Small Engine Laboratory Functional Zones



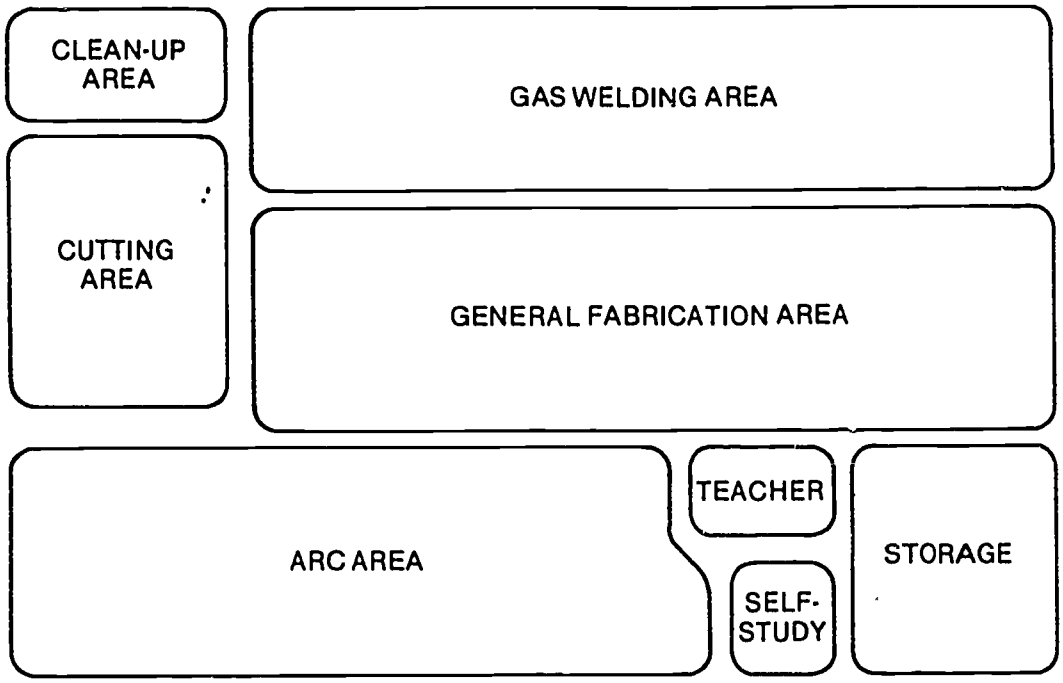
Suggested Small Engine Laboratory

SCALE 3/16" = 1'



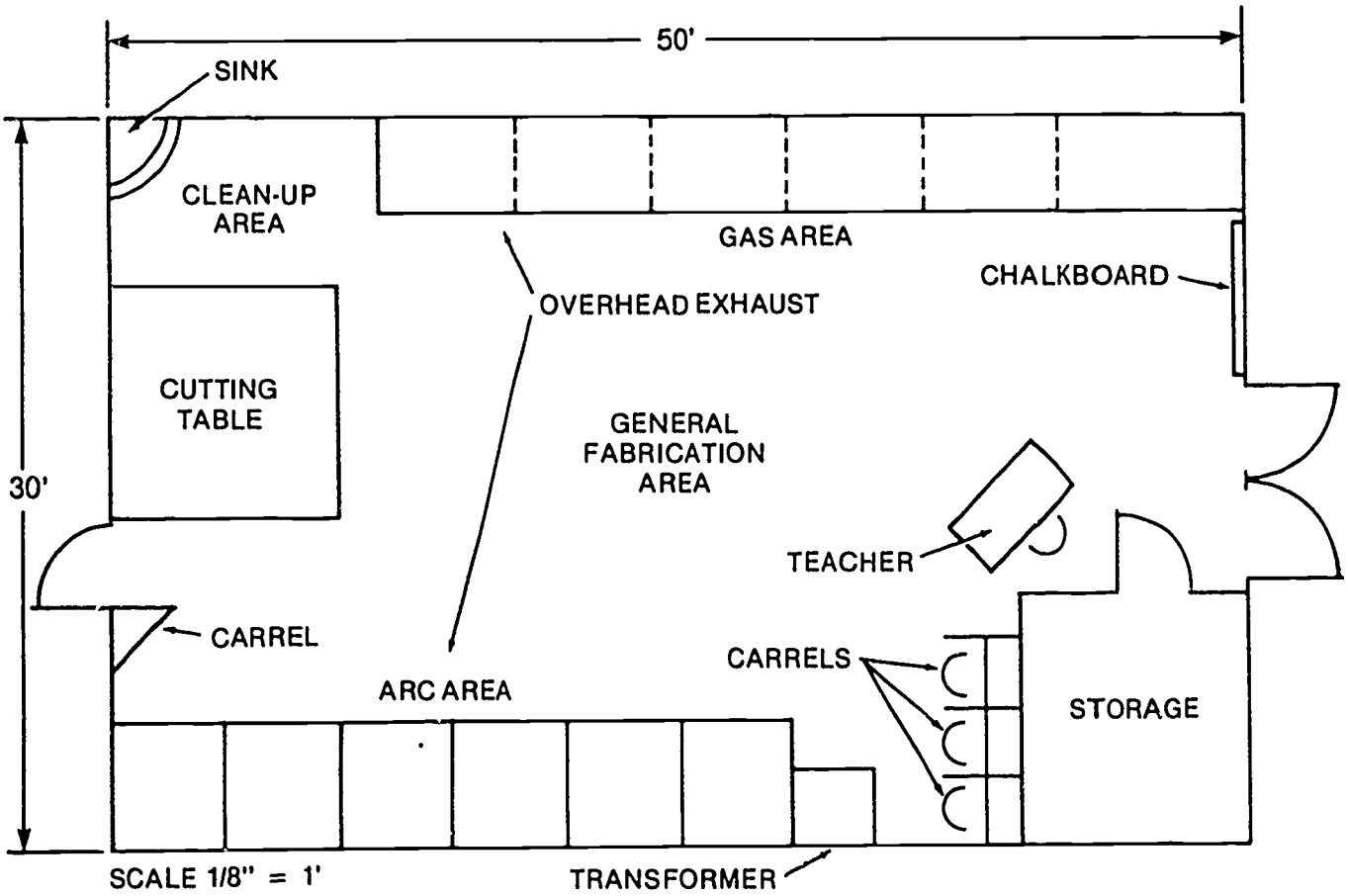
Suggested Welding Laboratory
Functional Zones

(Open Plan Allows Teacher Surveillance of All Stations)



Suggested Welding Laboratory

(Open Plan Allows Teacher Surveillance of All Stations)



CERTIFICATE OF PROFICIENCY

in *is awarded*

to

This Day of_____ 19_____

_____
Principal

_____
School, Country

_____
Instructor

LIST COMPETENCIES ON BACK OF CERTIFICATE AND INITIAL EACH ONE.

DOD DEPENDENTS SCHOOLS
AUTOMOTIVE TECHNOLOGY
SELF-ASSESSMENT EVALUATION

SCHOOL: _____ DATE: _____

INSTRUCTOR'S NAME: _____ TYPE OF LABORATORY: _____

INSTRUCTIONS: Below is a list of evaluative statements. The teacher should rate each item from 0 to 4. Four is the highest rating an item may receive, 0 is the lowest. Once the evaluation is completed, the ratings should be totaled. The total possible score is 100 points. This instrument is intended for the teacher's use in program diagnosis. It is suggested that this instrument be used midway and at the end of the program.

PART I (Program):

Special concerns of the automotive technology program are common learnings needed by all persons to function effectively in our industrial technological society: attitudes, interests, abilities and skills, problem solving, and understanding the world of work.

Ratings		Statements
4 3 2 1 0	1.	The program (includes all courses) is designed to serve boys and girls providing hands-on activities interpreting the technology of our mobile society.
4 3 2 1 0	2.	All levels of the program foster technological adaptability as an exit competency.
4 3 2 1 0	3.	Opportunity is offered each student to discover and to develop personal talents in the realm of technology.
4 3 2 1 0	4.	Courses enroll both boys and girls of all ability levels.

PART II (Curriculum):

Implementing an automotive program requires a division of services and responsibilities among the various levels, grades, facilities, and instructors.

4 3 2 1 0	5.	Individual courses are designed to be a part of a total program of instruction and are reviewed yearly for possible improvement.
4 3 2 1 0	6.	A written course of study is used to guide each class with activities designed to relate to the adaptability goal, the age, and the ability level of the students.

4 3 2 1 0	7.	The course of study lists exit competencies, i.e., what the student will have when he/she leaves the course.
4 3 2 1 0	8.	A student/personnel system is instituted for maintaining an orderly lab environment.
4 3 2 1 0	9.	A daily log or teacher plan book is maintained as a class instructional record.
4 3 2 1 0	10.	A record of pupil attendance in class is maintained.
4 3 2 1 0	11.	A record of individual student progress and activities is kept.
4 3 2 1 0	12.	A description of each course offered is included in a handbook of courses for use by students, parents, and guidance counselors.

PART III (Instruction):

Effective class instruction combines cognitive information and tactile activities designed to enable students to perform with ideas, tools, equipment, and materials.

4 3 2 1 0	13.	A lesson schedule, which includes approximately 50 group presentations (10 minutes or equivalent) per semester, is used with all classes.
4 3 2 1 0	14.	Teaching performance includes spontaneity, a relevant introduction, two-way communication, answerable questions, summation, and praise for participation.
4 3 2 1 0	15.	Students work without constant direction and/or questions.
4 3 2 1 0	16.	A variety of student project activities is evident.
4 3 2 1 0	17.	Provision is made for the display of student work.

PART IV (Facilities):

The presentation of instruction in automotive requires a laboratory environment with appropriate equipment/tools and an adequate supply of materials for student activity.

4 3 2 1 0	18.	Equipment represents a commitment to provide exploration in a wide variety of experiences rather than narrow, in-depth training.
4 3 2 1 0	19.	Guests and visitors routinely are invited and escorted to the automotive department as it represents a "showcase" environment for instruction.
4 3 2 1 0	20.	Storage of tools, materials, and projects is organized to provide full use of all benches and equipment and security for student work.
4 3 2 1 0	21.	Student clean-up activities are an integral part of the automotive maintenance course of study.

PART V (Safety):

Provision for instruction in common safety practices, the development of student safety habits, and the establishment of a safe work environment represent a necessary part of technological education.

4 3 2 1 0	22.	Safety considerations are an integral part of all class and individual instruction.
4 3 2 1 0	23.	Equipment is fully guarded and procedures are implemented to assure compliance with good safety practices.
4 3 2 1 0	24.	Eye safety devices are worn as a common practice when warranted.
4 3 2 1 0	25.	A record of all accidents is maintained.

SAFETY AND HEALTH*
RECOMMENDED PROCEDURES AND PRACTICES

A comprehensive safety and health program is essential to the success of a quality automotive technology and exploratory power program. The program provides for a safe environment and promotes lifelong attitudes and practices regarding safety and health.

PROGRAM - Learning experiences and activities are designed for the development of knowledge, skills, and attitudes concerning the safe use of tools, machines, materials, and processes.

1. Teachers should prepare a written plan for a comprehensive safety and health program.
2. Administrative personnel should provide input for and approval of the safety and health program.
3. Community resources should provide input to the safety and health program.
4. Safety and health information should be included in the instructions for all laboratory activities.
5. Teacher and student activities should reinforce safety and health instructions.
6. Safety and health instructions should be adapted to the individual student's needs.
7. Safety and health practices should be monitored continuously and reviewed annually by the teacher.
8. Local administrators should assess and make recommendations for the improvement of the safety and health program.
9. Proper authorities, external to the school, should inspect periodically and report on the safety and health program.
10. Teachers and administrators should review each recorded accident and all unsafe practices to correct deficiencies.

PHYSICAL ENVIRONMENT - The physical facilities and equipment are designed, constructed, and maintained to ensure a safe and healthful learning environment.

1. Laboratory facilities should meet appropriate safety and health laws and regulations.
2. Safety zones, fire lanes, and aisles should be properly marked.
3. Proper exhaust systems equipment, which removes fumes and dust from the room, should be provided.
4. Proper equipment should be provided to heat, cool, and ventilate all instructional and ancillary zones.
5. Approved safe cabinets, containers, or rooms should be provided to store flammable and corrosive materials.
6. Special safety and health accommodations should be provided for students with special needs.
7. Floors and all other surfaces should be kept free of waste material, grease, and obstructions.

*Standards for Industrial Arts Programs Project, Virginia Polytechnic Institute and State University November 1981. (Revised to reflect Automotive Technology.)

8. Floors should have non-skid surfaces, with special application on machine-operator work areas.
9. Each laboratory with powered equipment will have the equivalent of one easily accessible emergency disconnect switch (panic button).
10. Fire extinguishers of the correct class will be provided in appropriate locations.
11. A first-aid kit and related emergency supplies will be provided in accordance with local regulations.
12. Equipment will be selected on the basis of the ability to meet program objectives safely.
13. Machines and tools will be placed, mounted if necessary, and arranged in a safe and functional manner.
14. All machines and power tools will be provided with approved commercial guards and safety devices.
15. Safety guards will remain in place, except when the machine is disconnected for cleaning, repair, or adjustment.
16. Any machine or tool found to be unsafe will be removed from service until safety standards can be met.
17. Color-coding schemes for safety purposes will be used throughout the laboratory.
18. Conveniently located magnetic control switches and/or control boxes and braking devices will be provided for appropriate machines.
19. Lockable master switch boxes will be located in each laboratory.
20. Machines and work stations where dust or fumes are produced beyond acceptable health limits will be connected to an exhaust system.
21. Eye protection devices will be required of all persons exposed to conditions which may cause eye damage.
22. Ear protection devices will be required of all persons exposed to conditions which may cause ear damage.
23. Respiratory protection devices will be required of all persons exposed to conditions which may cause respiratory problems.
24. Head protection devices will be required of all persons exposed to conditions which may cause head injury.
25. Specially adapted personal protection devices will be available for and used by students with special needs.
26. Teachers and students will wear appropriate clothing when exposed to conditions which warrant such protection.
27. Personal protection devices requiring sanitation will be sanitized after each use.

RECORDS: Records are on file to document the existence of an effective safety and health program.

1. Lesson plans documenting provision for safety and health instructions should be on file.
2. Results of written and performance tests and observations documenting student safety and health knowledge, attitudes, and skills are on file.
3. Inspection, maintenance, repair, and replacement records will be current and on file.
4. Records of each accident and the follow-up procedures taken will be on file.
5. Emergency procedures for responding to accidents will be posted and on file.

MAINSTREAMING IN AUTOMOTIVE TECHNOLOGY AND EXPLORATORY POWER
INDIVIDUALIZED EDUCATIONAL PROGRAMS
(IEP)*

Included in Public Law 94-142 is the concept of individualized educational programs for handicapped students. Each student is to have an individually prescribed program of studies, containing short- and long-term goals, based on the diagnosis of the student's learning abilities. The law states:

> "A written statement for each handicapped child developed in any meeting by a representative of the local educational agency or an intermediate educational unit who shall be qualified to provide, or supervise the provision of, specially designed instruction to meet the unique needs of handicapped children, the teacher, the parents or guardians of such child, and whenever appropriate, such child, which statement shall include (a) a statement of the present levels of educational performance of such child; (b) a statement of annual goals, including short-term instructional objectives; (c) a statement of the specific educational services to be provided to such child, and the extent to which such child will be able to participate in regular educational program, (d) the projected date for initiation and anticipated duration of such service and appropriate objective criteria and evaluation procedures and schedules for determining, on at least an annual basis, whether instructional objectives are being achieved."

Since the automotive teacher will be involved in the planning and implementation of the instructional program for the particular automotive course in which the handicapped students are enrolled, the instructor should make every effort to participate actively in the development of the IEPs. This active participation will help to ensure that unrealistic or unreachable goals are not established for those phases of the students' programs which include the automotive teacher's area of expertise. Furthermore, planning appropriate instruction is crucial if handicapped students are to achieve their highest level of skill in the program. A side benefit of active participation in the writing of the IEP is the opportunity for working directly with the special education personnel, the students' parents, and the administration. Direct communication will help to prevent misunderstanding or confusion on the part of all parties involved.

One facet of the role of the automotive teacher, or any other teacher, is to provide information to appropriate persons for the identification of students with special needs. The major parts of the teacher's role, however, are those traditionally associated with helping students to learn - instructing and evaluating students. However, assisting students with special needs will probably require that the teacher reexamine methods, materials, motivational devices, and evaluation techniques.

*Courtesy of South-Western Publishing Company, Cincinnati, Ohio, Mainstreaming in Business Education, Monograph 135, March 1981. (Revised to reflect Automotive Technology)

DIAGNOSIS

Two vitally important elements essential to the development of the IEP are those of diagnosis and task analysis. The task analysis is based upon the interpretation of the diagnostic reports pertaining to the handicapped student.

The individual with special needs must first be identified, tested, and evaluated for learning according to the diagnosis of the special need. Once the diagnostic reports are adequately interpreted, the development of an appropriate program begins. Acting cooperatively, the automotive teacher, special education resource persons, and other key professional staff members begin the process of planning the educational program for specific students. The basis for the planning is the development of the learner's profile which includes information about the student's learning strengths, weaknesses, and occupational interests.

TASK ANALYSIS

Inherent in the development of the IEP is the need for automotive teachers to realistically assess methods, media, and content pertinent to any given course or occupational cluster. For the first time, coordinators and teachers may realize that not every student needs to complete every part of one course.

A study should be made of available resources and the competencies required for work in today's society. Each individual program for a special needs learner is planned, implemented, and evaluated by a team composed of representatives from the areas of expertise mentioned earlier. Periodic assessment of the learner's progress is used to provide information not only of educational gains, but of the status of the handicapping condition.

A career cluster analysis is similar to a job or task analysis. The planners are identifying skills, knowledges, and basic competencies to be incorporated into the individualized instructional plans for the learner. Thus, the team must identify tasks and the essential knowledges and skills necessary for the performance of the task within designated occupational clusters and/or courses. Additionally, the team must determine the competencies and the levels of competency that can realistically be achieved by the special needs student.

COMPETENCY PROFILE FOR VOCATIONAL TEACHERS INSTRUCTING SENSORY AND PHYSICALLY IMPAIRED STUDENTS*

A. Develop a positive attitude toward working with sensory and physically impaired in the regular program.

1. Assess own attitude toward working with handicapped students.
2. Participate in activities simulating handicapped conditions.
3. Identify myths, misconceptions, and stereotypes.
4. Identify handicapping characteristics of students.
5. Identify economic indicators supporting hiring of the handicapped.
6. Consult with persons working successfully with the handicapped to determine why they are committed.
7. Observe the handicapped in successful roles (e.g., on the job).
8. Interact with handicapped students.
9. Review legislation concerning handicapped.
10. Persist in the face of seeming failure.

B. Implement modifications in the physical setting.

11. Identify architectural barriers.
12. Recommend needed changes in facility design.
13. Determine the special safety conditions that may be required by the handicapped students.
14. Modify work stations as needed.
15. Secure/adapt appropriate equipment as needed by students.

C. Modify curriculum and instruction.

16. Identify and verify vocational skills needed by each student to meet career goals.
17. Identify and verify related skills (reading, math).
18. Identify jobs on career hierarchy/ladder.
19. Match/modify jobs on career hierarchy/ladder to students' abilities.
20. Determine if texts/materials are appropriate to students' reading levels.
21. Adapt materials to individual learning styles.
22. Develop materials to meet individual learning styles.
23. Teach job-seeking skills.
24. Teach job-survival skills.
25. Modify length of training period to meet students' needs.
26. Promote use of open-entry/open-exit programming.
27. Use a competency-based grading system to supplement 'grade' with competency profile.
28. Employ alternative teaching practices (e.g., peer tutoring, small-group discussions).
29. Individualize teaching practices.

*Courtesy of South-Western Publishing Company, Cincinnati, Ohio, Mainstreaming in Business Education, Monograph 135, March 1981.

30. Use specialized language instruction techniques (e.g., to teach vocabulary).
31. Use a multisensory approach to instruction.
32. Adapt/use media for individual needs (e.g., captions).
33. Simplify instruction of essential tasks.
34. Identify instructional resources, materials, and techniques available to the teacher.
35. Use supportive instructional services.
36. Provide frequent reinforcement and success experiences.
37. Review effectiveness of curriculum and instruction regularly, and update as required.
38. Modify instructional evaluation techniques as needed.

D. Participate in ongoing evaluation concerning sensory and physically impaired.

39. Develop skills in recognizing students with handicaps.
40. Review any existing student records.
41. Devise informal measures for assessing students' abilities.
42. Identify student learning styles.
43. Assess students' motor skills in relation to occupational skills required.
44. Determine if the disability is, in fact, a vocational handicap.
45. Participate in development of individualized student plans (e.g., IEPs).
46. Involve students/parents on an ongoing basis.
47. Monitor and update student goals based on student progress.
48. Provide student with realistic picture of job skills needed and time required to reach career goal.

E. Develop effective communications.

49. Establish rapport with students.
50. Facilitate the productive integration of the disabled with their peers.
51. Assist students in developing realistic goal-setting skills.
52. Involve students in developing their own individual programs.
53. Provide assertiveness training for students.
54. Teach appropriate situational responses/discrimination skills.
55. Secure feedback from individual students on how well the program is meeting their needs.
56. Use student contracts (performance contracting, behavior contracting).
57. Relate self-awareness activities to career goals.
58. Develop functional means (e.g., sign language) to communicate with students having communication deficits.
59. Observe nonverbal behaviors as indicators of feelings.
60. Ensure that your communication patterns (verbal, nonverbal) do not single out handicapped students as different.
61. Use active listening techniques.
62. Work cooperatively with other support/resource persons (e.g., interpreter, itinerant teachers) in the classroom.

63. Maintain liaison with special education personnel as needed or required.
64. Communicate with guardians, employers, agencies, and all others affecting handicapped students.
65. Facilitate the placement of handicapped students by working with employer.
66. Encourage administrators to support creative/alternative instructional approaches.

F. Identify and utilize supportive services (on campus and in the community).

67. Identify needs students have.
68. Obtain or develop a directory of support services.
69. Participate in activities designed to increase your knowledge of what services do and how to use them.
70. Inform students of relevant services available to them.
71. Match students' needs with available services.
72. Identify appropriate contact persons for teachers.
73. Initiate referral process as appropriate (inform service, refer student).

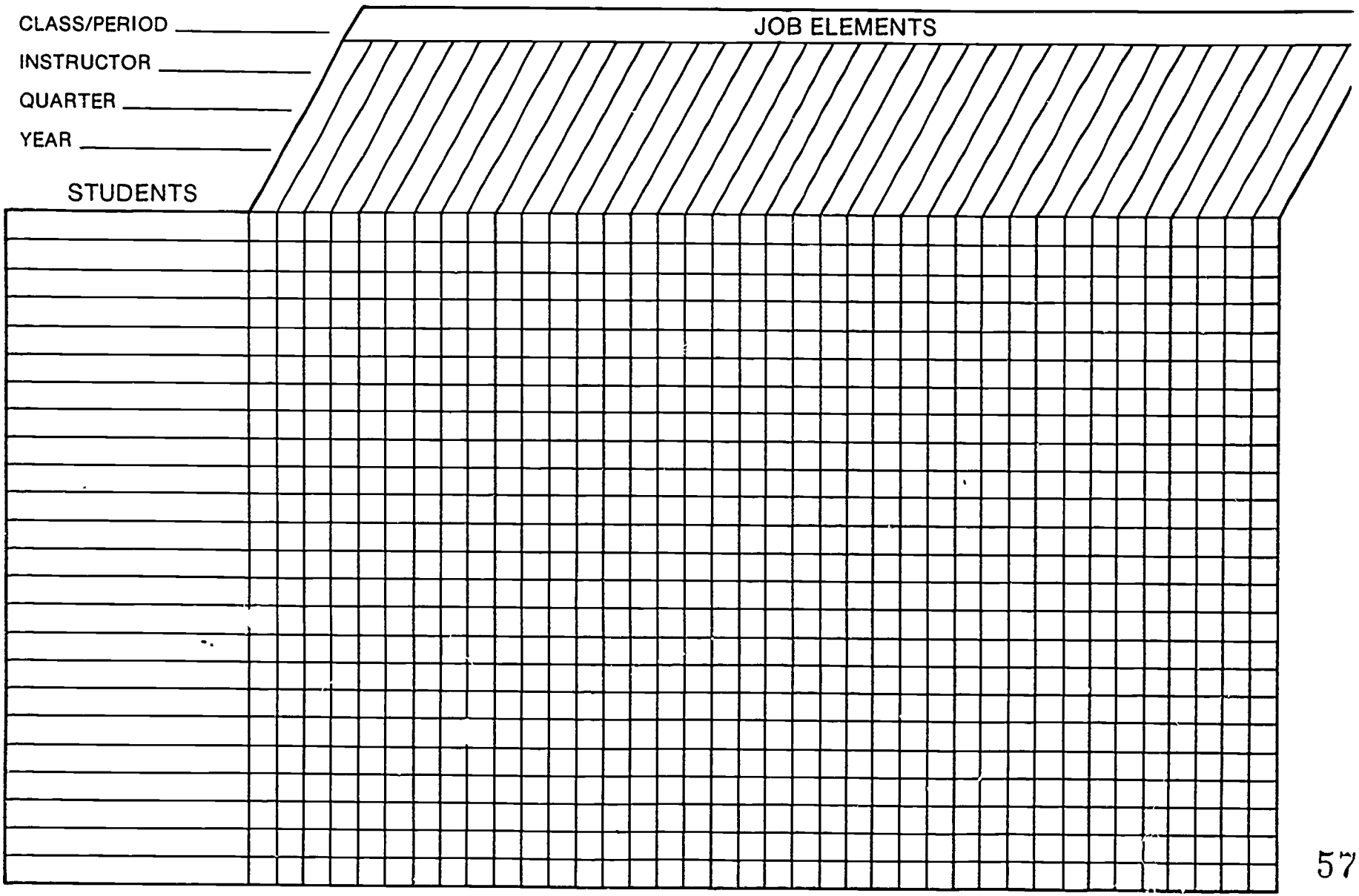
G. Provide aid in emergencies.

74. Be alert to the types of emergencies that might occur for individual students.
75. Identify legal implications involved in giving aid.
76. Identify emergency procedures to be followed.
77. Obtain training in types of aid for individual students.
78. Identify/contact emergency resources.

H. Continue professional growth.

79. Work toward improving the climate for acceptance in yourself, in colleagues, and in employers.
80. Review related literature.
81. Participate in orientations and workshops.
82. Observe/interact with colleagues who are doing a model job in teaching handicapped students.
83. Participate in experiences that promote creative development and exchange (e.g., problem sharing with colleagues).
84. Participate in/support professional groups dealing with handicapped.
85. Include in your own professional development plans steps to acquire additional skills for teaching the handicapped.

Student Progress Chart



AUTOMOTIVE REPAIR ORDER

READ CAREFULLY. I hereby authorize DODDS Auto Center (DAC) to accomplish the repair work indicated on this order, using parts and materials, and making tests including road tests determined by the Center to be necessary. I do not hold the Center, instructors, or students responsible for defects, loss, or damage to car before, during, or after servicing, for loss of articles left in car, or loss due to fire, theft, or any cause beyond their control. The Center is authorized to dispose of parts not removed from the facility by me upon signing the acknowledgement of receipt of the vehicle. (See reverse of form for Privacy Act information.)

Customer's/Owner's Signature _____

NAME _____

ADDRESS _____

PHONE: MIL _____ CIV _____

MAKE	MODEL	YEAR	MILEAGE	LICENSE #

CYLINDERS	TRANSMISSION	STEERING	AIR COND
4 6 8	std aut	std aut	yes no

SCRATCHES	DENTS	# HUB CAPS	WINTERIZED
yes no	yes no		yes no

RECORDED	PROMISED	COMPLETED

WRITTEN BY: | STUDENT'S NAME(S)

INITIAL	REPAIR (Column #1)	LABOR CHARGE	
	SAFETY INSPECTION		
	LUBRICATION SERVICE		
	MINOR TUNE-UP		
	MAJOR TUNE-UP		
	BRAKE INSPECTION		
	BRAKE ADJUSTMENT		
	BRAKE OVERHAUL		
	TIRE REP/MOUNT		
	TIRE ROTATION		
	WHEEL BALANCE		
	WHEEL ALIGN		
	MUFFLER REPLACE		
	HEADLIGHT ADJ		
	TOTAL COLUMN #1		
	ROAD TESTED BY (name & date)		
	CASHIER'S SIGNATURE		
	RECEIPT (Customer's Signature)		

REPAIR (Column #2)	LABOR TIME	LABOR CHARGE	
	TOTAL LABOR COL #2		

PARTS & SUPPLIES	PRICE	
	TOTAL PARTS & SUPPLIES	

TOTAL CHARGES:

TOTAL LABOR COL 1		
TOTAL LABOR COL 2		
PARTS & SUPPLIES		
GRAND TOTAL		

Local Reproduction Authorized

DS Form 2671
November 1983

PRIVACY ACT STATEMENT

Authority: Title V, Section 301; Title X, Section 133; Title XX, Sections 921 and 922; EO 9297.

Principal Purposes: To provide information concerning ownership and authorization to utilize the facility. To provide a point-of-contact to facilitate the return of the vehicle when the work is completed.

Principal Uses: Information on the form will be used by school personnel, as necessary, to document the use of the Automotive Center facilities and to contact the owner of the vehicle when the work is completed.

Mandatory/Voluntary Disclosure/Effect of Non-Disclosure: Voluntary. If the information is not provided, however, the vehicle will not be admitted to the Automotive Center facility.

INSTRUCTIONS FOR PREPARING AND PROCESSING DSF 2871

The primary purpose for doing work in the automotive technology laboratories is to provide real training experience. To be effective, work experience must be correlated with the technical and related information of the trade. Also, the standards and methods of our laboratories must simulate the practices of commercial shops.

A job order system is used to control this phase of the school work. The system operates as follows:

a. All customer service jobs undertaken by any DoDDS automotive laboratory will be processed on the job order system.

b. The DSF 2871, Automotive Repair Order, is a three-part form. No other edition will be utilized. Resupply of the form is available from the regional publication stock room.

c. The DSF 2871 will be prepared by the customer, instructor, and the student service manager. It is imperative that the form be filled out completely and include the customer's signature under the liability statement. The repair order will remain with the car until all work is completed. Once the car is finished, the student mechanic(s) will complete the repair order by listing labor time and appropriate cost (customer will supply their own parts).

d. The completed repair order, with check or money order, is to be made out to include the word "donation"and then given to the instructor. No cash money should be collected or accepted. The instructor will turn in the checks or money order to the school's activity fund custodian. The pink copy of the paid repair order should be retained by the fund custodian for accounting purposes, the yellow copy should be filed in the automotive laboratory, and the original white copy should be given to the customer. All money collections and disbursements will be made in accordance with local procedures governing student activity funds.

RECOMMENDED EQUIPMENT AND TOOLS LIST FOR AUTOMOTIVE TECHNOLOGY

NOMENCLATURE	QUANTITY
Study Carrel (2-3 students)	2 ea
Shop Vacuum	2 ea
Drill Press	1 ea
Arbor Press	1 ea
Filing Cabinet	1 ea
Student Chairs and Desks	20 ea
Parts Bin	3 ea
Tool Cabinet w/tools	1 ea
Spark Plug Cleaner	1 ea
Machinist Vise	4 ea
Locking Tool Cabinet	1 ea
Metal Shelves Cabinet	2 ea
Cleaning Sink	1 ea
Book Shelves	2 ea
Exhaust Vent System	1 ea
Alignment Rack	1 ea
Drip Pans	4 ea
Lube Kits	2 ea
Tire Changer	1 ea
Hand Tools	Variety
Air Hoses w/Couplings	4 ea
Glass Bead Cabinet	1 ea
Jack Stands (2 Ton)	12 ea
Jack Stands (4 Ton)	4 ea
Hydraulic Floor Jacks (2 Ton)	3 ea
Telescopic Transmission Jack	1 ea
Distributor Machine w/Classroom Ignition Simulator	1 ea
Infra Red Exhaust Analyzer	1 ea
Alternator Bench Tester	1 ea
Air Compressor (Min. 150 CFM)	1 ea
4 Post Electric Hoist	1 ea
Hydraulic Single Post Frame Hoist	1 ea
Engine Analyzer	1 ea
Battery Charger	2 ea
Dynamic Electronic Wheel Balancer	1 ea
Work Benches	6 ea

Battery/Charging/Starting System Tester	1 ea
Steam Cleaner	1 ea
Parts Washer	1 ea
Brake Drum/Rotor Lathe w/Drum and Rotor Micrometer	1 ea
Valve Refacer	1 ea
Hard Seat Grinder	1 ea
Carbide Valve Seat Cutters	1 set
Headlamp Aimer Kit w/Intensity Meter	1 set
Basic Hand Tools w/Box Metric/SAE	20 sets
Fixed Engine Stands	4 ea
Portable Engine Stands	4 ea
Hydraulic Press (20 Ton)	1 ea
Welding Set, Gas	1 ea
Arc Welder	1 ea
Bench Grinder w/Pedestal	2 ea

RECOMMENDED EQUIPMENT AND TOOLS LIST
FOR AUTO BODY
(In addition to listing for Automotive Technology)

NOMENCLATURE	QUANTITY
MIG Welder w/Spot Welding Capabilities	1 ea
TIG Welder	1 ea
Portable Frame Machine	1 ea
4-Ton Master Body Jack Kit	2 ea
10-Ton Master Body Jack Kit	1 ea
Welding Booth	1 ea
Spray Guns	4 ea
Remote Pot Spray Gun	1 ea
Basic Body Hand Tools	20 sets
Pneumatic Grinding, Cutting, and Sanding Tools	20 sets
Paint Shaker	1 ea
Air Filter/Separater/Regulator Systems	4 ea
Electric Grinders/Buffers	4 ea

1

RECOMMENDED EQUIPMENT AND TOOL LIST FOR SMALL ENGINE LABORATORY

NOMENCLATURE	QUANTITY
Cabinet w/Locking Doors	3 ea
Study Carrel, 3 student	2 ea
Planning Tables	3 ea
Stools	10 ea
Machinist Bench	3 ea
Gas Station	1 ea
Parts Cleaner	1 ea
Drill Press	1 ea
Arbor Press	1 ea
Arc Welder	1 ea
Gas Welder	1 ea
Engine Bench (Two Station)	6 ea
Work Bench	4 ea
Filing Cabinet	2 ea
Student Chairs or Desks	20 ea
Parts Bin	3 ea
Tool Cabinet w/Tools	1 ea
Foreman's Desk	1 ea
Spark Plug Cleaner	1 ea
Air Compressor	1 ea
Machinist Vise	2 ea
Bench Grinder	1 ea
Chalk Board	1 ea
Bulletin Board	1 ea
Teacher's Desk	1 ea
Teacher's Chair	1 ea
Two Stroke Cycle Engine	20 ea
Four Stroke Cycle Engine	20 ea
Dynamometer	1 ea

RECOMMENDED EQUIPMENT AND TOOLS LIST FOR WELDING

NOMENCLATURE	QUANTITY
Welding Tool Cabinet w/Tools	1 ea
OXY/ACE Welding and Cutting Outfit	6 ea
Electric Arc Welding Outfit	6 ea
Basic Mechanic's Tool Boxes	4 ea
Grinders, Heavy Duty	2 ea
Angle Iron Cutter and Bender	1 ea
Hydraulic Bender	1 ea
Hydraulic Tensil Tester	1 ea
Arc Welding Booths	5 ea
OXY/ACE Gas Welding Benches	5 ea
Tool Toters	2 ea
Stools	12 ea
Foreman's Desk	1 ea
Work Benches	4 ea
Student Lockers	20 ea
Sheet Metal Bench	1 ea
Pop Rivet Guns	3 ea
Slip Rollers	1 ea
Hand Punch	1 ea
Hossfeld Bender	1 ea
Small Anvil	2 ea
Large Anvil	2 ea
Electric Portable Grinder	1 ea
Electric Portable Sheet Metal Cutter	1 ea
Squaring Shears	1 ea
Fume Exhausters	12 ea
TIG Welding Outfit	1 ea
Safety Glass Cabinet	1 ea
Portable Cylinder Truck	1 ea
Spot Welding Gun and Power Pack	1 ea
Carbon Arc Torch	1 ea
First Aid Kits	2 ea
Fire Blankets	3 ea
Precision Metal Working Tools	1 set
Air Compressor	1 ea
Metal Cutting Hand Saw	1 ea
Shop Vacuum Cleaner	1 ea
Power Hack Saw	1 ea
Hack Saw Frame	1 ea
Metal Lathe	1 ea
Safety Shields	20 ea

*BASIC TEXTBOOKS FOR

AUTOMOTIVE TECHNOLOGY

(Approved For Adoption April 6, 1984)

TITLE	AUTHOR	PUBLISHER	COPYRIGHT DATE
EXPLORATORY (POWER), 7-8			
Basic Book of Power Mechanics	Webster	American Technical Publ.	1979
SMALL ENGINE, 7-12			
Small Engine Operation & Service	Webster	American Technical Publ.	1981
AUTOMOTIVE CONSUMERISM, 7-12			
The Car Care Book	Barbarossa	Southwestern Publ. Co.	1983
BASIC AUTOMOTIVE TECHNOLOGY, 9-12			
Auto Mechanics Fundamentals	Stockel	Goodheart-Wilcox Co., Inc.	1982
The Auto Book	Crouse	McGraw-Hill Co.	1984
ADVANCED AUTO TECHNOLOGY, 9-12			
Auto Service & Repair	Stockel	Goodheart-Wilcox Co., Inc.	1978
Automotive	Crouse	McGraw-Hill Co.	1980
WELDING, 9-12			
Welding Fundamentals	Madsen	American Technical Publ.	1982
AUTO BODY			
Auto Body Repair	Duenk, Williams	Charles A. Bennett Co.	1984

* For ordering these basic textbooks and other supplementary materials, refer to the DoDDS BOSS catalog.