DOCUMENT RESUME

ED 131 282 CE 008 870

AUTHOR Humphreys, Harvey
TITLE Bicycle Repair Course of Instruction. Final Report.
INSTITUTION Pennsylvania School for the Deaf, Philadelphia.
SPONS AGENCY Pennsylvania Research Coordinating Unit for Vocational Education, Harrisburg.
REPORT NO VT-103-202
PUB DATE Jun 75
NOTE 123p.; Not available in hard copy due to marginal reproducibility of the original document

EDRS PRICE MF-$0.83 Plus Postage. HC Not Available from EDRS.
DESCRIPTORS *Curriculum; Curriculum Guides; *Deaf; Job Analysis; *Multiply Handicapped; Occupational Surveys; *Repair; Special Education; Teaching Guides; *Trade and Industrial Education
IDENTIFIERS *Bicycle Repair

ABSTRACT

Developed for an occupational training program in bicycle repair for the multiply-handicapped deaf student, this curriculum guide is organized around three levels of achievement each having a specific terminal objective and corresponding to a predetermined employment entry-level skill. Level I is a general service level; Level II, advanced service and general mechanical repair; and Level III, advanced mechanical repair and shop management. The course outline for all levels is presented in chart form. Examples of units of instruction are Tires, Tubes, Wheels, Frames, Brakes, Accessories, Crank Unit, Engineering Principles, and Shop Management. For each lesson topic within the unit, the teacher objective, student activity, and bibliographic reference are presented. Guidelines for implementing the course include lists of general student requirements and entry skills, facility description, and lists of tools, equipment, parts, and supplies. A bibliography contains both texts and reference materials. (The curriculum was developed from the results of a questionnaire survey of 15 local bicycle repair centers. The questionnaire consisted of a task inventory, and respondents were asked to indicate those tasks which students should be able to do correctly for entry-level employment.) Survey results and project forms are appended. (RG)

FINAL REPORT

BICYCLE REPAIR

COURSE OF INSTRUCTION

(Project No. 19-3802)

BY

HARVEY HUMPHREYS

Produced at
The Pennsylvania School For The Deaf
Nevil Vocational School
7500 Germantown Ave.
Philadelphia, Pennsylvania
19119

June 1975

PENNSYLVANIA DEPARTMENT OF EDUCATION

BUREAU OF VOCATIONAL-EDUCATION

RESEARCH COORDINATING UNIT

TABLE OF CONTENTS

ACKNOWLEDGEMENT

The author would like to acknowledge the support of Dr. Sydney Jaffee, Chief, Eastern Regional Field Services for the Bureau of Vocational Education in the Commonwealth of Pennsylvania, and Mr. John Degler, Principal of the Pennsylvania School for the Deaf, who were instrumental in the direction of this project. Mr. Walter Reisert, Mr. Richard DeLoch, Mrs. Helen James, Mr. Edward Herritt, and all the professional staff personnel of the Pennsylvania School for the Deaf have assisted in the support and implementation of this project.

Special acknowledgement is given to Dr. Raymond S. Lolla, Coordinator, Industrial Arts Department, Temple University of the Commonwealth System of Higher Education, for his exemplary support of the author in the development of this curriculum.

Recognition is given to Dr. Hugh T. Swogger, Project Director, Delaware State V-Tecs, University of Delaware for his support of the author in solving problems in the execution of classroom development and management, and in developing general program criteria.

Harvey A. Humphreys

INTRODUCTION

PROGRAM RATIONALE

The need of this curriculum is predicated on the emergence of a vast population of recreational bicycle owners and operators. The latest statics state that one million Americans rode bicycles in 1974. These bicycles, due to their age, degree of satisfaction, and the lack of owner-instituted maintenance have a potential for supporting employment opportunities specifically directed to the sale, repair, and maintenance of bicycles.

As the world changes with time, so does the employment requirements and needs change for handicapped people.

Therefore, the purpose of this bicycle repair curriculum guide is to provide a program to train and aid handicapped children and produce children with a valuable and needed skill for use in the employment market.

In addition to and along with the acquisition of a labor skill, the program will try to provide a development of work and social interaction skills for the handicapped students.

The bicycle repair curriculum has been broken down into three competence-based levels to provide for the physical and mental limitations of the student. Each level will correspond to a pre-determined employment entry-skill level.

The curriculum has been designed to provide a general and complete guideline to be followed to fit a given situation criteria.

Schools for the deaf across the nation are faced with the problem of increasing numbers of multiple-handicapped deaf students. Pennsylvania State Department of Education officials have assured us that a similar condition exists in this state.

Approximately 20% of the 241 students enrolled in our secondary program have multiple handicaps. Multiple-handicapped deaf students have lower achievement levels than "normal" deaf students and require special programming to meet their unique needs.

Multiple-handicapped deaf children are already handicapped, and should not be further handicapped by going into a world of work without trade skills necessary for securing and maintaining employment.

The following is an example of a curriculum outline to be used for our bicycle repair course.

It consists of competency level, unit of study--specific lessons, the teacher activity (objective), a student activity or operation, and a reference of technical information sources. In the reference column will be a number of parentheses. This will refer to the listing in the bibliography.

OBJECTIVES

Objectives

1. To design and implement an occupational training program in Bicycle Repair for multiple-handicapped students
2. To serve those multiple-handicapped students who cannot succeed in a regular vocational program without special adaptation of the program.
3. To provide the students with the technical knowledge and principles utilized in bicycle repair.
4. To provide the students with an appreciation for good work habits, craftsmanship, business relations, and customer service.
5. To identify and make information available relative to the program which might be transferred to regular programs operating within the schools of Pennsylvania.
6. To make available to the Pennsylvania Department of Education the research findings pertaining to the deaf participants.

MAJOR CURRICULUM COMPONENTS

The curriculum shall be divided into three major components, Level I, Level II, and Level III, each with a specific terminal objective and direct relationship to the student's acquisition of the prescribed employment entry skills.

The following is a brief description of each level:

Level I: General Service Level:

The first segment of a three-part program offering directed to develop the competencies necessary for fundamental general service and normal preventative maintenance related to safe bicycle upkeep. The terminal skill development in Level I shall be related to: acquisition of proper safety procedures, workmanship habits, adjustment and replacement of accessories and/or mechanical components not requiring calibration and diagnostic capabilities, and/or cognition of the engineering principles in the mechanical operation of the bicycle. Appendix B specifies the skills to be acquired at the Level I program offering.

Level II: Advanced Service and General Mechanical Repair:

The second segment of a three-part program offering directed to develop the competencies necessary for performing the advanced general services and fundamental

general mechanical repairs critical to safe bicycle upkeep and operation. The terminal skill development in Level II shall be related to: acquisition of proper safety procedures, workmanship habits, adjustment and replacement of accessories and/or mechanical components requiring basic calibration and diagnostic capabilities, and the simple engineering principles critical to the safe operation of the bicycle. Appendix B. specifies the skills to be acquired at the Level II program offering.

Level III Advanced Mechanical Repair and Shop Management:

The terminal segment of a three-part program offering directed to develop the competencies necessary for performing the advanced general mechanical repairs critical to safe bicycle upkeep and operation as well as the concepts of owner/operator shop management and customer relations. The terminal skill development in Level III shall be related to: acquisition of proper safety procedures, workmanship habits, adjustment and replacement of mechanical components requiring advanced calibration and diagnostic capabilities; engineering principles critical to the safe operation of the bicycle, legal restrains on bicycle repair, history of bicycle development, and the concepts of customer relations mandatory for the operation of a bicycle repair shop. Referenced - Appendix B

SPECIFIC UNIT TOPICS

LEVEL I UNIT	LESSON	TEACHER OBJECTIVE	STUDENT ACTIVITY	REFERENCE
INTRODUCTION	General class requirements, safety rules, tool use, work habits	Teacher will discuss, use visu aids, and demonstrate the gene and basic safety rules, use of .. and work habits that are required at all times.	s will receive written .er .d take a pretest on the c epts of safety, tool use and work habits.	Schoo sciplinary code l manuals, and l text books
	General History	Teacher will discuss, use multi media and display the brief highlights of the development of bicycles.	Students will review films, charts, slides and written materials on history.	(19)
	Employment Possibilities	Teacher will give description of job titles and functions, working hours, locations, attitudes and pay of various aspects of bicycle repair.	Students will review charts, slides, and written material on employment aspects.	Local bicycles repair companys
	Vocabulary	Teacher will give discussion on importance of key expressions needed for employment.	Students will review multi media information through review of charts and slides on vocabulary.	Compiled from questionnaire
	Types	Teacher will give discussion of the major types of bicycles.	Students will review multi media information on types of bicycles.	(11)
	Legalities	Teacher will give the explanation of basic laws of liability, responsibility and local ordinances.	Student will review written material and multi media on legalities.	Local police station
	Field Trips	Teacher will arrange trip to local bicycle repair and manufacturing firm.	Student will review experiences of local manufacturing facility.	Telephone directory
Tires	Safety rules	Teacher will give discussion and demonstration of the safe operation of equipment and tools.	Students will review multi media material and demonstrate safety knowledge on actual equipment and tools.	(18, Pg. 397)

LEVEL I UNIT	LESSON	TEACHER OBJECTIVE	STUDENT ACTIVITY	REFERENCE
Tires (Continued	Tool Use	Teacher will give discussion and demonstration of the proper and correct use of tools.	Students will review multi media materials and demonstrate correct use of tools on actual equipment.	(17, Pg. 207)
	Work Habits	Teacher will give discussion and demonstration of proper work habits.	Students will review multi media materials and demonstrate proper work habits while working on actual equipment.	(18, Pg. 490)
	Defectiveness	Teacher will demonstrate various methods of locating [illegible]	Students will review materials and perform work on actual tires.	(9, Pg. 54)
	Rubbing	Teacher will demonstrate various causes for rubbing, and correction thereof.	Students will perform corrective work on actual equipment for tire rubbing.	(9, Pg. 54)
	Sizes	Teacher will give discussion and demonstration of actual tire size, the knowledge and recognition thereof	Students will review written and visual material, the actual identification of tube sizes.	(5, Pg.2)
Tubes	Safety Rules	Teacher will give discussion and demonstration of the safe operation of equipment and tools.	Students will review multi media material and demonstrate safety knowledge on actual equipment and tools.	(18, Pg. 397)
	Tool Use	Teacher will give discussion and demonstration of the proper and correct use of tools.	Students will review multi media materials and demonstrate correct use of tools on actual equipment.	(17, Pg. 207)
	Work Habits	Teacher will give discussion and demonstration of proper work habits.	Students will review multi media materials and demonstration of proper work habits while working on actual equipment.	(18, Pg. 490)
	Sizes	Teacher will give demonstration and discussion of actual tube size the knowledge and recognition thereof	Students will review written and visual material, actual identification of tube sizes.	(5, Pg. 2)

LEVEL I UNIT	LESSON	TEACHER OBJECTIVE	STUDENT ACTIVITY	REFERENCE
Tubes (continued)	Valve Stem	Teacher will demonstrate problems with function of and removal thereof.	Students will perform work on actual valve stem.	(9, Pg. 59)
	Pressure	Teacher will give discussion of proper inflation pressures of the tube sizes, tools and equipment used.	Students will review charts, and perform work on actual equipment.	(5, Pg. 2)
	Removal	Teacher will give dicussion and demonstration of proper methods and equipment used.	Students will perform work on actual equipment removing tubes.	(9, Pg. 55) (5, Pg. 45)
	Replacement	Teacher will give discussion and demonstration of proper methods and equipment used.	Students will perform work on actual equipment replacing tubes.	(9, Pg. 57) (5, Pg. 45)
	Pressure	Teacher will give discussion of proper inflation pressure, tools and equipment used.	Students will review pressure and actual performance on tubes.	(5, Pg. 2)
	Removal	Teacher will give discussion and demonstration of proper methods and equipment used.	Students will remove tubes actual equipment.	(9, Pg. 55) (5, Pg. 45)
	Replacement	Teacher will give discussion and demonstration of proper methods and equipment used.	Students will replace tubes actual equipment.	(9, Pg. 57) (5, Pg. 45)
Wheels	Safety Rules	Teacher will give discussion and demonstration of the safe operation of equipment and tools.	Students will review multi media materials and demonstrate safety knowledge on actual equipment.	(18, Pg. 397)
	Tool Use	Teacher will give discussion and demonstration of the proper and correct use of tools.	Students will review multi media materials and demonstrate correct use of tools on actual equipment.	(17, Pg. 207)

LEVEL I UNIT	LESSON	TEACHER OBJECTIVE	STUDENT ACTIVITY	REFERENCE
Wheels (Continued)	Work Habits	Teachers will give discussion and demonstration of proper work habits.	Students will review multi media materials and demonstrate proper work habits during work on actual equipment.	(18, Pg. 490)
	Rims	Teacher will give discussion and demonstration of problems of maintenance for rims.	Students will perform proper rim maintenance on actual equipment.	(9, Pg. 86)
	Spokes	Teacher will give discussion and demonstration of straightening and tightening methods for spokes.	Students will perform actual spoke maintenance on equipment.	(9, Pg. 86)
	Bearings	Teacher will give discussion and demonstration of proper maintenance and lubrication methods for bearings.	Students will perform actual bearing maintenance on equipment.	(9, Pg. 80)
	Coaster Brake	Teacher will give discussion and demonstration of proper maintenance and lubrication methods for coaster brake.	Students will perform actual coaster maintenance on equipment.	(9, Pg. 94)
Frames	Safety Rules	Teacher will give discussion and demonstration of the safe operation of equipment and tools.	Students will review multi media materials and demonstration safety knowledge on actual equipment and tools.	(18, Pg. 397)
	Tool Use	Teacher will give discussion and demonstration of the proper and correct use of tools.	Students will review multi media materials and demonstrate correct use of tools on actual equipment.	(17, Pg. 207)
	Work Habits	Teacher will give discussion and demonstration of proper work habits.	Students will review multi media materials and demonstrate proper work habits during work on actual equipment.	(18, Pg. 490)

LEVEL I UNIT	LESSON	TEACHER OBJECTIVE	STUDENT ACTIVITY	REFERE
Frames (Continued)	Chainguard	Teacher will demonstrate basic replacement, maintenance, and adjustment of chainguards.	Students will correctly perform methods of repair, maintenance, adjustment on actual chainguards.	(5, Pg. 16)
	Fenders	Teacher will demonstrate basic replacement, maintenance, and adjustment of fenders.	Students will correctly perform methods of repair, maintenance, and adjustment on actual fenders.	(5, Pg. 15)
	Handle Bars	Teacher will demonstrate basic replacement, maintenance, and adjustment of handle bars.	Students will correctly perform methods of repair, maintenance, and adjustment on actual handle bars.	(5, Pg. 9)
	Head Set	Teacher will demonstrate basic replacement, maintenance, and adjustment of head sets.	Students will correctly perform methods of repair, maintenance, and adjustment on actual head sets.	(5, Pg. 11)
	Seat	Teacher will demonstrate basic replacement, maintenance, and adjustment of seats.	Students will correctly perform methods of repair, maintenance, and adjustment of actual seats.	(5, Pg. 7)
	Stem	Teacher will demonstrate basic replacement, maintenance, and adjustment of stems.	Students will correctly perform methods of repair, maintenance, adjustment on actual stems.	(5, Pg. 10)
Brakes	Safety Rules	Teacher will give discussion and demonstration of the safe operation of equipment and tools.	Students will review multi media materials and demonstrate safety knowledge on actual equipment.	(18, Pg. 397)
	Tool Use	Teacher will give discussion and demonstration of the proper and correct use of tools.	Students will review multi media materials and demonstrate correct use of tools on actual equipment.	(17, Pg. 207)

LEVEL I UNIT	LESSON	TEACHER OBJECTIVE	STUDENT ACTIVITY	REFERENCE
Brakes (Continued)	Work Habits	Teacher will give discussion and demonstration of proper work habits.	Students will review multi media materials and demonstrate proper work habits during work on actual equipment.	(18, Pg. 490)
	Cables	Teacher will demonstrate the method of removing and replacing cables.	Students will correctly remove, replace and adjust cables.	(5, Pg. 28)
	Levers	Teacher will demonstrate the proper method of removal and replacement of levers.	Student will correctly remove, replace and adjust levers.	(5, Pg. 25)
	Frame Unit	Teacher will demonstrate the proper method of removal and replacement of frame units.	Student will correctly remove, replace, and adjust frame units.	(5, Pg. 31)
Accessories	Safety Rules	Teacher will give discussion and demonstration of safe operation of equipment and tools.	Students will review multi media materials and demonstrate safety knowledge on actual equipment.	(18, Pg. 397)
	Tool Use	Teacher will give discussion and demonstration of the proper and correct use of tools.	Students will review multi media materials and demonstrate correct use of tool on actual equipment.	(17, Pg. 207)
	Work Habits	Teacher will give discussion and demonstration of proper work habits.	Students will review multi media materials and demonstrate proper work habits during work on actual equipment.	(18, Pg. 490)
	Lights	Teacher will demonstrate the proper methods of removal, replacement and adjustment of lights.	Students will correctly perform removal, replacement and adjustment of lights.	Actual Equipment

LEVEL I UNIT	LESSON	TEACHER OBJECTIVE	STUDENT ACTIVITY	REFERENCE
Accessories (Continued)	Reflectors	Teacher will demonstrate the proper methods of removal, replacement, and adjustment of reflectors.	Student will correctly perform removal, replacement, and adjustment of reflectors.	Actual Equipment
	Bags	Teacher will demonstrate the proper methods of removal, replacement and adjustment of bags.	Student will correctly perform removal, replacement and adjustment of bags.	Actual Equipment
	Baskets	Teacher will demonstrate the proper methods of removal, replacement and adjustment of baskets.	Student will correctly perform removal, replacement and adjustment of baskets.	Actual Equipment
	Air Pumps	Teacher will demonstrate the proper methods of removal, replacement and adjustment of air pumps.	Student will correctly perform removal, replacement, and adjustment of air pumps.	Actual Equipment
	Mirrors	Teacher will demonstrate the proper methods of removal, replacement and adjustment of mirrors.	Student will correctly perform removal, replacement and adjustment of mirrors.	Actual Equipment
	Horns	Teacher will demonstrate the proper methods of removal, replacement and adjustment of horns.	Student will correctly perform removal, replacement, and adjustment of horns.	Actual Equipment

LEVEL II UNIT	LESSON	TEACHER OBJECTIVE	STUDENT ACTIVITY	REFERENCE
INTRODUCTION	Safety	Teacher will give discussion and demonstration of the safe operation of equipment and tools.	Students will review multi-media materials and demonstrate safety knowledge on actual equipment and tools.	(18, Pg. 397)
	Tool use	Teacher will give discussion and demonstration of the proper and correct use of tools.	Students will review multi media materials and demonstrate correct use of tools on actual equipment.	(17, Pg. 207)
	Work Habits	Teacher will give discussion and demonstration of proper work habits.	Students will review multi media materials and demonstrate proper work habits during work on actual equipment.	(18, Pg. 490)
	Requirements and Purpose of Course	Teacher will give discussion and use of multi media materials for course requirements.	Students will review materials.	School Policy
	Intermediate History	Teacher will give discussion and use of multi media materials on history.	Students will review materials and pass an exam on history.	(79)
	Vocabulary	Teacher will give discussion and use of multi media materials on Vocabulary.	Students will review materials and pass an exam on vocabulary.	Compiled from Questionnaire
	Bicycle Types	Teacher will give discussion and use of multi media materials concerning bicycle types.	Students will review materials and pass an exam on bicycle types.	(20)
	Legalities	Teacher will give discussion and use of multi media materials concerning legalities.	Students will review materials and pass an exam on legalities.	(18, Pg. 26)

LEVEL II UNIT	LESSON	TEACHER OBJECTIVE	STUDENT ACTIVITY	REFERENCE
Gear Units	Safety	Teacher will discuss, and demonstrate the safe operation of equipment and tools.	Students will review multi-media materials and demonstrate safety knowledge on actual equipment.	(18, Pg. 397)
	Tool use	Teacher will give a discussion and demonstration of the proper and correct use of tools.	Students will review multi media materials and demonstrate correct use of tools on actual equipment.	(17, Pg. 207)
	Work Habits	Teacher will give discussion and demonstration of proper work habits.	Students will review multi media materials and demonstrate proper work habits during work on actual equipment.	(18, Pg. 490)
	Derailleur	Teacher will give a multi media discussion/demonstration on basic concepts; related technology; calibration; diagnostic problems; and vocabulary concerning derailleurs.	Students will review multi media demonstration/discussion and perform problems on actual equipment related to derailleurs.	(9, Pg. 11)
	Coaster	Teacher will give a multi media discussion/demonstration on basic concepts; related technology; calibration; diagnostic problems; and vocabulary concerning coasters.	Students will review the multi media demonstration/discussion and perform problems on actual equipment related to coasters.	(9, Pg. 94)
	Multi Speed Unit	Teacher will give a multi media discussion/demonstration on basic concepts; related technology; calibration; diagnostic problems; and vocabulary concerning multi speed units.	Students will review the multi media demonstration/discussion and perform problems on actual equipment related to multi speed units.	(9, Pg. 35)

LEVEL II UNIT	LESSON	TEACHER OBJECTIVE	STUDENT ACTIVITY	REFERENCE
Brakes-Coaster	Safety	Teacher will give discussion and demonstration of safe operation of equipment and tools.	Students will review multi media materials and demonstrate correct use of tools on actual equipment.	(18, Pg. 397)
	Tool Use	Teacher will give discussion and demonstration of [illegible] and correct use of tools.	Students will review multi media materials and demonstrate correct use of tools on actual equipment.	(18, Pg. 207)
	Work Habits	Teacher will give discussion and demonstration of proper work habits.	Students will review mult media materials and demonstrate proper work habits while working on actual equipment.	(18, Pg. 490)
	Dragging	Teacher will give multi media discussion/demonstration on basic concepts; related technology; calibration; diagnostic problems; vocabulary concerning dragging.	Students will review the multi media demonstration/discussion and perform problems on actual equipment related to dragging.	(4, Pg. 73)
	Sticking	Teacher will give multi media discussion/demonstration on basic concepts; related technology; calibration; diagnostic problems; vocabulary concerning sticking.	Students will review the multi media demonstration/discussion and perform problems on actual equipment related to sticking.	(4, Pg. 73)
	Arm Breakage	Teacher will give multi media discussion/demonstration on basic concepts; related technology; calibration; diagnostic problems; vocabulary concerning arm breakage.	Students will review the multi media demonstration/discussion and perform form problems on actual equipment related to arm breakage.	(4, Pg. 73)
	Squeak	Teacher will give multi media discussion/demonstration on basic concepts; related technology; calibration; diagnostic problems; vocabulary concerning squeaking.	Students will review the multi media demonstration/discussion and perform problems on actual equipment related to squeaking.	(4 Pg. 73)

LEVEL II UNIT	LESSON	TEACHER OBJECTIVE	STUDENT ACTIVITY	REFERENCE
Brakes-Coaster (Continued)	Jerkyness	Teacher will give multi media discussion/demonstration on basic concepts, related technology; calibration; diagnostic problems; vocabulary concerning jerkyness.	Students will review multi media demonstration/discussion and perform problems on actual equipment related to jerkyness.	(4, Pg. 74)
	Slipping	Teacher will give multi media discussion/demonstration on basic concepts: related technology; calibration; diagnostic problems; vocabulary concerning slipping.	Students will review the multi media demonstration/discussion and perform problems on actual equipment related to slipping.	(4, Pg. 74)
Tires	Safety	Teacher will discuss and demonstrate the safe operation of equipment and tools.	Students will review multi media materials and demonstrate correct use of tools on actual equipment.	18, Pg. 397)
	Tool Use	Teacher will give discussion and demonstration of the proper and correct use of tools.	Students will review multi media materials and demonstrate the correct use of tools on actual equipment	17, Pg. 207)
	Work Habits	Teacher will give discussion and demonstration of proper work habits.	Students will review multi media materials and demonstrate proper work habits while working on actual equipment.	(18, Pg. 490)
	Puncture	Teacher will give multi media discussion/demonstration on the concepts: related technology; calibration; diagnostic problems; and vocabulary concerning puncture.	Students will review multi media demonstration/discussion and perform problems on actual equipment related to puncture.	(4, Pg. 46)

LEVEL II UNIT	LESSON	TEACHER OBJECTIVE	STUDENT ACTIVITY	REFERENCE
Tires (Continued)	Rubbing	Teacher will give multi media discussion/demonstration on the concepts; related technology; calibration; diagnostic problems; and vocabulary concerning rubbing	Students will review multi media demonstration/discussion and perform problems on actual equipment related to rubbing.	(4, Pg. 70)
	Rim Cuts	Teacher will give multi media discussion/demonstration on the concepts; related technology calibration; diagnostic problems; and vocabulary concerning rim cuts.	Students will review multi media demonstration/discussion and perform problems on actual equipment related to rim cuts.	(4, Pg. 46)
	Uneven Wear	Teacher will give multi media discussion/demonstration on the concepts; related technology; calibration; diagnostic problems; and vocabulary concerning uneven wear.	Students will review multi media demonstration/discussion and perform problems on actual equipment related to uneven wear.	(4, Pg. 46)
	Balance	Teacher will give multi media discussion/demonstration on the concepts; related technology; calibration; diagnostic problems; and vocabulary concerning balance.	Students will review the multi media demonstration/discussion and perform problems on actual equipment related to balance.	(4, Pg, 63)
	Sizes	Teacher will give multi media discussion/demonstration on the concepts; related technology calibration; diagnostic problems and vocabulary concerning sizes.	Students will review the multi media demonstration/discussion and perform problems on actual equipment related to sizes.	(4, Pg. 6)
	Types	Teacher will give multi media discussion/demonstration on the concepts; related technology; calibration; diagnostic problems; and vocabulary concerning types.	Students will review multi media demonstration/discussion and perform problems on actual equipment related to types.	(4, Pg. 47)

LEVEL II UNIT	LESSON	TEACHER OBJECTIVE	STUDENT ACTIVITY	REFERENCE
Tubes	Safety	Teacher will discuss and demonstrate the safe operation of equipment and tools.	Student will review multi media materials and demonstrate correct use of tools on actual equipment.	(18, Pg. 397)
	Tool Use	Teacher will give discussion and demonstration of the proper and correct use of tools.	Students will review multi media materials and demonstrate correct use of tools on actual equipment.	(17, Pg. 207)
	Work Habits	Teacher will give discussion and demonstration of proper work habits.	Students will review multi media materials and demonstrate proper work habits while working on actual equipment.	(18, Pg. 490)
	Sizes	Teacher will give multi media discussion/demonstration on the concepts related technology; calibration; diagnostic problems; and vocabulary concerning sizes.	Students will review the multi media demonstration/discussion and perform problems on actual equipment related to sizes.	(4, Pg. 50)
	Valve Stem	Teacher will give multi media discussion/demonstration on the concepts; related technology; calibration; diagnostic problems; and vocabulary concerning valve stems.	Students will review the multi media demonstration/discussion and perform problems on actual equipment related to valve stems.	(4, Pg. 50)
	Pressure	Teacher will give a multi media discussion/demonstration on the concepts: related technology; calibration, diagnostic problems; and vocabulary concerning pressure.	Students will review the multi media demonstration/discussion and perform problems on actual equipment related to pressure.	(4, Pg. 46)
	Patch	Teacher will give multi media discussion/demonstration on the concepts; related technology; calibration; diagnostic problems; and vocabulary concerning patching.	Students will review the multi media demonstration/discussion and perform problems on actual equipment related to patching.	(4, Pg. 50)

LEVEL II UNIT	LESSON	TEACHER OBJECTIVE	STUDENT ACTIVITY	REFERENCE
	Puncture	Teacher will give multi media discussion/demonstration on the concepts; related technology; calibration; diagnostic problems; and vocabulary concerning punctures.	Students will review the multi media demonstration/discussion and perform problems on actual equipment related to punctures.	(4, Pg. 46)
Brakes Hand Pull	Safety	Teacher will discuss and demonstrate the safe operation of equipment and tools.	Students will review multi media materials and demonstrate correct use of tools on actual equipment.	(18, Pg. 397)
	Tool Use	Teacher will give discussion and demonstration of the proper and correct use of tools	Students will review multi media materials and demonstrate correct use of tools on actual equipment.	(17, Pg. 207)
	Work Habits	Teacher will give discussion and demonstration of proper work habits.	Students will review multi media materials and demonstrate proper work habits while working on actual equipment.	(18, Pg. 490)
	Dragging	Teacher will give a multi media discussion/demonstration on the concepts; related technology; calibration; diagnostic problems; and vocabulary concerning dragging.	Students will review the multi media demonstration/discussion and perform problems on actual equipment related to dragging.	(8, Pg. 50)
	Sticking	Teacher will give multi media discussion/demonstration on the concepts; related technology; calibration; diagnostic problems; and vocabulary concerning sticking.	Students will review multi media demonstration/discussion and perform problems on actual equipment related to sticking.	(8, Pg. 50)

LEVEL II UNIT	LESSON	TEACHER OBJECTIVE	STUDENT ACTIVITY	REFERENCE
Brakes Hand Pull (Continued)	Cable Breakage	Teacher will give multi media discussion/demonstration on the concepts; related technology; calibration; diagnostic problems; and vocabulary concerning cable breakage.	Students will review the multi media demonstration/discussion and perform problems on actual equipment related to cable breakage.	(8, Pg. 51)
	Squeaking	Teacher will give multi media discussion/demonstration on the concepts; related technology; calibration; diagnostic problems; and vocabulary concerning squeaking.	Students will review the multi media demonstration/discussion and perform problems on actual equipment related to squeaking.	(8, Pg. 50)
	Slipping	Teacher will give multi media discussion/demonstration on the concepts; related technology; calibration; diagnostic problems; and vocabulary concerning slipping.	Students will review the multi media demonstration/discussion and perform problems on actual equipment related to slipping.	(8, Pg. 50)
	Jerkyness	Teacher will give multi media discussion/demonstration on the concepts; related technology; calibration; diagnostic problems; and vocabulary concerning jerkyness.	Students will review the mulit media demonstration/discussion and perform problems on actual equipment related to jerkyness.	(8, Pg. 51)
3 speed	Safety	Teacher will discuss and demonstrate the safe operation of equipment and tools.	Students will review multi media materials and demonstrate correct use of tools on actual equipment.	(18, Pg. 397)
	Tool Use	Teacher will give discussion and demonstration of the proper and correct use of tools.	Students will review multi media materials and demonstrate correct use of tools on actual equipment.	(17, Pg. 207)

LEVEL II UNIT	LESSON	TEACHER OBJECTIVE	STUDENT ACTIVITY	REFERENCE
3 speed (Continued)	Work Habits	Teacher will give discussion and demonstration of proper work habits.	Student will review multi media materials and demonstrate proper work habits while working on actual equipment.	(18, Pg. 490)
	Slips Out of Gear	Teacher will give multi media discussion/demonstration on the concepts; related technology; calibration; diagnostic problems; and vocabulary concerning slipping out of gear.	Students will review the multi media demonstration/discussion and perform problems on actual equipment related to slipping out of gear.	(2, Pg. 42)
	Improper Selection	Teacher will give a multi media discussion/demonstration on the concepts; related technology; calibration; diagnostic problems; and vocabulary concerning selection.	Students will review the multi media demonstration/discussion and perform problems on actual equipment related to selection.	(2, Pg. 42)
	Improper Brake Action	Teacher will give a multi media discussion/demonstration on the concepts; related technology; calibration; diagnostic problems; and vocabulary concerning brake action.	Students will review the multi media demonstration/discussion and perform problems on actual equipment related to brake action.	(2, Pg. 42)
	Frozen Action	Teacher will give a multi media discussion/demonstration on the concepts; related technology; calibration; diagnostic problems; and vocabulary concerning frozen action.	Students will review the multi media demonstration/discussion and perform problems on actual equipment related to frozen action.	(2, Pg. 43)

LEVEL II UNIT	LESSON	TEACHER OBJECTIVE	STUDENT ACTIVITY	REFERENCE
Derailleur Front and Rear	Safety	Teacher will discuss and demonstrate the safe operation of equipment and tools.	Students will review multi media materials and demonstrate safety knowledge on actual equipment and tools.	(18, Pg. 397)
	Tool Use	Teacher will give discussion and demonstration of the proper and correct use of tools.	Students will review multi media materials and demonstrate correct use of tools on actual equipment.	(17, Pg. 207)
	Work Habits	Teacher will give discussion and demonstration of proper work habits.	Students will review multi media materials and demonstrate proper work habits during work on actual equipment.	(18, Pg. 490)
	Inspection	Teacher will give a multi media discussion/demonstration on the concepts; related technology;	Students will review multi media demonstration/discussion and perform problems on actual equipment related to inspection.	(8, Pg. 84)
	Adjustment	Teacher will give a multi media discussion/demonstration on the concepts; related technology; calibration; diagnostic problems; and vocabulary concerning adjustment.	Students will review the multi media demonstration/discussion and perform problems on actual equipment related to adjustment.	(8, Pg. 81)
	Removal	Teacher will give multi media discussion/demonstration on the concepts; related technology; calibration; diagnostic problems; and vocabulary concerning removal.	Students will review the multi media demonstration/discussion and perform problems on actual equipment related to removal.	(8, Pg. 82)

LEVEL II UNIT	LESSON	TEACHER OBJECTIVE	STUDENT ACTIVITY	REFERENCE
Derailleur Front and Rear (Continued)	Installation	Teacher will give multi media discussion/demonstration on the concepts; related technology; calibration; diagnostic problems; and vocabulary concerning installation.	Students will review the multi media demonstration/discussion and perform problems on actual equipment related to installation.	(8, Pg. 82)
Selector Levers	Safety	Teacher will discuss and demonstrate the safe operation of equipment and tools.	Students will review multi media materials and demonstrate safety knowledge on actual equipment and tools.	(18, Pg. 397)
	Tool Use	Teacher will give discussion and demonstration of the proper and correct use of tools.	Students will review multi media materials and demonstrate correct use of tools on actual equipment.	(17, Pg. 207)
	Work Habits	Teacher will give discussion and demonstration of proper work habits.	Students will review multi media materials and demonstrate proper work habits during work on actual equipment.	(18, Pg. 490)
	Inspection	Teacher will give multi media discussion/demonstration on the concepts; related technology; calibration; diagnostic problems; and vocabulary concerning inspection.	Students will review the multi media demonstration/discussion and perform problems on actual equipment related to inspection.	(6, Pg. 103)
	Adjustment	Teacher will give multi media discussion/demonstration on the concepts; related technology; calibration; diagnostic problems and vocabulary concerning adjustment.	Students will review multi media demonstration/discussion and perform problems on actual equipment related to adjustment.	(6, Pg. 105)

LEVEL II UNIT	LESSON	TEACHER OBJECTIVE	STUDENT ACTIVITY	REFERENCE
Selector Levers (Continued)	Removal	Teacher will give a multi media discussion/demonstration on the concepts; related technology; calibration; diagnostic problems; and vocabulary concerning removal.	Students will review the multi media demonstration/discussion and perform problems on actual equipment related to removal.	(6, Pg. 109)
	Installation	Teacher will give multi media discussion/demonstration on the concepts; related technology; calibration; diagnostic problems; and vocabulary concerning installation.	Students will review the multi media demonstration/discussion and perform problems on actual equipment related to installation.	(6, Pg. 112)
	Cables	Teacher will give a multi media discussion/demonstration on the concepts; related technology; calibration; diagnostic problems; and vocabulary concerning cables.	Students will review the multi media demonstration/discussion and perform problems on actual equipment related to cables.	(6, Pg. 109)
Crank Unit	Safety	Teacher will discuss and demonstrate the safe operation of equipment and tools.	Students will review multi media materials and demonstrate safety knowledge on actual equipment and tools.	(18, Pg. 397)
	Tool Use	Teacher will give discussion and demonstration of the proper and correct use of tools.	Students will review multi media materials and demonstrate correct use of tools on actual equipment.	(17, Pg. 207)
	Work Habits	Teacher will give discussion and demonstration of proper work habits.	Students will review multi media materials and demonstrate proper work habits during work on actual equipment.	(18, Pg. 490)

LEVEL II UNIT	LESSON	TEACHER OBJECTIVE	STUDENT ACTIVITY	REFERENCE
Crank Unit (Continued)	Inspection	Teacher will give a multi media discussion/demonstration on the concepts related technology; calibration; diagnostic problems; and vocabulary concerning inspection.	Students will review multi media demonstration/discussion and perform problems on actual equipment related to inspection.	(6, Pg. 132)
	Adjustment	Teacher will give a multi media discussion/demonstration on the concepts related technology; calibration; diagnostic problems; and vocabulary concerning adjustment.	Students will review multi media demonstration/discussion and perform problems on actual equipment related to adjustment.	(6, Pg. 133)
	Removal	Teacher will give a multi media discussion/demonstration on the concepts related technology; calibration; diagnostic problems; and vocabulary concerning removal.	Students will review multi media demonstration/discussion and perform problems on actual equipment related to removal.	(6, Pg. 135)
	Installation	Teacher will give a multi media discussion/demonstration on the concepts; related technology; calibration; diagnostic problems; and vocabulary concerning installation.	Students will review multi media demonstration/discussion and perform problems on actual equipment related to installation.	(6, Pg. 133)

LEVEL III UNIT	LESSON	TEACHER OBJECTIVE	STUDENT ACTIVITY	REFERENCE
ENGINEERING PRINCIPLES	Safety	Teacher will give discussion and demonstration of the safe operation of equipment and tools.	Students will review multi media materials and demonstrate safety knowledge on actual equipment.	(18, Pg. 397)
	Tool Use	Teacher will give discussion and demonstration of the proper and correct use of tools.	Students will review multi media materials and demonstrate corrrect use of tools on actual equipment.	(17, Pg. 207)
	Work Habits	Teacher will give discussion and demonstration of proper work habits.	Students will review multi media materials and demonstrate proper work habits while working on actual equipment.	(18, Pg. 490)
	Design	Teacher will give a multi media discussion/demonstration concerning: advanced concepts; related technology calibration; diagnostic problems; and vocabulary concerning design.	Students will review lesson material and achieve a minimal level on design exams.	1), (11), (12)
	Materials	Teacher will give a multi media discussion/demonstration concerning: advanced concepts; related technology calibration; diagnostic problems; and vocabulary concerning materials.	Students will review lesson materials and achieve a minimal level on material exams.	(1), (11), (12)
	Physics	Teacher will give a multi media discussion/demonstration concerning: advanced concepts; related technology calibration; diagnostic problems; and vocabulary concerning physics.	Students will review lesson materials and achieve a minimal level on physic exams.	(1), (11), (12)

LEVEL III UNIT	LESSON	TEACHER OBJECTIVE	STUDENT ACTIVITY	REFERENCE
	Finance	Teacher will give a multi media discussion/demonstration concerning: advanced concepts; related technology; calibration; diagnostic problems; and vocabulary concerning finance.	Students will review material and fill out simulated materials concerning finance.	(1), (11), (12)
	Training	Teacher will give a multi media discussion/demonstration concerning: advanced concepts; related technology; calibration; diagnostic problems; and vocabulary concerning training.	Students will review materials and role play training aspects.	(1), (11), (12)
	Hiring	Teacher will give a multi media discussion/demonstration concerning: advanced concepts; related technology; calibration; diagnostic problems; and vocabulary concerning hiring.	Students will review materials and role play hiring principles.	(1), (11), (12)
	Legalities	Teacher will give a multi media discussion/demonstration concerning: advanced concepts; related technology; calibration; diagnostic problems; and vocabulary concerning legalities.	Students will review materials and pass an exam on legalities.	(18, Pg. 26)
	Workmanship	Teacher will give a multi media discussion/demonstration concerning: advanced concepts; related technology; calibration; diagnostic problems; and vocabulary concerning workmanship.	Students will review materials and pass an exam on workmanship.	(1), (11), (12)
	History (In-Depth)	Teacher will give a multi media discussion/demonstration concerning: advanced concepts; related technology; calibration; diagnostic problems; and vocabulary concerning history.	Students will review materials and pass an exam on Bicycle History.	(19)

LEVEL III UNIT	LESSON	TEACHER OBJECTIVE	STUDENT ACTIVITY	REFERENCE
	Terminologies	Teacher will give a multi media discussion/demonstration concerning: advanced concepts; related technology calibration; diagnostic problems; and vocabulary concerning terminologies.	Student will review lesson materials and achieve a minimal level on terminology exams.	(12)
SHOP MANAGEMENT	Customer Relations	Teacher will give discussion role play of required behaviors with supportive multi behaviors.	Student will review on instruction materials and role play aspects of customer relations.	(17, Pg. 321)
	Shop Layout	Teacher will give a multi media discussion/demonstration concerning: advanced concepts; related technology calibration; diagnostic problems; and vocabulary concerning shop layout.	Students will develop a mock-up of facilities.	(17, Pg. 181)
	Purchasing	Teacher will give a multi media discussion/demonstration concerning: advanced concepts; related technology calibration; diagnostic problems; and vocabulary concerning purchasing.	Students will review materials and fill out simulated materials concerning purchasing.	(17, Pg. 273)
	Records	Teacher will give a multi media discussion/demonstration concerning: advanced concepts; related technology calibration; diagnostic problems; and vocabulary concerning records	Students will review material and fill out simulated materials concerning records.	(17, Pg. 223)

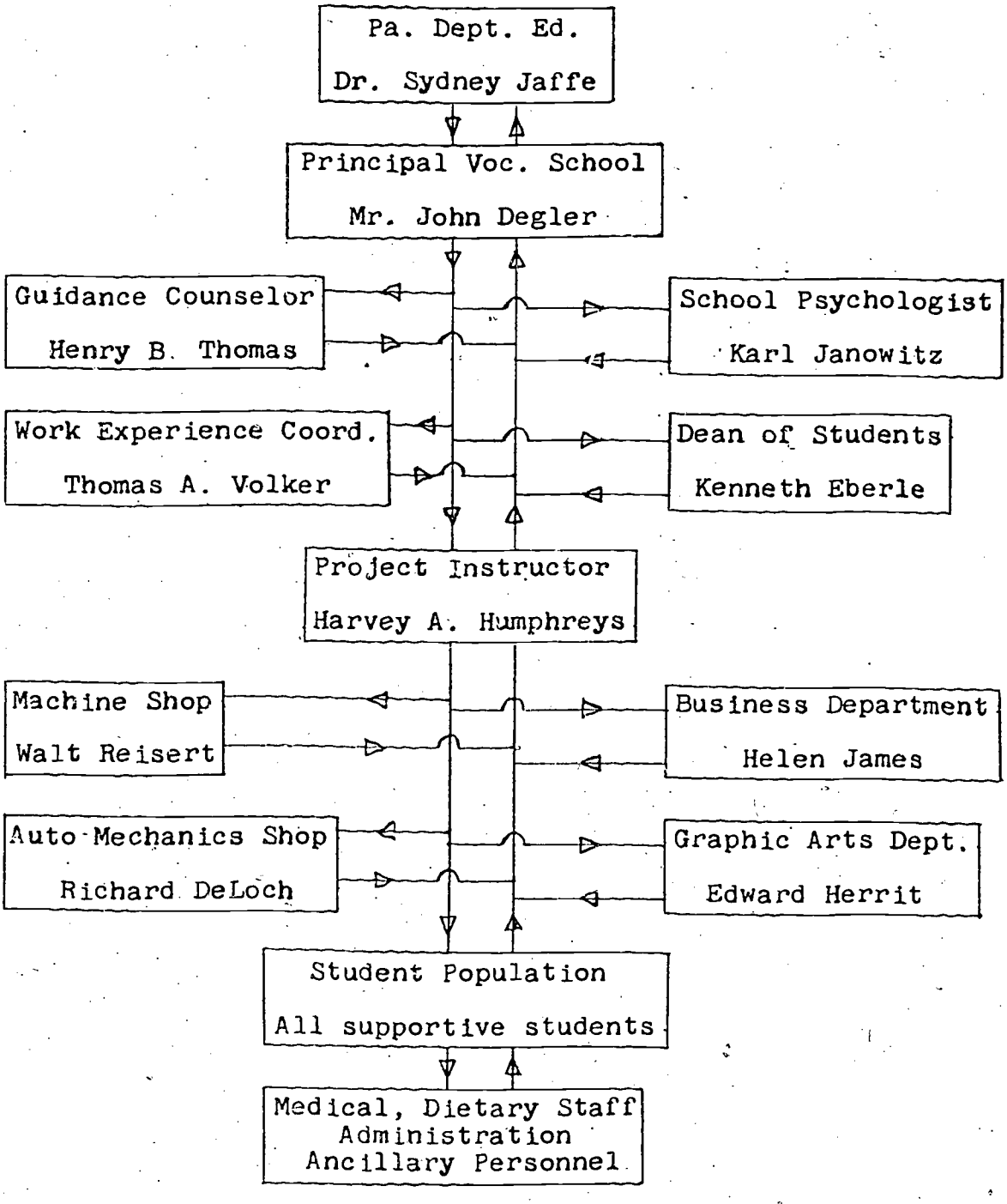
GENERAL REQUIREMENTS FOR COMPLETING EACH LEVEL OF THE CURRICULUM

(LEVEL I, LEVEL II, LEVEL III)

You must learn and follow all safety rules and general shop rules.

1. There is to be no playing around at any time for any reason.
2. You must wear safety glasses at all times when:
   a. Working with any machinery or equipment.
   b. Watching any machinery or equipment working.
   c. During any hazardous work.
   d. Any time the teacher requires them.
3. There is to be no willful damage or misuse of tools and equipment.
4. You must start on time, clean your work area, and stop on time.
5. You must learn the proper names and signs of given tools, parts, and equipment for your given level.
6. You must finish all written work, project sheets test, forms, and any work given by the instructor.
7. You must learn to accept responsibility and complete tasks assigned to you.
8. You should develop a concern about the quality of your work.
9. You should work successfully with peers and co-workers.

PROJECT PERSONNEL



STUDENT SELECTOR

(Prerequisite Entry Skills)

Due to the basic handicaps concerning the particular abilities of academic, physical, and social development of multiple-handicapped deaf children, one needs to have a general and simple pre-entry skill abilities guideline.

Basic guidelines for the three personal abilities areas depend on the Terminal Objectives Levels (I, II, III).

All students should have a basic visual and physical ability so that they can be mobile and have enough dexterity to manipulate machinery, tools, and bicycles. This is necessary for all three levels.

Level I would require little reading, language, or mathematics ability.

Level II would require a minimal level of reading, language, and mathematics ability, such as: the ability to use repair manuals and charts, to identify given parts and names of repair orders and identification tags, to communicate (by some method) to the foreman or other workers.

Level III would require a higher level of reading, language, and mathematics ability than Level II, such as: the ability to read and understand written material at the fifth grade reading level, the social maturity to deal with different people and situations requiring self control and understanding for problems that arise.

FACILITIES

The bicycle repair shop facility consisted of a 150-200 square foot shared room, shared equipment and a remote bicycle storage location.

EQUIPMENT AND TOOL LIST

DETAILED EQUIPMENT AND TOOL LIST--EXISTING

Copy Schwinn Finish

Work Benches and Vises

Grinder

Electric Welder

Lathe

Drill Press

Power Hacksaw

Air Pump and Hose

Tire Repair Kit and Patches

Assortment of various sizes of nuts and bolts

Safety Equipment

PARTS AND SUPPLIES

Schwinn Bicycle Company

Set of Amer. Comb. wrenches
Set of Metr. Comb. wrenches
Set of Amer. Cone wrenches
Set of Metric Cone wrenches
Set of Pedal wrenches
Midget Ratchet Set
Metric Cone Wrench Set
Letour Crank Puller
Set of 4 Spoke wrenches
Universal Crank Puller
Univ. Crank Arm Wrench
Univ. Crank Tool Set
3/8"Socket (3/8"Drive)
7/16" Socket
1/2" Socket
9/16" Socket
5/8" Socket
11/16" Socket
3/*" Ratchet Wrench
6" extension
Head & Hanger lock nut wrench

Kickstand Tool
Front Hub Tool
Universal Freewheel Tool
Freewheel Tool Atom Cogs
Freewheel T.F/Maillard Cogs
Freewheel Tool For Sun Tour Cogs
Standard Freewheel Tool
Shimano Free Tool F/Auto 5 Sp.
#8 3/4" Easy Out
Phil Wood Free Wheel Tool
Shimano Freewheel Tool
Deluxe Freewheel Tool
Bendix Cone Wrench
15MM and 16MM Pedal Wrench
9/16" Pedal Wrench
Wheel Aligning Tool
Derailleur Open End Wrench
Allen Wrench F/Cinelli Stem - 7MM
Schwinn App. Seat Post Tool
Derailleur Screwdriver

Allen Wrench F/Letour Kickstand
Campagnolo "T" Wrench
Schwinn App. Sprocket Tool
Cable Cutter
Var Chain Tool
Spare Pins for 74405
Adjusting Pin Spanner
Spare Pin for 74410
Hanger Spanner Wrench
Hngr. Dble. Spanner End Wrench
Schwinn Approved Chain Tool
Schwinn App. Plier Type Chain Tool
Spare Pins for 74425 & 74426
N.S. Var Plier Type Chain Tool
9/16" Pedal Tap R
9/16" Pedal Tap L
½" Pedal Tap R
½" Pedal Tap L
9/16" Pedal Taps-set
½" Pedal Taps-set
Spoke Nippers
24 TH. Fork Stock & Die
26 TH. Fork Stock & Die
Fork Stock only
24 TH. Fork Die only
26 TH. Fork Die only

Nut Pliers
10MM Socket
11MM Socket
Hub Brush
12MM Socket
13MM Socket
14MM Socket
15MM Socket
Var Nipple Bit
Spare Pin for 74536
Var Plier Type Chain Tool
Spare Pins for 74550
Cone Pliers
Wedge Pin Remover
Brake Screwdriver
Brake Wrenches-Set of Four
Fourth Hand Tool
Third Hand Tool
8MM-10MM Box Caliper Br. Wrench
9MM-11MM Box Caliper Br. Wrench
8MM-10MM Open End Cal. Br. Wr.
9MM-11MM Open End Cal. Br. Wr.
8MM Box-10MM Op.End Cal.Br.Wr.
Crank Straightener
Fork Straightener
80 Ga. Union Spoke Wrench

80 Ga. Japanese Spoke Wrench

105 Ga. Union Spoke Wrench

120 Ga. Union Spoke Wrench

80 Ga. Profess. Spoke Wrench

105 Ga. Profess. Spoke Wr.

120 Ga. Profess. Spoke Wr.

Insert for 74624 80 Ga.

Insert for 74625 105 Ga.

Insert for 74626 120 Ga.

Replac.Casting F/Pro. Sp.Wr.

Shimano Ball Cup Tool

Shimano Pliers

Fork Aligning Gauge

Fork Aligning Clamp

Schwinn Bicycle Spec. Cat.

Bicycle Safety Booklet

Lock Your Bike Booklet

Tire Care Guide Booklet

Derailleur Booklet

Good Reasons to Cycle

Delong Pamphlet

Wheel Trung Stand

One pair brass inserts F/74905

5 Gal. can of degreasol

Bin Box 4x24x41/2

Bin Box 8x12x4 1/2

Bin Box 8x15x4 1/2

Box of 4MM x 10MM Bolts

Box of 4MM Nuts

PARTS AND SUPPLIES

DETAILED EQUIPMENT AND TOOL LIST

NEEDED

Storage cabinets

Audio Visual Materials

Bicycle Wall and Ceiling Racks

Painting Equipment

Selection of Various Bicycle Parts

Selection of Bolts and Nuts

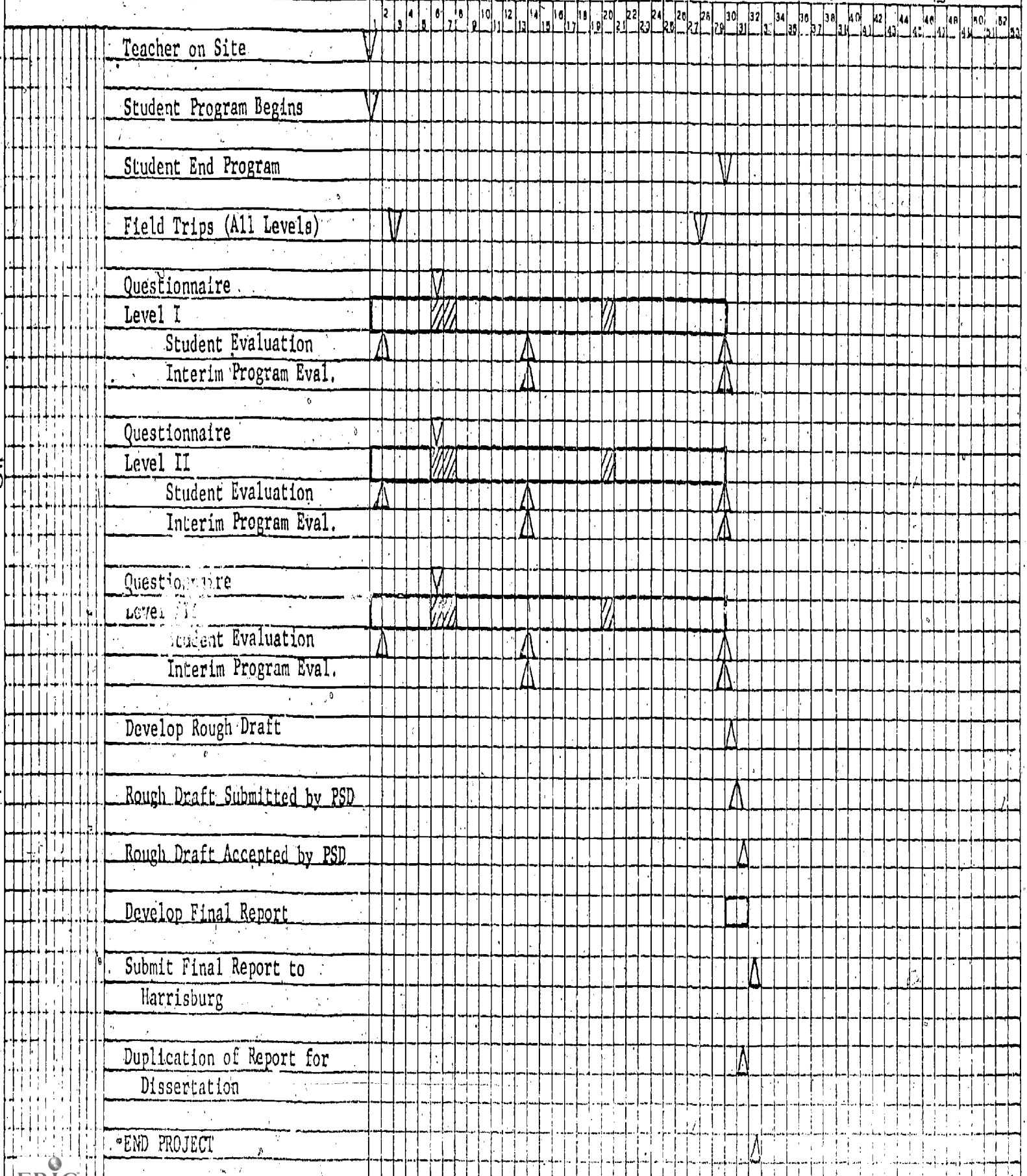
BICYCLE PROGRAM

SCHEDULE

CAP:

GO-AHEAD DATE 11/14/75.

CALENDAR INCREMENT MONTHS ☐ WEEKS ☒ DAYS ☐



QUESTIONNAIRE

The employment level questionnaire was developed and implemented for the specific purpose of assisting the Author in the interrogation of fifteen bicycle repair centers in and around the Greater Philadelaphia Area. The fifteen centers were selected to be representative of the small, medium, and large firms found in this area. The interogation was conducted to determine the nature of the skills needed by potential employees of the various firms.

The questionnaire contained thirteen major areas of interest (A-M) with up to twenty-two sub-set skill oriented questions per area. Each sub-set question was to be answered on a dichotomous scale (Yes-No) with provision for those questions that do not apply (D.A.). Analysis of the data extracted by the questionnaire was computed to establish the percentage of respondents reacting to the dichotomous scale for each sub-set question, after which the "No" and "D.S." responses were compressed into a single percentage response. The compression of these two reactions is predicated on the assumption that if a skill is not required (No) or if a skill does not apply (D.A.), the end result (ef-

These skill areas were then developed into a three-level curriculum, as defined under Level I, Level II, and Level III descriptions.

The Matrix located in Appendix B was developed from the questionnaire to support and augment the Level I, Level II, and Level III Curricula. The Matrix may be used as a student performance completion record. Two blocks are provided for recording purposes for each operation according to the component being studied: one block is to be used for the data of competency attainment and the other block is to be initialed by the attending instructor as proof of competency attainment.

FINDINGS AND ANALYSIS

FINDINGS

DEMOGRAPHIC DATA

The respondent bicycle repair shops were found to represent a medium size labor force (three to six repair personnel) in a large repair area facility (105 square feet and up). Appendix E specifies the findings for all three concerns in labor force size and repair area size. The analysis of the skill requirements for bicycle repair personnel in the Philadelphia Area resulted in the skill specified in the curriculum as well as in the work completion matrix (Appendix B). Deletion of a skill requirement was based upon "yes" responses of less that 55% of the population. The following findings contain the results of the data analysis as they apply to each area of the questionnaire.

FINDINGS

Questionnaire Analysis

The raw data was analyzed to determine the percentage of responses on each question for the Yes, No and D.A. response areas. Appendix E contains this data analysis.

The following analysis was developed to present a cumulative-average percentage response for each major sub-set area (General Question and A - M) with suggested deletions of specific skill areas to conform to the minimum percentage response required for the retention of a skill area in the curriculum (55%):

From a total of 13 questionnaires.

General Questions: The total cumulative response on the first ten general questions was 94.5% answered yes, 5.5% answered no, and there were no "Do not apply" (D.A.) responses.

Group A I: 99.6% of the total group responses were yes, .4% were no, and 0% were D.A.

Group A II: 99.6% of the total group responses were yes, .4% were no, and 0% were D.Z.

Group A III: 99.2% of the total group responses were yes, .8% were no, and 0% were D.A.

Group B I: 97.3% of the total group responses were yes, 2.7% were no, and 0% were D.A.

Group B II: 97.3% of the total group responses were yes, 2.7% were no, and 0% were D.A.

Group B III: 55% of the total group responses were yes, 41% were no, and 4% were D.A. Note: The following skill areas 4, 5, 6, and 7 are being deleted because of insufficient yes responses (55%).

Group C I: 93.6% of the total group responses were yes, 6.4% were no, and 0% were D.A.

Group C II: 93.6% of the total group responses were yes, 6.4% were no, and 0% were D.A.

Group C III: 92.0% of the total group responses were yes, 8% were no, and 0% were D.A.

Group D: 88% of the total group responses were yes, 12% were no, and 0% were D.A.

Group E: 62% of the total group responses were yes, 32% were no, and 6% were D.A. Note: The following skill areas 2, 3, and 4 are being deleted because of insufficient yes responses (55%).

Group F: 62% of the total group responses were yes, 38% were no, and 0% were D.A. Note: The following skill areas 2, 3, 4, and 5 are being deleted because of insufficient yes responses (55%).

Group G: 70% of the total group responses were yes, 29% were no, and 1% were D.A. Note: The following skill areas 2, 3, 4, and 5 are being deleted because of insufficient yes responses (55%).

Group H: 75% of the total group responses were yes, 25% were no, and 0% were D.A.

Group I: 84% of the total group responses were yes, 16% were no, and 0% were D.A.

Group J: 85% of the total group responses were yes, 15% were no, and 0% were D.A.

Group K: 90% of the total group responses were yes, 10% were no, and 0% were D.A.

Group L: 77% of the total group responses were yes, 23% were no, and 0% were D.A.

Group M: 47% of the total group responses were yes, 53% were no, and 0% were D.A. Note: The following skill areas 1, 2, 3, 6, 8, 9, 10, 11, and 12 are being deleted becuase of insufficient yes responses (55%).

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS AND RECOMMENDATIONS

Conclusions:

Contingent upon the findings conducted in the trade analysis, the following skill areas are not required by the industry in the Greater Philadelphia Area: tire and tube service related to leaks and the repairing of leaks, the repair of multi speed hubs, the repair of derailleur units, the repair of coaster brakes, the repair of frame and frame components, and the customer relations aspects of the industry.

The conclusion can be developed that the industry is interested not in those skills required to repair specific replaceable components but only in the proper removal and replacement of the components specified above. The area of customer relations was considered to be of sufficient value to be retained in the curriculum.

Curriculum

Part of planning a bicycle repair curriculum should include budgetary plans for the following:

1. Physical area for workshop
   a. Equivalent to 150 square feet
2. Purchase of training materials - books, manuals
   a. Reference - Bibliography
3. Purchase of tools and equipment
   a. Reference - Page 36
4. Parts and supplies
   a. Reference - Page 37
5. Trained competent personnel - Contingent on the nature of the professional requirements and program needs
6. Student selection and development - Contingent upon nature of student body
7. Trade Analysis
   a. Local manpower requirement
   b. Job task analysis to determine applicability of suggested curriculum to local conditions
8. Class scheduling and size (registering) and location
9. Community involvement

In establishing a working program, the following is recommende

1. Locate interested local representatives of both the sales and repair aspect of the bicycle business.
2. Consult your local school district office for any aid or knowledge of bicycle repair.
3. Determine whether and where there are employment opportunities for your graduates of bicycle repair.
   a. Craft advisory committee

4. Establish prerequisites for the program.

a. Language and communication skills

b. Physical and emotional or age standards

c. Any practical mechanical aptitudes

5. Establish a parts supply place for orders of parts and equipment.

6. Determine available laboratory facilities in accordance with the above suggestions for:

a. Space

b. Location

c. Scheduling

RECOMMENDATIONS

Facilities

The bike repair "shop" was cohabitant with an existing machine shop. The layout of the equipment and the resultant space allowance required the storage of bicycles in a remote facility. These problems were sufficiently serious to affect the smooth operating of the program.

In setting up a workshop in an existing shop, one should try to provide: area for tool storage that is equivalent to 150-200 square feet and area for bicycle and equipment storage for instruction that is also equivalent to about 150-200 square feet.

The bicycle repair class was scheduled concurrently with the regularly scheduled machine shop class. The resulting conflict of activities led to a distraction problem. It is therefore suggested that the bicycle repair class, if established in concert with an existing class, be scheduled when there is no other class scheduled for the same room.

The present class is scheduled one period a day, five days a week. It is recommended, based on the space and tool requirements, that the largest working size of the class be eight students. The size (four) of the experimental class was due mostly to the limited space and newness of the project.

APPENDIX

APPENDIX A

QUESTIONNAIRE

BICYCLE CURRICULUM QUESTIONNAIRE

Firms Name:_____ Date:_____

Address:_____

_____

Respondents Name:_____

Labor Force Size*: ☐ Small ☐ Medium ☐ Large

Repair Area Floor Size+: ☐ Small ☐ Medium ☐ Large

*Small - 1-2 repair personnel
Medium- 3-6 repair personnel
Large - 7-up repair personnel

+Small - up to 60 square feet
Medium- 65-100 square feet
Large - 105-up square feet

BICYCLE CURRICULUM:

Basic Minimal Employment Level Questionnaire

The following questions are for determining the minimal performance skill level, needed for employment in local area bicycle repair businesses.

Question: The student will be able to correctly perform the following:

	Yes	No	D.A.*
1. To remove bicycle components from packing crate	___	___	___
2. To assemble bicycle components from packing crate	___	___	___
3. To adjust or prepare the assembled bicycle for showroom	___	___	___
4. To clean all tools	___	___	___
5. To clean shop area	___	___	___
6. To obtain tools and equipment from tool room	___	___	___
7. To return tools to tool room	___	___	___
8. To use service manuals	___	___	___
9. To have acceptable social behaviors	___	___	___
10. To have acceptable work behaviors	___	___	___

* D.A. will represent "Does not apply"

A. Bicycle Frame and Associated Components

Each student must be able to correctly:

		I. Remove			II. Replace			III. Adjustment		
		Yes	No	D.A.	Yes	No	D.A.	Yes	No	D.A.
Seat	1.	___	___	___	___	___	___	___	___	___
Handle Bars	2.	___	___	___	___	___	___	___	___	___
Seat Stem	3.	___	___	___	___	___	___	___	___	___
Front Fender	4.	___	___	___	___	___	___	___	___	___
Rear Fender	5.	___	___	___	___	___	___	___	___	___
Chain Guard	6.	___	___	___	___	___	___	___	___	___
Reflectors	7.	___	___	___	___	___	___	___	___	___
Lights	8.	___	___	___	___	___	___	___	___	___
Horns	9.	___	___	___	___	___	___	___	___	___
Mirrors	10.	___	___	___	___	___	___	___	___	___
Pedals	11.	___	___	___	___	___	___	___	___	___
Handle Grips	12.	___	___	___	___	___	___	___	___	___
Baskets	13.	___	___	___	___	___	___	___	___	___
Racks	14.	___	___	___	___	___	___	___	___	___
Kick Stand	15.	___	___	___	___	___	___	___	___	___
Chain	16.	___	___	___	___	___	___	___	___	___
Brake Lever	17.	___	___	___	___	___	___	___	___	___
Brake Cables	18.	___	___	___	___	___	___	___	___	___
Speed Selector Mechanisms	19.	___	___	___	___	___	___	___	___	___
Selector Cables	20.	___	___	___	___	___	___	___	___	___

B. icycle Tire and Tube Service

Each student must be able to correctly:

		I. Remove			II. Replace			III. Adjustment		
		Yes	No	D.A.	Yes	No	D.A.	Yes	No	D.A.
Inner Tube	1.	___	___	___	1. ___	___	___	1. ___	___	___
Valve Stem	2.	___	___	___	2. ___	___	___	2. ___	___	___
Tire	3.	___	___	___	3. ___	___	___	3. ___	___	___
Locate Leak								4. ___	___	___
Prepare Area								5. ___	___	___
Apply Cement								6. ___	___	___
Apply Patch								7. ___	___	___
Inflate								8. ___	___	___

C. Bicycle Hand Brakes

Each student must be able to correctly:

		I. Remove			II. Replace			III. Adjustment		
		Yes	No	D.A.	Yes	No	D.A.	Yes	No	D.A.
Cables	1.	___	___	___	1. ___	___	___	1. ___	___	___
Levers	2.	___	___	___	2. ___	___	___	2. ___	___	___
Pads	3.	___	___	___	3. ___	___	___	3. ___	___	___
Units Center Pull	4.	___	___	___	4. ___	___	___	4. ___	___	___
Units Side Pull	5.	___	___	___	5. ___	___	___	5. ___	___	___

D. Bicycle Lubrication

Each student must be able to correctly lubricate the:

		Yes	No	D.A.
Front Wheel Hub Bearings	1.	___	___	___
Rear Wheel Hub Bearings	2.	___	___	___
Crank Bearings	3.	___	___	___
Chain	4.	___	___	___
Derailleurs	5.	___	___	___
Rear Wheel Hub	6.	___	___	___
Selector Lever	7.	___	___	___
Head Set	8.	___	___	___
Pedals	9.	___	___	___

E. Bicycle Multi Speed Hubs

Each student must be able to do the following correctly:

		Yes	No	D.A.
Remove unit from bicycle	1.	___	___	___
Disassembly unit	2.	___	___	___
Exchange Damage or worn parts	3.	___	___	___
Reassemble unit	4.	___	___	___
Install unit	5.	___	___	___
Adjust for normal operation	6.	___	___	___

F. Bicycle Derailleur Units

Each student must be able to do the following correctly:

		Yes	No	D.A.
Remove unit from bicycle	1.	___	___	___
Disassemble unit	2.	___	___	___
Diagnose problem	3.	___	___	___
Exchange damage or worn parts	4.	___	___	___
Reassemble unit	5.	___	___	___
Install unit	6.	___	___	___
Adjust for normal operation	7.	___	___	___

G. Bicycle Coaster Brakes

Each student must be able to do the following correctly:

		Yes	No	D.A.
Remove unit from bicycle	1.	___	___	___
Disassemble unit	2.	___	___	___
Diagnose problem	3.	___	___	___
Exchange damage or worn parts	4.	___	___	___
Reassemble unit	5.	___	___	___
Install unit	6.	___	___	___
Adjust for normal operation	7.	___	___	___

H. Bicycle Crank and Pedals

Each student must be able to do the following correctly:

		Yes	No	D.A.
Diagnose problems	1.	___	___	___
Remove unit	2.	___	___	___
Disassemble unit	3.	___	___	___
Remove worn parts	4.	___	___	___
Replace new parts	5.	___	___	___

I. Bicycle Chain

Each student must be able to:

		Yes	No	D.A.
Diagnose problems	1.	___	___	___
Remove unit	2.	___	___	___
Replace unit	3.	___	___	___

J. Bicycle Wheel and Tires

Each student must be able to:

		Yes	No	D.A.
To remove	1.	___	___	___
To replace tires	2.	___	___	___
To identify different types and sizes	3.	___	___	___
To diagnose problems	4.	___	___	___
Correct problems	5.	___	___	___
Rubbing	6.	___	___	___
Wheel wobble	7.	___	___	___
Loose spokes	8.	___	___	___
True rims	9.	___	___	___

K. Bicycle Hand Brakes

Each student must be able to:

		Yes	No	D.A.
Diagnose problems	1.	___	___	___
Remove brake pads	2.	___	___	___
Replace brake pads	3.	___	___	___
Remove brake cables	4.	___	___	___
Replace brake cables	5.	___	___	___
Lubricate cables	6.	___	___	___
Adjust for proper functioning	7.	___	___	___

L. Bicycle Speed Selector Units

Each student must be able to:

		Yes	No	D.A.
Diagnose problems	1.	___	___	___
Remove selector unit	2.	___	___	___
Replace selector unit	3.	___	___	___
Remove selector cable	4.	___	___	___
Replace selector cable	5.	___	___	___
Lubricate cable	6.	___	___	___
Adjust for proper functioning	7.	___	___	___

M. Frame and Components

Each student will be able to correctly perform:

		Yes	No	D.A.
Straighten frame	1.	___	___	___
Remove dents	2.	___	___	___
Prepare for painting	3.	___	___	___
Know different sizes and types bicycles	4.	___	___	___
Know different thread sizes	5.	___	___	___
Weld broken frame components	6.	___	___	___
Management and Customer Relations	7.	___	___	___
Confers with customer	8.	___	___	___
Fill out work orders	9.	___	___	___
Fill out identification tags	10.	___	___	___
Collect money and receipts	11.	___	___	___
Order parts	12.	___	___	___
Obtain parts	13.	___	___	___
Use service manual	14.	___	___	___

APPENDIX B

MATRIX

LEVEL I COMPONENT / OPERATION	SAFETY	TOOL USE	WORK HABITS	REMOVE	REPLACE	LUBRICATION	VOCABULARY	ADJUSTMENT
TIRES								
RUBBING								
SIZES								
DEFECTS								
TUBES								
SIZES								
VALVE STEM								
PRESSURE								
PATCH								
WHEELS								
RIM								
SPOKES								
BEARINGS								

LEVEL I COMPONENT / OPERATION	SAFETY	TOOL USE	WORK HABITS	REMOVE	REPLACE	LUBRICATION	VOCABULARY	ADJUSTMENT
(Wheels Cont'd) COASTER BRAKE								
FRAMES								
CHAINGUARD								
FENDERS								
HANDLE BARS								
HEAD SET								
SEAT								
STEM								
BRAKES								
CABLES								
LEVERS								
CALIPER UNIT								

LEVEL I OPERATION / COMPONENT	SAFETY	TOOL USE	WORK HABITS	REMOVE	REPLACE	LUBRICATION	VOCABULARY	ADJUSTMENT
GEAR UNITS								
DERAILLEUR								
COASTER								
MULTI SPEED HUB								
FRAME AND ASSOC-IATED COMPONENTS								
HANDLE BARS								
SEAT STEM								
FRONT FENDER								
REAR FENDER								
CHAIN GUARD								
REFLECTORS								
LIGHTS								
HORNS								
MIRRORS								

LEVEL I OPERATION COMPONENT	SAFETY	TOOL USE	WORK HABITS	REMOVE	REPLACE	LUBRICATION	VOCABULARY	ADJUSTMENT
(Frame and Associated Components Cont'd)								
PEDALS								
HANDLE GRIPS								
BASKETS								
RACKS								
KICK STAND								
CHAIN								
SPEED SELECTOR								
SELECTOR UNIT								
CABLE								
MECHANISM								

LEVEL I OPERATION / COMPONENT	SAFETY	TOOL USE	WORK HABITS	REMOVE	REPLACE	LUBRICATION	VOCABULARY	ADJUSTMENT
CRANK UNIT								
BRACKET								
PEDAL								
CHAIN								
CHAIN WHEEL								
CRANK								
BEARINGS								

LEVEL II COMPONENT / OPERATION	SAFETY	TOOL USE	WORK HABITS	REMOVE	REPLACE	LUBRICATION	VOCABULARY	ADJUSTMENT
TIRES								
PUNCTURE								
RUBBING								
SIZES								
TYPES								
BEARINGS								
RIM CUTS								
UNEVEN WEAR								
BALANCE								
TUBES								
SIZES								
VALVE STEM								
PRESSURE								
PATCH								

LEVEL II OPERATION / COMPONENT	SAFETY	TOOL USE	WORK HABITS	REMOVE	REPLACE	LUBRICATION	VOCABULARY	ADJUSTMENT
BRAKES HAND PULL								
DRAGGING								
STICKING								
CABLE BREAKAGE								
SQUEAK								
SLIPPING								
JERKY								
GEAR UNITS								
DERAILLEUR								
COASTER								
MULTI-SPEED HUBS								

LEVEL II COMPONENT / OPERATION	SAFETY	TOOL USE	WORK HABITS	REMOVE	REPLACE	LUBRICATION	VOCABULARY	ADJUSTMENT
BRAKES - COASTER								
DRAGGING								
STICKING								
ARM BREAKAGE								
SQUEAK								
SLIPPING								
JERKY								
THREE SPEED HUB								
SLIPS OUT OF GEAR								
IMPROPER SELECTION								
IMPROPER BRAKE ACTION								
FROZEN								

LEVEL II COMPONENT / OPERATION	SAFETY	TOOL USE	WORK HABITS	REMOVE	REPLACE	LUBRICATION	VOCABULARY	ADJUSTMENT
5-10 SPEED DERAILLEUR								
SLIPS OUT OF GEAR								
IMPROPER SELECTION								
WEAR								
FRAMES								
OUT OF SHAPE								
BROKEN AND CRACKED								
RUST								
PAINT								
SIZES								
SPEED SELECTOR UNIT								
CABLE								
MECHANISM								

LEVEL II OPERATION / COMPONENT	SAFETY	TOOL USE	WORK HABITS	REMOVE	REPLACE	LUBRICATION	VOCABULARY	ADJUSTMENT
CRANK UNIT								
BRACKET								
PEDAL								
CHAIN								
CHAINWHEEL								
CRANK								
BEARINGS								
ACCESSORIES								
TYPES								
LAWS								

LEVEL III OPERATION / COMPONENT	SAFETY	TOOL USE	WORK HABITS	DIAGNOSIS	ENGINEERING	VOCABULARY	SUBJECT MATERIAL	EXAMINATIONS
ENGINEERING PRINCIPLES								
DESIGN								
MATERIALS								
PHYSICS								
TERMINOLOGIES								
SHOP MANAGEMENT								
CUSTOMER RELATIONS								
SHOP LAYOUT								
PURCHASING								
RECORDS								
FINANCE								
TRAINING								
HIRING								
LEGALITIES								

LEVEL III COMPONENT	OPERATION	SAFETY	TOOL USE	WORK HABITS	DIAGNOSIS	ENGINEERING	VOCABULARY	SUBJECT MATERIAL	EXAMINATIONS
(Shop Management Cont'd)									
WORKMANSHIP									
HISTORY IN DEPTH									

APPENDIX C

WORK ORDER

FOR THE DEAF

REPAIR ORDER No. 451

BICYCLE REPAIR

PHILADELPHIA, PENNSYLVANIA 19119

NAME _____ DATE _____ 19 _____

QUAN.	PARTS AND ACCESSORIES	PRICE	INSTRUCTIONS	SALE AMOUNT
	OIL		POSTAGE	
	GREASE		FINISHING COST	
	TOTAL MATERIAL			

RECEIVED PAYMENT:

STUDENT'S INITIALS

COMMENTS

TOTAL

TOTAL MATERIAL

GRAND TOTAL

ORDER TAKEN BY

I hereby authorize repair work to be done as described above with necessary parts. I further agree that the instructor or the school, will not be held responsible for fire, theft or any cause beyond our control.

Signed

THIS INVOICE IS DUE UP PRESENTATION!

APPENDIX D

ATION TAGS

NO.

NAME

ADDRESS

WORK NEEDED

NAME

NO.

NAME

NO.

APPENDIX E

FINDINGS QUESTIONNAIRE

FINDINGS QUESTIONNAIRE

Respondents reactions in terms of Labor Force Size:

Small Labor Force Size - 40%

Medium Labor Force Size - 53%

Large Labor Force Size - 7%

Respondents reactions in terms of Repair Area Floor Size:

Small area - 27%

Medium area - 27%

Large area - 46%

General Question Responses: N - 13

1.	92% Yes	8% No	0% D.A.
2.	84% Yes	16% No	0% D.A.
3.	92% Yes	8% No	0% D.A.
4.	100% Yes	0% No	0% D.A.
5.	100% Yes	0% No	0% D.A.
6.	100% Yes	0% No	0% D.A.
7.	100% Yes	0% No	0% D.A.
8.	77% Yes	23% No	0% D.A.
9.	100% Yes	0% No	0% D.A.
10.	100% Yes	0% NO	0% D.A.

A - I: N - 13

1.	100% Yes	0% No	0% D.A.
2.	100% Yes	0% No	0% D.A.
3.	100% Yes	0% No	0% D.A.

4. 100% Yes	0% No	0% D.A.
5. 100% Yes	0% No	0% D.A.
6. 100% Yes	0% No	0% D.A.
7. 100% Yes	0% No	0% D.A.
8. 100% Yes	0% No	0% D.A.
9. 100% Yes	0% No	0% D.A.
10. 100% Yes	0% No	0% D.A.
11. 92% Yes	8% No	0% D.A.
12. 100% Yes	0% No	0% D.A.
13. 100% Yes	0% No	0% D.A.
14. 100% Yes	0% No	0% D.A.
15. 100% Yes	0% No	0% D.A.
16. 100% Yes	0% No	0% D.A.
17. 100% Yes	0% No	0% D.A.
18. 100% Yes	0% No	0% D.A.
19. 100% Yes	0% No	0% D.A.
20. 100% Yes	0% No	0% D.A.

A - II: N - 13

1. 100% Yes	0% No	0% D.A.
2. 100% Yes	0% No	0% D.A.
3. 100% Yes	0% No	0% D.A.
4. 100% Yes	0% No	0% D.A.
5. 100% Yes	0% No	0% D.A.
6. 100% Yes	0% No	0% D.A.
7. 100% Yes	0% No	0% D.A.
8. 100% Yes	0% No	0% D.A.
9. 100% Yes	0% No	0% D.A.
10. 100% Yes	0% No	0% D.A.

11. 92% Yes	8% No	0% D.A.
12. 100% Yes	0% No	0% D.A.
13. 100% Yes	0% No	0% D.A.
14. 100% Yes	0% No	0% D.A.
15. 100% Yes	0% No	0% D.A.
16. 100% Yes	0% No	0% D.A.
17. 100% Yes	0% No	0% D.A.
18. 100% Yes	0% No	0% D.A.
19. 100% Yes	0% No	0% D.A.
20. 100% Yes	0% No	0% D.A.

A - III: N - 13

1. 100% Yes	0% No	0% D.A.
2. 100% Yes	0% No	0% D.A.
3. 100% Yes	0% No	0% D.A.
4. 92% Yes	8% No	0% D.A.
5. 92% Yes	8% No	0% D.A.
6. 92% Yes	8% No	0% D.A.
7. 92% Yes	8% No	0% D.A.
8. 92% Yes	8% No	0% D.A.
9. 100% Yes	0% No	0% D.A.
10. 100% Yes	0% No	0% D.A.
11. 100% Yes	0% No	0% D.A.
12. 92% Yes	8% No	0% D.A.
13. 100% Yes	0% No	0% D.A.
14. 100% Yes	0% No	0% D.A.
15. 100% Yes	0% No	0% D.A.

16. 100% Yes	0% No	0% D.A.
17. 100% Yes	0% No	0% D.A.
18. 100% Yes	0% No	0% D.A.
19. 100% Yes	0% No	0% D.A.
20. 100% Yes	0% No	0% D.A.

B - I: N - 13

1. 100% Yes	0% No	0% D.A.
2. 92% Yes	8% No	0% D.A.
3. 100% Yes	0% No	0% D.A.

B - II: N - 13

1. 100% Yes	0% No	0% D.A.
2. 92% Yes	8% No	0% D.A.
3. 100% Yes	0% No	0% D.A.

B - III: N - 13

1. 100% Yes	0% No	0% D.A.
2. 92% Yes	8% No	0% D.A.
3. 100% Yes	0% No	0% D.A.
4. 23% Yes	69% No	8% D.A.
5. 16% Yes	76% No	8% D.A.
6. 16% Yes	76% No	8% D.A.
7. 16% Yes	76% No	8% D.A.
8. 77% Yes	23% No	0% D.A.

C - I: N - 13

1.	92% Yes	8% No	0% D.A.
2.	92% Yes	8% No	0% D.A.
3.	100% Yes	0% No	0% D.A.
4.	92% Yes	8% No	0% D.A.
5.	92% Yes	8% No	0% D.A.

C - II: N - 13

1.	92% Yes	8% No	0% D.A.
2.	92% Yes	8% No	0% D.A.
3.	100% Yes	0% No	0% D.A.
4.	92% Yes	8% No	0% D.A.
5.	92% Yes	8% No	0% D.A.

C - III: N - 13

1.	92% Yes	8% No	0% D.A.
2.	92% Yes	8% No	0% D.A.
3.	92% Yes	8% No	0% D.A.
4.	92% Yes	8% No	0% D.A.
5.	92% Yes	8% No	0% D.A.

D: N - 13

1.	92% Yes	8% No	0% D.A.
2.	77% Yes	23% No	0% D.A.
3.	85% Yes	15% No	0% D.A.
4.	92% Yes	8% No	0% D.A.
5.	92% Yes	8% No	0% D.A.

6.	85% Yes	15% No	0% D.A.
7.	92% Yes	8% No	0% D.A.
8.	85% Yes	15% No	0% D.A.
9.	92% Yes	8% No	0% D.A.

E: N - 13

1.	92% Yes	8% No	0% D.A.
2.	38% Yes	54% No	8% D.A.
3.	38% Yes	54% No	8% D.A.
4.	38% Yes	54% No	8% D.A.
5.	85% Yes	15% No	0% D.A.
6	85 % Yes	15% No	0% D.A.

F: N - 13

1.	92% Yes	8% No	0% D.A.
2.	38% Yes	62% No	0% D.A.
3.	54% Yes	46% No	0% D.A.
4.	38% Yes	62% No	0% D.A.
5.	38% Yes	62% No	0% D.A.
6.	92% Yes	8% No	0% D.A.
7.	85% Yes	15% No	0% D.A.

G: N - 13

1.	92% Yes	8% No	0% D.A.
2	54% Yes	46% No	0% D.A.
3	54% Yes	46% No	0% D.A.
4	54% Yes	46% No	0% D.A.
5.	54% Yes	46% No	0% D.A.
6	92% Yes	8% No	0% D.A.
7.	92% Yes	8% No	0% D.A.

H: N - 13

1.	62% Yes	38% No	0% D.A.
2.	92% Yes	8% No	0% D.A.
3.	70% Yes	30% No	0% D.A.
4.	77% Yes	23% No	0% D.A.
5.	70% Yes	30% No	0% D.A.

I: N - 13

1.	70% Yes	30% No	0% D.A.
2.	92% Yes	8% No	0% D.A.
3.	92% Yes	8% No	0% D.A.

J: N - 13

1.	100% Yes	0% No	0% D.A.
2.	100% Yes	0% No	0% D.A.
3.	85% Yes	15% No	0% D.A.
4.	77% Yes	23% No	0% D.A.
5.	92% Yes	8% No	0% D.A.
6.	85% Yes	15% No	0% D.A.
7.	77% Yes	23% No	0% D.A.
8.	77% Yes	23% No	0% D.A.
9.	77% Yes	23% No	0% D.A.

K: N - 13

1.	69% Yes	31% No	0% D.A.
2.	100% Yes	0% No	0% D.A.
3.	100% Yes	0% No	0% D.A.

4.	92% Yes	8% No	0% D.A.
5.	92% Yes	8% No	0% D.A.
6.	92% Yes	8% No	0% D.A.
7.	92% Yes	8% No	0% D.A.

L: N - 13

1.	62% Yes	38% No	0% D.A.
2.	92% Yes	8% No	0% D.A.
3.	92% Yes	8% No	0% D.A.
4.	92% Yes	8% No	0% D.A.
5.	92% Yes	8% No	0% D.A.
6.	92% Yes	8% No	0% D.A.
7.	92% Yes	8% No	0% D.A.

M: N - 13

1.	8% Yes	92% No	0% D.A.
2.	38% Yes	62% No	0% D.A.
3.	46% Yes	54% No	0% D.A.
4.	85% Yes	15% No	0% D.A.
5.	69% Yes	31% No	0% D.A.
6.	0% Yes	100% No	0% D.A.
7.	92% Yes	8% No	0% D.A.
8.	38% Yes	62% No	0% D.A.
9.	54% Yes	46% No	0% D.A.
10.	54% Yes	46% No	0% D.A.
11.	23% Yes	77% No	0% D.A.
12.	0% Yes	100% No	0% D.A.
13.	77% Yes	23% No	0% D.A.
14.	69% Yes	31% No	0% D.A.

BIBLIOGRAPHY

BIBLIOGRAPHY

TEXT

1. Ballantine, Richard. "Richard's Bicycle Book." New York: Ballantine Books, 1972.

2. Burstyn, Ben. "Bicycle Repair and Maintenance." New York: Arco Publishing Company, 1974.

3. Carrell, Al. "The Super Handyman's Big Bike Book." Englewood Cliffs: Prentice-Hall, Inc., 1973.

4. Coles, Clarence W., Glenn, Harold T. "Glenn's Complete Bicycle Manual." New York: Crown Publishers, Inc., 1974.

5. "Coaster and Three Speed Bicycle Repair." Canoga Park, California: Pub-XYZ, 1972.

6. "Derrilleur 5, 10 & 15 Speed Coaster and Three Speed Bicycle Repair Manuals." Canoga Park, California: Pub-XYZ, 1972.

7. Ewers. William. "Sincere's Bicycle Service Book." Phoenix: Sincere Press, 1971.

8. Jorgensen, Eric, Bergman, Joe G. "Fix Your Bicycle." Los Angeles: Clymer Publications, 1972.

9. McFarlane, John W. "It's Easy To Fix Your Bike." Chicago: Follett Publishing Company, 1973.

10. Schwinn Bicycle Company. "Schwinn Bicycle Service Manual," Vol. 1 and 2. Chicago: Schwinn, 1972.

11. Sloane. Eugene A. "The New Complete Book of Bicycling." New York: Simon and Schuster, 1974.

12. Whiter, Robert. "The Bicycle Manual on Maintenance and Repairs." Hollywood: Laurida Books Publishing Company, 1972.

BIBLIOGRAPHY

REFERENCE

13. Bicycling: "A Bicycle Safety Instruction Guide for Teachers." Department of Public Instruction, Commonwealth of Pennsylvania. Harrisburg: Department of Public Instruction, 1966.

14. Cuthbertson, Tom. "Anybody's Bike Book." Berkeley: Ten Speed Press, 1971.

15. "General Information About The American Bicycle Industry." The Columbia Manufacturing Company, Inc. Westfield, Massachusetts. (Mimeographed.)

16. Kolstoe, Oliver P. and Frey, Roger M. "A High School Work Study Program for Mentally Subnormal Students." Southern Illinois University Press, 1965.

17. Silvius, H. G. and Curry, E. H. "Managing Multiple Activities." Bloomington: McKnight and McKnight Publishing Company, 1971.

18. Silvius, H. G. and Curry, E. H. "Teaching Successfully." Bloomington: McKnight and McKnight Publishing Company, 1967.

19. Smith, Robert A. "A Social History of the Bicycle." New York: America Heritage Press, 1972.

20. Teeman, Lawrence. "Consumer Guide 1975 Bicycle Test Reports." Skokie: Publications International, Ltd., 1975.