A project designed to develop a prevocational program for grade 9 students in a comprehensive area vocational school is described in this final report. The major goals of the project were to enable students to make wise career choices and to develop better work habits and attitudes. Other goals were to identify the possible need for 10th grade prevocational programs and to further involve the community in the process of vocational education. A total of 66 unit packets were written for the cluster areas of graphics, metals, construction, and electricity/electronics. Each of the packets included instruction sheets, audiovisual materials, suggested field trips, and appropriate evaluation instruments. Occupational analysis was used as the basis for package development. The packages are currently being field tested. Appended materials (25 pages) include sample instructional materials and work sheets, a complete unit on basic electricity, and a list of completed units. (VA)
FINAL REPORT

DEVELOP A PRE-VOCATIONAL PROGRAM FOR FRESHMEN STUDENTS IN A COMPREHENSIVE AREA VOCATIONAL SCHOOL

William E. Parson
Project No. 61-73-C

HAMMOND SCHOOL CITY
HAMMOND, INDIANA

(MVT 102 009)

March 31, 1975

State Board of Vocational and Technical Education
Department of Public Instruction
Division of Vocational Education
State of Indiana
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F - COMPLETED UNIT - SAMPLE OF WORK SHEET AND COMPLETED UNIT
G - LIST OF COMPLETED UNITS
I. INFORMATION SHEET

A. Kind of Project: (check one)

1. Experimental
2. Developmental
3. Pilot
4. Demonstration
5. Evaluative
6. X. Exemplary

B. Population

<table>
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<td>F Other</td>
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GROUP

| 1 Pre-school                  | 1       |
| 2 Elementary                  | 2       |
| 3 Junior High School          | 3       |
| 4 Middle School               | 4       |
| 5 Senior High School          | 5 500   |
| 6 Post Secondary              | 6       |
| 7 Adult                       | 7       |
| 8 University                  | 8       |
| 9 Employer                    | 9       |
| 10 Employee                   | 10      |
| 11 Citizens                   | 11      |
| 12 Parents                    | 12      |
| 13 Combination of the above   | 13      |

LOCALITY (check the one which encompasses the locality involved)

| a National                    | a       |
| b State                       | b       |
| c Region                      | c       |
| d District                    | d       |
| e County                      | e       |
| f Area                        | f  X    |
| g Community                   | g       |
| h School Corporation (LEA)    | h       |
II. ABSTRACT

It is recognized that preparation for life - including career choice and preparation - is an ongoing process involving a continuing learning situation. It is important that students completing their 9th grade have somewhat of an idea of their occupational goal, so that they can utilize the last 3 years in high school in preparation for immediate employment or for preparation for continued study.

This project was designed to "Develop a Prevocational Program for Freshman Students in a Comprehensive Area Vocational School." Such a program has been developed, covering the cluster areas of graphics, metals, construction, and electricity-electronics. A total of 66 unit packets were written. Each packet includes instruction sheets, audio visual materials and suggested field trips, and appropriate evaluation instruments.

Package development was based on an occupational analysis to determine the knowledge and skills required for the job, and additional appropriate information and exercises to achieve the following goals:

The student will:

1. Be better able to make a wise career choice because of more knowledge of career education.

2. Develop better work habits and attitudes.

School Administration will:

3. Establish if there is a need for a 10th grade prevocational program

The Community will:

4. Be more involved in the process of vocational education.
III. STATEMENT OF PROBLEM

Technical-Vocational High School has been serving the vocational needs of the Hammond area for over 50 years. Students have been prepared for immediate employment after graduation, or for continued education in programs where a vocational background is an asset.

During this period many innovative programs have been initiated. Among these is a system of exploratory shops in which the freshmen may enroll in pre-vocational programs in electricity, wood, metal, and graphics for 9 weeks each.

A conviction has developed among responsible personnel that the ninth grade student could benefit more from career information and value development than from the present industrial arts concept.

The problem therefore was to develop and implement a program dealing primarily with career information and career choice, and secondarily with development of student work habits and life style within accepted individual and group values.

IV. PRIORITY AREA

This project falls into the category of a career education-community based model for vocational education, using business and industry, civic and social organizations, parents and schools.

It is recognized that preparation for life - including career choice and preparation - is an ongoing process involving a continuing learning situation. This project focused on using all possible resources which could provide information and guidance to help the student make a career choice in keeping with his aptitude, interest, and goals.
V. STRATEGIES

The basic object of this project as outlined in the statement of the problem was to design and implement a better program of pre-vocational instruction for ninth grade students.

Measurable goals to be realized as a result of implementing this program are:

1. Students will be more knowledgeable in the area of career education and thus be better able to make wise career choices because:

   a) They will develop awareness of types of occupational information.
   b) They will recognize specific occupational information which is related to their capabilities and interests.
   c) They will be able to apply, in terms of involvement, a broad course of action or occupational direction.
   d) They will be able to analyze skill development as part of an information base to determine awareness of skills and attitudes needed for the cluster.
   e) They will recognize the occupational skills that are compatible with their capabilities and interests.
   f) They will evolve a commitment to the skill levels within their chosen occupation.

2. Students will develop better work habits and attitudes.

3. Administration will be able to identify individual students who are not yet ready to enter vocational programs in the 10th grade. Such accumulated information will establish if there is a need for an additional pre-vocational program in the 10th grade.
4. There will be further involvement of the community in vocational education.

Based on the above objective and goals, the following preliminary strategies were developed:

1. A tentative operating program was designed for the project.
2. Staffing requirements were established.
3. A budget was prepared.
4. A tentative time schedule was established.
5. A proposal was submitted and funded by the State Board of Vocational and Technical Education through the Indiana Department of Public Instruction, Division of Vocational Education.

VI. THE PROCEDURES

1. Professor Andrew Parker of Purdue University was employed during the initial stages of the program to select the necessary developmental system and theory to be employed by the Project; and to train the staff in areas of task analysis of occupations; generation and writing of measurable goals and objectives; preparation of teacher-centered curriculum packages including instruction sheets, audio-visual materials development and utilization, and test construction.

2. The writing staff was selected from available teachers, each of whom had a combination of classroom experience and occupational experience in their respective fields.

(Appendix A)
3. Possible cluster areas for development under the Project were reviewed. Selected were graphics, metals, construction, and electricity-electronics. These were chosen on the basis of the following criteria:

   a) Practicality of class scheduling and pupil programming. Four areas for 9 weeks each were most logical.

   b) Employment opportunities. Yearly surveys of student-graduate employment and area employment opportunities are used to establish the vocational programs to be offered.

   c) High coverage of vocational programs being offered. The 4 areas selected cover 90% of the vocational offerings, excluding business.

   d) Student interest. Results of OVIS Interest Survey and Student Program Selection substantiates areas chosen.

   (Appendix B)

4. A list of occupations available in the area was prepared for each of the 4 clusters. From this tentative list of occupations, a selection was made of the occupations to be taught.

   (Appendix C)

5. Each such occupation was then analyzed to determine the knowledges and skills required to successfully perform the job.

   (Appendix D)

6. Instructional objectives were then developed for each cluster.

   (Appendix E)

7. Appropriate teaching units were written which would enable the students to achieve the established goals.

   (Appendix F)
8. Teaching units are now being employed and field tested. Due to the fact that the new curriculum required some change in facilities, purchase of additional equipment, and teacher acceptance, field testing and revision have not been completed. Completion dates of field testing will vary, depending on successful resolution of above delay factors.

(Appendix G)

VII. RESULTS

The objective of the Project has been accomplished; namely a better pre-vocational program for 9th grade students has been designed and implemented.

Complete 9-week pre-vocational programs have been written for cluster areas in graphics, metals, construction, and electricity-electronics. A total of 66 lesson units were developed.

The construction program was started from scratch in an available facility. Equipment was transferred from other shops. Necessary books and supplies were purchased. The teacher participated in writing the program.

The metals program used the same facilities and equipment. The teacher participated in writing the program.

The graphics program was relocated in a renovated facility. $15,000 of new equipment was needed for the new program. Financial restrictions has limited purchase to date of about half the requirements, resulting in delay in application of some teaching units. The teacher was involved in writing the program.
The electric-electronic program was relocated in an available facility. Purchase of supplies and equipment was implemented. The teacher was not available at the time the program was written.

Progress is being made toward attaining Measurable Goals as a result of implementing the new program in the classroom.

However, due to the normal time requirements to set up and equip the shops, there has been insufficient class time to date to permit collection of test data needed for evaluation of the student-centered goals, #1-2-3.

Goal 1 - Being better able to make wise career choices because of more knowledge of career education.

Goal 2 - Develop better work habits and attitudes.

Goal 3 - Establish possible need for 10th grade pre-vocational program - must await data collection for another semester.

Goal 4 - Further involvement of the community in vocational education - has been attained through stipulation in the units of field trips and class presentations by representatives of labor and management.
VIII. RECOMMENDATIONS

As indicated in previous sections of this report a curriculum has been developed and implemented in the classroom, but final field testing, revision of materials, and systematic evaluation remain to be completed.

It is therefore recommended that:

1. A continuation of the Project be instituted to provide the manpower needed to pursue the work to its ultimate conclusion.

2. The developed curriculum packets be made available at this time only to other groups working on similar projects.

3. On final completion of the Project the curriculum packets then be made available for general distribution.

Persons desiring unit packets should contact Research Coordinator, Vocational Department, 120 West Market Street, Indianapolis, Indiana 46204, for authorization.
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**PROJECT MONITOR**

**DIRECTOR**

**LEA** Hammond, Indiana
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DIRECTOR

LEA Hammond, Indiana

14
APPENDIX

Project No. 61 - 73 - C
A - STAFF

Director

William Person

Director Vocational Ed.

Principle Investigator

Andrew Parker

Purdue University

Coordinator

Andrew Adaska

Coordinator, Tech-Voc. H.S.

Writers

Andrew Adaska

Graphics

Adolph Egyed

Metals

Jack Hayden

Power Mechanics

John Molnar

Electric

Jim Rizzuth

Construction

Elbert Smith

Construction

Richard Stemper

Construction

Tom Strbjak

Graphics

Consultants

Gerald Kackley

Director Guidance

All Instructors in T - 1 Department
B - CLUSTER DEVELOPMENT - WORK SHEET

Establish skill sequence from simple to complex for entry into 11th grade. Student selects two.

Desired outcomes:

Construction | Electricity | Industrial | Metals

Common skill development use of management team performance objectives:

Carpenter | Electrician | Automotive mech | Welder, combination
Painter | Elect. app. repair | Diesel mechanic | Machinist
Ironworker | Ind. electrician | Automotive repair | Sheethmetal worker
Planters | Equipment inst. | Const. equip. mech. | Pipefitter
Plumber | | Tractor mechanic | Automotive body repair
## C - OCCUPATIONS TO BE TAUGHT - SAMPLE

**SCHOOL CITY OF HAMMOND**
Hammond, Indiana
HAMMOND TECHNICAL VOCATIONAL HIGH SCHOOL

**Electricity-Electronics Cluster**

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<tr>
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<td>952.782</td>
<td>Transmission and Power Plant Operator</td>
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## ELECTRICAL OCCUPATION ANALYSIS

### OCCUPATIONS

<p>| Occupation                  | Skill 1 | Skill 2 | Skill 3 | Skill 4 | Skill 5 | Skill 6 | Skill 7 | Skill 8 | Skill 9 | Skill 10 | Skill 11 | Skill 12 | Skill 13 | Skill 14 | Skill 15 | Skill 16 | Skill 17 | Skill 18 | Skill 19 | Skill 20 | Skill 21 | Skill 22 | Skill 23 | Skill 24 |
|-----------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Radio Dispatcher            |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
| Equipment Installer        |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
| Equipment Repairman        |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
| Electrical Repairman       |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
| Construction Electrician   |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
| Electronic Technician      |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
| Electronics Assembler      |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
| Appliance Repairman Elect. |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
| Transmission Man           |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
| Power Plant Operator       |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
| Refrigeration Mechanic     |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
| Cable Splicer              |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
| Electrician Ship + Boat    |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
| Electrical Foreman         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
| Lineman                    |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
| Automotive Electrician     |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |
| Electrical Control Assem.  |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |</p>
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D - OCCUPATIONAL ANALYSIS - SAMPLE

SCHOOL CITY OF HAMMOND
Hammond, Indiana
HAMMOND TECHNICAL VOCATIONAL HIGH SCHOOL

Electronic Technician

I. DUTIES PERFORMED

A. Works with engineers and scientist
B. Engaged in research and development work
C. Help with design and construction of experimental models
D. Work with inspection, testing, and assembling

II. KNOWLEDGE AND SKILLS

A. Basic electronics theory
B. Mathematics
C. Reading schematic diagrams
D. Understand technical publications
E. Need color vision, manual dexterity, and good hand-eye coordination

III. TEACHABLE ELEMENTS

A. Basic electronic theory
B. Electronics math
C. Test procedures (equipment and procedure)
D. Reading schematics
E. Soldering and electrical connection
F. Use of simple hand tools
G. Nomenclature
Electricity and Electronics Cluster

Instructional Objectives

Each student should be able to:

1. Read and interpret elementary schematic diagrams.

2. Recognize and relate, in general terms; the skills, traits, and work habits of the electrical and electronic component occupations.

3. Apply the following electrical concepts and laws:
   a. Kirchoff Laws
   b. Series Circuits
   c. Parallel Circuits
   d. Complex Circuits

4. Manipulate basic test equipment, such as:
   a. Multi-meter
   b. Continuity tester

5. Recognize and apply safe work habits and practices in the use of electricity.

6. Demonstrate satisfactory utilization of basic hand and layout tools of the electricity and electronics cluster.

7. Satisfactorily use basic mathematics in measurement and record keeping as determined by the instructor.

8. Identify, recognize and apply basic tracing methods in problem solving situations as determined by the instructor.
Goals

Objectives applicable to the freshman career development program at Hammond Technical Vocational High School are to help students:

1. Develop an awareness of occupational types of information
2. Recognize that occupational information which is related to his capabilities and interests.
3. Apply, in terms of involvement, a broad course of action or occupational direction.
4. Analyze skill development as part of information base to determine awareness of skills and attitudes needed for the cluster
5. Recognize the occupational skills that are compatible with his capabilities and interests.
6. Envelop a commitment to the skill levels within the occupation of his choice.
## BASIC ELECTRICITY

### A. NATURE OF MATTER
1. Definition
2. Structure

### B. ELECTRON THEORY
1. Laws of Charges
2. Flow of Electrons

### C. NATURE OF ELECTRICITY
1. Types
   a. Static
   b. Dynamic
2. Electrical Charges
   a. Positive
   b. Negative
3. Kinds of Electricity
   a. Alternating
   b. Direct

### (CLASS ROOM)

<table>
<thead>
<tr>
<th>Illustration - Use</th>
<th>Demonstration - Use</th>
<th>Duration</th>
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<tr>
<td>Chalkboard</td>
<td>Audio-Visual - Transparency on Electron Movement</td>
<td>30</td>
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<tr>
<td>Static &amp; Dynamic Electricity</td>
<td>Use Batteries or D.C. Source to Show Static &amp; Dynamic Electricity</td>
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<tr>
<td>Use an Oscilloscope</td>
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<td>Quiz on Unit</td>
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**STUDENT ACTIVITY**

**BEFORE**
- Reads Units 6A, IN TEXT
- Reads Handout Outline

**DURING**
- Takes Notes on Lecture
- Takes Notes on Lecture and Demonstration
- Observe Demonstration
- Ask Questions
- Possible Discussion

**AFTER**
- Takes Quiz

**CLASSROOM**

**I I L U S T R A T I O N - USE**
- Chalkboard
- Audio Visual - Transparency
- On Electron Movement
- Static & Dynamic Electricity
- Elect. Charges Demonstration
- Use Batteries or D.C. Source to Show Static & Dynamic Electricity
- Use an Oscilloscope to show difference between AC & DC

**QUIZ ON UNIT**

---

**CHALK BOARD**
- Electron Movement
- Static & Dynamic Electric
- Electric Charges

**EQUIPMENT**
- Oscilloscope
- AC & DC Source

**MATERIALS**
- Capacitor
- Light Bulb
- Wire
- Demonstration Board

**HANDOUT OUT LINE OF:**
- Content to be discussed
- Objective of Lecture
- Questions they should be able to answer

**TEXT pp. 32-34**

**QUIZ**

26
BASIC ELECTRICITY

OBJECTIVES:
The student will, upon completion of this lesson be able to:

1. Describe the elements of basic electricity in a 20 minute quiz, passing with a score of 70 percent.

PREPARATION:

Teacher

Equipment:
- Chalkboard, eraser, chalk
- Overhead Projector and Screen
- Oscilloscope
- Capacitor
- AC and DC Power Supply

Teaching Aids (in order of introduction in course):
1. Objectives for lesson
2. Outline
3. Complete Atom
4. What is electricity
5. Static and Dynamic electricity
6. Post test

References:
- Basic Electricity and Electronics, Steinberg, William B., and Ford, Walter B., 1962, Unit 6A.

Learner
- Read in text Unit 6A, pages 32-34.
- Ask question, "Now that you are all enrolled in Electricity, who knows what electricity actually is?"
- Cite objectives
I. INTRODUCTION - Matter and Electron Theory
   A. Explain to the student the importance of what electricity is:
      (EXAMPLE: As in any form of energy person who works with it
      can do a better and more economical job if he knows why and
      how it works.)
      (EXAMPLE: automobile mechanic)
   B. Acquaint the students with the format to be used in this
      presentation.
      1. Hand out 1-2

II. BASIC ELECTRICITY
   A. Nature of matter
      1. Definition - anything that has weight and occupies space
      2. Structure - (EXAMPLE: salt)
         a. Compound
         b. Element
         c. Atom
   B. Electron Theory
      1. Discuss electrical charges
         a. Negative
         b. Positive
      2. Identify laws of electrical charges
         a. Refer to handout 1-2
      3. Have members of class tell you:
         a. Flow of electrons
         b. Direction of electrons
   C. Identify types of electricity
      1. Static - Demonstrate with capacitor and paper showing
         how electricity is stored.
      2. Dynamic - Demonstrate showing electricity in motion
         with light bulb.
   D. Explain kinds of electricity
      1. Refer to handout 1-2
         a. Alternating
         b. Direct current
      2. Demonstrate showing what AC and DC look like on an
         oscilloscope.
      3. Field questions
OBJECTIVES

THE STUDENT WILL, UPON COMPLETION OF THIS LESSON BE ABLE TO:

1. DESCRIBE THE ELEMENTS OF BASIC ELECTRICITY IN A 20 MINUTE QUIZ, PASSING WITH A SCORE OF 70%.
APPLICATION:

I. Organize students into small groups no larger than five (5).
   A. Select leader and recorder

II. Give each group a question on which to report collectively.
    (EXAMPLES: 1. Does the normal atom have an electrical charge?
               2. Explain and give examples of static electricity.
               3. Explain the laws of electric charges and cite examples of these.)

III. Group recorder restates question and then gives their summary.
     Then teacher clarifies or asks questions to bring out other pertinent information.

IV. Question class on questions at bottom of Hand out 1-2.

EVALUATION:

I. Assessing outcomes
   A. Administer test
   B. Collect and critique test having students participate in answering
   C. Refer to Handout 1-1-T and have student make his own assessment.
   D. Summary
      1. Review Handout 1-2
      2. Solicit questions from members of class.
THE ELECTRON IS ELECTRICITY
WHAT IS ELECTRICITY?

ELECTRICITY IS THE FLOW OF ELECTRONS!

ELECTRON

WHAT HAPPENS AT THE END?

ELECTRICITY ALWAYS* FLOWS IN A CIRCLE

(*ALMOST ALWAYS)
A balloon is attracted because unlike charges are produced by the charged balloon.

Distribution of electrical charges on a cloud and on the earth beneath it. Sometimes the charges are reversed so that the underside of the cloud is positive and the ground is negative. Yet the same whether the excess electrons start flowing from the cloud to the ground, or from the ground to the cloud.
BASIC ELECTRICITY

DIRECTIONS: In the following statements or questions select the correct answer and circle the letter in front of the correct response.

(EXAMPLE: An example of dynamic electricity is:
A. Lightning
B. A motor operating
C. A dead light bulb
D. An unused battery)

1. An electron has:
   A. a negative charge
   B. no charge
   C. a positive charge
   D. either positive or negative charge

2. Electrons drifting from atom to atom in a material:
   A. are free electrons
   B. are bound electrons
   C. go in opposite directions
   D. have a positive charge

3. Electric current is considered to be the movement of electrons
   A. from a positive point to a negative point
   B. in orbit around a nucleus
   C. from a negative point to a positive point
   D. in a random fashion

4. Direct current flows
   A. in alternate directions
   B. in one direction in a particular circuit
   C. from negative to positive
   D. from positive to negative

5. The following is a compound.
   A. iron
   B. copper
   C. water
   D. oxygen

6. The nucleus of an atom contains
   A. an electron
   B. an electron and proton
   C. a proton and neutron
   D. a proton
7. If a negatively charged material came near a positive material it would
   A. attract it   C. have no effect
   B. repel it     D. depend on their strength

8. When electrons have motion
   A. they move in a straight line
   B. you call this static electricity
   C. you call this current
   D. they form a compound

9. If you took the compound salt and divided it into its principal parts; you would have
   A. two atoms   C. salt
   B. two elements D. a molecule

10. Alternating current differs from direct current because
    A. it changes direction
    B. it flows from negative to positive
    C. half way through it reaches zero
    D. it is not portable

11. Most all atoms in their normal state
    A. have a negative charge   C. repel each other
    B. have a positive charge   D. are neutral

DIRECTIONS: Answer the following questions with a short statement or word.

12. Of what is all matter made? ________________________________

13. What do we call loosely held electrons? __________________________

14. How do electrons move through a material? _______________________

15. What are five (5) examples of matter?
   (a) __________________________ (b) __________________________
   (c) __________________________ (d) __________________________ (e) __________

16. Explain in your own words what is electricity?
APPENDIX G - LIST OF COMPLETED UNITS

METALS

1 - ORIENTATION TO METALS
2 - WORK DRAWINGS
3 - LAYOUT TOOLS
4 - FILES AND FILING
5 - DRILLS AND DRILLING
6 - HAND HACKSAW
7 - SHEET METALS
8 - ARC AND OXY-ACETYLENE WELDING
9 - FORGING
10 - LATHE WORK
11 - SHAPER
12 - MOLDS AND MOLDING
ELECTRIC

1 - BASIC ELECTRICITY
2 - CONDUCTORS AND INSULATORS
3 - WIRE CONNECTIONS
4 - WIRE CONNECTIONS
5 - SOURCES AND EFFECTS
6 - BASIC MEASURING INSTRUMENTS
7 - KIRCHOFF'S LAWS AND CELL CONNECTIONS
8 - ELECTRICAL RESISTANCE
9 - RESISTANCE MEASUREMENTS
10 - SYMBOLS AND SCHEMATIC DIAGRAMS
COMMUNICATIONS

1 - INTRODUCTION TO GRAPHICS
2 - PLANNING, AND ART AND COPY PREPARATION
3 - COMPOSITION
4 - PROOFING - LOCKUP - IMPOSITION
5 - PLATEN PRESS

OFFSET

1 - OFFSET PRINTING
2 - OFFSET PRINTING INDUSTRY
3 - COLD TYPE COMPOSITION
4 - JOB PLANNING AND LAYOUT
5 - CAMERA COPY
6 - LINE PHOTOGRAPHY
7 - DARK ROOM PROCEDURE
8 - LAYOUT AND STRIPPING THE FLAT
9 - PLATE MAKING
10 - FUNDAMENTALS OF OFFSET PRESS
11 - OPERATION OF OFFSET PRESS
DRAFTING

1 - INTRODUCTION TO LETTERING
2 - SCALES AND MEASUREMENTS
3 - INSTRUMENTS
4 - FREEHAND SKETCHING
5 - ORTHOGRAPHIC PROJECTION
6 - SIZE DESCRIPTION
7 - PICTORIAL DRAWINGS
8 - SECTION USE
9 - AUXILIARY VIEWS
CONSTRUCTION

INTRODUCTION

1. - SAFETY AND YOU
2. - MEASURING AND YOU (TERMINOLOGY)
3. - UNDERSTANDING BLUEPRINTS
4. - MEASURING AND YOU (TOOL IDENTIFICATION)
5. - USE OF HAND TOOLS
6. - TOOL CARE AND STORAGE

CONCRETE AND MASONRY

1. - HISTORY - CHARACTERISTICS - MANUFACTURING
2. - MORTAR INGREDIENTS
3. - MATERIALS
4. - TOOLS AND EQUIPMENT
5. - APPLICATION

CARPENTRY

1. - MAKING A MITER BOX
2. - BUILDING A MODER GARAGE
CONSTRUCTION CONTINUED

PIPEFITTING

1 - CUTTING PIPE
2 - REAMING PIPE
3 - THREADING PIPE
4 - MAKING UP PIPE WORK

HEATING AND VENTILATING

1 - SUBJECT EXPOSURE
2 - INSTALLATION