

An Experimental Project  
For Limited Distribution

PROPOSED COURSE OF STUDY  
RELATED TECHNOLOGY  
LUDLOW TYPESETTING OPERATION

A Cooperative Curriculum Project of  
THE HIGH SCHOOL DIVISION (VOCATIONAL), BOARD OF EDUCATION  
OF THE CITY OF NEW YORK

and

The State Education Department  
Albany

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PREFACE

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The course of study in related technology for Ludlow Typesetting Operation is part of a continuing program dating back many years to establish and revise curricula for shop and related technical subject courses in the vocational high schools of New York City. The program has been sponsored jointly by the High School Division (Vocational) of the New York City Board of Education and the State Education Department. The course of study is experimental in nature. Although it will be distributed to the schools for immediate use in September, 1965, comments will be solicited at the end of its first year of use, and a reappraisal will be made with an eye to further changes.

The need for this course of study emerges from the lack of an existing course of study in the subject. During and prior to its preparation every attempt was made to bring it into line with the latest advances in the printing industry. To this end, meetings were held with representatives of industry and companies were investigated in order to learn the most recent trends, especially with regard to job opportunities for graduates of this course.

The resulting materials should bring the related technical subject of Ludlow Typesetting Operation up to date with newly revised shop courses, and in general should prepare the shop pupil for those trade problems which require a knowledge of theory for their solution.

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FOREWORD

This course of study is written for full-time pupils in vocational day high schools, spending approximately three hours daily in a Ludlow Typesetting Operation shop. It is intended to outline the material to be covered in a related technology course lasting one-half a school year and meeting 45 minutes daily. It provides an outline of required subject matter around which lesson plans may be written by the teacher. It is a complete unit in related technology for one-half of the twelfth year.

This project is part of a curriculum workshop conducted during the summer of 1965 at George Westinghouse Vocational and Technical High School under the general direction of Mr. Daniel P. Marshall, Chairman of Related Technical Subjects assigned to the Board of Education. The resulting course of study was written by Mr. Leo Hochmald, a licensed Chairman of Printing Trades at the New York School of Printing, under the immediate supervision of Mr. Allen Fishken, Chairman of Shop Subjects at William E. Grady Vocational and Technical High School. Mr. Henry Mandel, of the Bureau of Trade and Technical Education, was the State Education Department representative at the workshop. Mr. Alfred E. Davies, also of the State Bureau of Trade and Technical Education, contributed a valuable viewpoint to its development.

Manuscripts were edited by Miss Catherine Nelson, curriculum consultant of the Board of Education and Mr. Arthur Goddard, Chairman of Academic Subjects at the New York School of Printing. Illustrations were provided by Mr. Anthony Munisteri, Chairman of Metal Trades at Manhattan Vocational and Technical High School.

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TO THE INSTRUCTOR

This course of study is intended to provide the necessary technical knowledge related to Ludlow Typesetting Operation. It consists mainly of the science, mathematics, drawing, and associated knowledge related to Ludlow Typesetting. Material has been suggested which the teacher can use in preparing his lesson plans. The number of days allocated to the teaching of each unit has been indicated.

An appendix has been added showing the resource material which are available to assist the instructor and to aid the students. Future comprehensive or city-wide examinations will be based on the material in this course of study.

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COURSE OF STUDY

UNIT I. INTRODUCTION TO AND EARLY HISTORY OF THE LUDLOW TYPOGRAPH SYSTEM (5 days)

- OBJECTIVES:
1. To introduce students to the technological development of the Ludlow Typograph System.
  2. To acquaint students with the early attempts at designing the machine and its components, and to show its adaptation by the printing industry.

TOPIC:

- A. Technological factors
  1. Similarities between Ludlow and machine typesetting
  2. Differences in mechanical factors and in specialized procedures related to equipment functioning and techniques of performance.
  3. Production of large volume of display job, and miscellaneous type composition which should be set by hand
- B. Need for the invention
  1. Need to supplant hand-set foundry type for display lines
  2. Unavailability of display sizes on linotype machines
  3. Impracticability of using type bar, with matrices, two feet long.
- C. The successful development
  1. Role of Washington I. Ludlow, working with William A. Reade, in perfecting the process
  2. Innovation of setting brass matrices by hand and casting slugs with a simple mechanism
  3. Elimination of problems of keyboard construction, matrix magazines, etc.
  4. First successful marketing of Ludlow casting machine in 1911
  5. Introduction in Chicago newspaper composing room in 1913

UNIT II. HEALTH AND SAFETY OF THE OPERATOR

(3 days)

- OBJECTIVES: 1. To remind students of the need to pay attention to personal health factors while working.
2. To create an awareness of specific hazards.
3. To illustrate methods of eliminating or reducing accident potential through proper observation of safe work practices.

TOPIC:

- A. Personal health
1. Reducing fatigue
    - a. Appropriate clothing
    - b. Organize work procedure to cut down on frequency of movements across shop
    - c. Reducing eye strain
      - 1) Sufficient overhead light
      - 2) Installation of overhead lamp directly at matrix cabinet
      - 3) Proper distribution of matrices and spacing materials in space cases
  2. Lifting and handling
    - a. Metal pigs
    - b. Matrix cases
- B. Operational hazards
1. Preventing squirts
  2. Dropping table top
    - a. Position of safety finger
    - b. Safety key
    - c. Lock-down
  3. Safety while casting
    - a. Stalls
    - b. Bottleneck at delivery slide
    - c. Location of bands
- C. Safe work practices
1. Concentration at caster
    - a. No distractions
    - b. If machine does not function:
      - 1) Shut off power
      - 2) Notify superior
  2. When removing matrix case:
    - a. Grasp firmly with two hands
    - b. Place securely on working surface
    - c. Return to proper location

UNIT III. MATRICES, MATRIX CASES AND MATRIX CASE CABINETS

(30 days)

- OBJECTIVES: 1. To acquaint students with the nature and uses of Ludlow matrices and the method by which they are arranged and kept
2. To show the important characteristics of the design and structure of this equipment

- TOPIC: A. The Ludlow matrix
1. Construction and manufacture
    - a. Basic material
    - b. Use of steel dies, punches, precision cutting tools
    - c. No tooth combinations
  2. Parts of a matrix
    - a. Position
    - b. Function
    - c. Font distinguishing marks
  3. Type sizes of matrices
    - a. Body sizes
    - b. Display sizes
    - c. Advertising figures - oversize matrices
  4. Matrix dimensions
    - a. Three different depths between ears
    - b. Special casting position for extra-large matrices
  5. Mortised matrices
    - a. For both roman and italic characters
      - 1) Avoid mortising slug by hand work
      - 2) Avoid need for duplicate slug casting
    - b. Improving esthetic appearance of line
- B. The Ludlow Italic matrix for italic and cursive type faces
1. Cast on 17° angle
  2. Close fitting
    - a. Esthetic appearance
    - b. Full bearing
    - c. Solid casting
- C. Spaces and quads
1. Same height and size combinations as for regular roman type casting matrix
  2. Low quad casting
  3. Italic spaces and quads
    - a. Same height and size combinations
    - b. Cast on 17° angle to fit italic matrices
    - c. Special angle quads for composing roman and italic in same line



UNIT III. (Continued)

- D. Matrix type case
  - 1. Kinds of case pulls
    - a. Case layouts for characters
      - 1) Caps on left, l.c. on right
      - 2) Lower case on left; caps on right
      - 3) Arrangements for numerals, punctuation marks, etc.
    - b. Special size compartments for display figures
  - 2. Central case for spaces and quads
    - a. Thicknesses of spaces and quads
    - b. Provision for miscellaneous quads, dividers, etc.
- E. The matrix case cabinet
  - 1. Standard cabinet
  - 2. Universal cabinet
    - a. Same arrangement as standard cabinet
    - b. Provision for stick storage
  - 3. Special double-pull single cabinet
    - a. Opposite cases pull to right or left only
    - b. Two compositors can set at same time
  - 4. All cases held at slant; mats remain standing

UNIT IV. LUDLOW CASTER

(10 days)

- OBJECTIVES:
- 1. To identify the essential working parts of the Ludlow typograph caster.
  - 2. To explain to students the major functions of the parts of the caster.

TOPIC:

- A. Basic design of Ludlow caster
  - 1. Table top left
  - 2. Metal pot and pump
  - 3. Mouthpiece and mold
  - 4. Crucible mouthpiece retraction
  - 5. Casting and releasing devices
  - 6. Slug finishing, ejecting, delivering
- B. Caster nomenclature
  - 1. General identification
  - 2. Function of caster
    - a. Slugs cast on either 6 or 12 pt. body width
    - b. 21 or 22 1/2 pica mold length
    - c. Cast blank slugs (underpinning) .765" high
      - 1) For overhanging accommodation
      - 2) For blanking out and makeup purposes
    - d. Use same type metal as for Linotype and Intertype

UNIT IV. (Continued)

- C. Table top lift: Locking down mechanism
  - 1. Stick lock down combination
  - 2. Safety finger device
  - 3. Stick stop
  - 4. Hand pressure control
  
- D. Metal pot and pump
  - 1. Gas or electric heat
    - a. Disadvantages of gas heat
    - b. Hazards of gas heat
  - 2. Electric thermostatic temperature control
    - a. Operating temperature
    - b. Cold metal problems
  - 3. Maintenance of metal level
    - a. Mergash automatic feed and mechanism
    - b. Hand feeding slugs and small pigs
      - 1) Disadvantages
      - 2) Contamination of metal purity
    - c. Fluxes and toners
  
- E. Mouthpiece and mold
  - 1. Water-cooling system
    - a. Water pump mechanism
    - b. Water pump mechanical seal
    - c. Soluble oil additive
  - 2. Regulators
    - a. Pressure adjustment plunger spring
    - b. Mouthpiece temperature control rheostat
  - 3. Slotted mouthpiece
    - a. Metal entering mold in flat stream
    - b. Production of better slug face
  
- F. Crucible mouthpiece retraction
  - 1. Single cast operation
    - a. Air removal pressure
    - b. Filling in matrix details
  - 2. Repeat cast action
    - a. Automatic repeat lever control
    - b. Timing factor
  
- G. Casting and releasing devices
  - 1. Tripper mechanism and throw-off
  - 2. Safety-lever and shear-key shaft features
  - 3. Removal timing

UNIT IV. (Continued)

- H. Finishing, ejecting, delivering
  - 1. Bottom trimming
    - a. Removing excess metal
    - b. Maintaining accurate slug height
  - 2. Slug ejection mechanism
  - 3. Ejection control and timing
  - 4. Slug delivering onto galley
  - 4. Prevention of disappearing slugs

UNIT V. LUDLOW MATRIX STICKS

(3 days)

- OBJECTIVES:
- 1. To acquaint students with the range of Ludlow matrix sticks and to describe the special use of each.
  - 2. To point out their construction and to explain the major details of each kind as a basic tool in Ludlow matrix composition.

TOPIC:

- A. Kinds of matrix sticks
  - 1. Normal roman loose-side
    - a. How they differ from hand typesetting sticks
    - b. Care in handling, casting and storage
  - 2. Italic matrix
  - 3. Adjustable offset (LP)
  - 4. Long lines
  - 5. Self-quadring loose-side
  - 6. Self-centering
- B. Special uses of each kind
  - 1. Resourcefulness in setting variants
  - 2. Imitations
  - 3. Safety factors
- C. Design for various point size matrices
- D. Precision construction and accurate gauging
- E. Arrangements for setting lining gothics, etc.
- F. Use of division quads for long lines setting
  - a. Minimum-maximum allowance range
  - b. Kinds and interchangeability
  - c. Safety factors
    - 1) Damage to equipment
    - 2) Hot metal squirts

UNIT VI. PRINCIPLES OF MACHINES

(5 days)

- OBJECTIVES:
1. To explain the basic scientific principles of mechanical actions.
  2. To study the movements of the components of the Indlow caster.
  3. To understand the necessity for cleaning and maintaining the equipment on a regular schedule.
  4. To recall the role played by electricity in the operation of the casting device.

- TOPIC:
- A. Principles of mechanics
    1. Forms of energy and power
    2. Elastic properties
    3. Stress and tension
  - B. Application of principles of mechanical action to components of Indlow caster
    1. Levers
    2. Springs
    3. Pulleys and belts
    4. Gears
    5. Gears
  - C. Meaning of terms
    1. Pins
    2. Cotter
    3. Keys
    4. Ball and roller bearings
  - D. Principal parts of the caster
    1. Mechanical and electrical components
    2. Function, elements, parts, operation
      - a. Crucible
      - b. Mold and mold wiper
      - c. Mouthpiece
      - d. Plunger
      - e. Trim knife
      - f. Ejector blade
      - g. Delivery slide and tray
      - h. Water tank and cooling system
      - i. Electric switches
      - j. Thermostat
  - E. Maintenance requirements
    1. Periodic maintenance and cleaning
      - a. General materials and tools
      - b. Special tools and lubricants
      - c. Method of performance
      - d. Safety practices

UNIT VI. (Continued)

- F. Theory of electricity in operating Inklow castor
  - 1. Underlying principles of simple meters
    - a. Electric current
    - b. A.C. and D.C. supplies
  - 2. Wiring
    - a. Kinds
    - b. Connections
  - 3. Power units
  - 4. Heating elements

UNIT VII. PROOFREADING AND CORRECTING

(3 days)

- OBJECTIVES:
- 1. To review the proofreader's text and margin marks and how to use them.
  - 2. To show the students how to make corrections in order to follow customer's instructions.

TOPIC:

- A. Need for typographical correctness
  - 1. Following customer's specifications
    - a. Copy: grammatical and factual
    - b. Layout: typographic arrangement
      - 1) Type faces, sizes, measurements
      - 2) Indentions, centering, spacing
  - 2. Care of customer's copy and layout
- B. Standard marks in proofreading
  - 1. Marks commonly used within proof of text matter
  - 2. Corresponding marks used in margins of proof
- C. Making corrections on the proof
  - 1. Author's alterations vs. office corrections
  - 2. Responsibility and judgment
  - 3. Use of reference guides

UNIT VIII. LAYOUT AND DESIGN

(10 days)

- OBJECTIVES: 1. To review the principles of design for typographic planning for linlow typesetting and make up.  
2. To help students recognize the individual differences in the basic structure of type face classification and application.

- TOPIC:
- A. Review of principles of design
    - 1. Appropriateness, balance, contrast, legibility, proportion, shape harmony, etc.
    - 2. Forms of display
      - a. Centered lines: formal
      - b. Off-center balance: informal
      - c. Squared form
      - d. Modernistic
  - B. Kinds of typographic layouts
    - 1. Thumb nail sketches
    - 2. Rough preliminary plan
    - 3. Finished layout
    - 4. Detailed specifications
    - 5. Customer's elaborate layout
  - C. Classification of type face structure
    - 1. Roman and accompanying italic
      - a. Old style roman
      - b. Modern roman
      - c. Transitional roman
    - 2. Sans serif and gothic
    - 3. Square serif
    - 4. Text letter
    - 5. Cursive and script
    - 6. Novelty and miscellaneous display
  - D. Interpreting customer's own layout and copy
    - 1. Analysis of copy
    - 2. Adaptation to available materials
      - a. Type sizes and type faces
      - b. Ornamental and decorative rules, borders, designs
      - c. Resourcefulness in use of equipment

UNIT VIII. (Continued)

- N. Application to layout and design of commercial forms, advertisements, etc.
  - 1. Bills of fare and menus
  - 2. Matching stationery styles
    - a. Business
    - b. Professional
    - c. Personal
  - 3. Book and catalogue title pages
  - 4. Newspaper advertisements
    - a. Mitered rule borders (Ludlow cast)
    - b. Butted rule borders (Ludlow cast)
  - 5. Magazine advertisements
    - a. Mitered ornamental strip border
    - b. Butted and mitered border combinations
  - 6. Announcements
    - a. Formal design; informal design
    - b. Two-color design
- F. Study of contemporary display typography
  - 1. Current mass publications
  - 2. Daily metropolitan newspapers
  - 3. Examples of modern layouts
  - 4. Review of Ludlow type face library with examples of 1900 fonts

UNIT IX. COPY FITTING TECHNIQUES

(5 days)

- OBJECTIVES:
- 1. To review the fundamentals of arithmetic used in the composing room.
  - 2. To explain the use of character counting methods and charts and to apply this information to problems in Ludlow typesetting.

TOPIC:

- A. Review of printer's system of measurement
  - 1. Point system and its uses
    - a. Problems involving points, picas, inches
    - b. Problems involving spacing and use of makeup materials
    - c. Conversion of linear measurements to composing room terms
    - d. Reading and working with a foot rule and a pica gauge
  - 2. Applications involving fundamentals of arithmetic

UNIT IX. (Continued)

- B. Copy fitting
  - 1. Character count methods used
    - a. Introduction to type sheets designed for copy fitting of display matter
    - b. Comparisons of similar type face designs, weights and sizes
    - c. Applications involving character counting for copy fitting
  - 2. Study of matrix maker's type specimen sheets and charts
  
- C. Other mathematical applications
  - 1. Ratio and proportion
  - 2. Calculating enlargements; finding reductions
  - 3. Reading and using a micrometer
    - a. Parts and their function
    - b. Care in handling
  
- D. Ludlow setting and casting problems
  - 1. Calculating multi-stick display-line treatment
    - a. Use of division grids within safety zone
    - b. Letterspacing factors and problems
  - 2. Overhand slug considerations
    - a. Allowing for insufficient matrices
      - 1) Blank space utilization
      - 2) Character substitution
    - b. Cutting in and mitering to arrive at a pre-determined measure

UNIT X. LUDLOW RULEFORM MATRIX COMPOSITION

(5 days)

- OBJECTIVES:
- 1. To acquaint students with the function, purpose and mathematics of the Ludlow Ruleform System.
  - 2. To solve problems in calculating the composition procedure in form typesetting.

- TCPIC:
- A. Definition of Ruleform typography
    - 1. Comparison with brass and lead rule makeup
    - 2. Comparison with other hand and machine reproductive processes



UNIT X. (Continued)

- B. Components of Ruleform make up
  - 1. Rule slug
  - 2. Blank slugs for spacing and overhang usage
  - 3. Type headings composed within boxes
  - 4. Ruleform slugs, cast from this combination:
    - a. Intersecting rule matrices
    - b. Horizontal rule matrices
    - c. Slug-aligning matrices
- C. Widths of horizontal rule matrices
- D. Sizes of intersecting and vertical rule matrices and slug-aligning rule matrices
- E. Special feature of slug-aligning rule matrices
  - 1. Esthetic appearance
  - 2. Full perfect vertical alignment
  - 3. Compactness when printing
- F. Problems in calculating
  - 1. Analyzing copy
  - 2. Application of printer's arithmetic
  - 3. Considerations for rule matrix substitutions
  - 4. Checking horizontal, vertical and overall calculations before setting, casting and making up
- G. Setting factors involved with Ruleform work
  - 1. Use adjustable offset matrix stick (LP)
  - 2. Difficulties encountered if any other matrix stick is used
- H. Casting problems involved with Ruleform work
  - 1. Locking stick holder securely
    - a. At maximum position
    - b. Frequent checking when recasting quantities
  - 2. Casting on 6 pt. body

UNIT XI. AUXILIARY EQUIPMENT AND NEW MODEL LUDLOW CASTER

(6 days)

- OBJECTIVES:
1. To review the function of basic auxiliary equipment found in general composing rooms and in Ludlow shops, or areas.
  2. To introduce and explain the special auxiliary machinery of the Ludlow shop.
  3. To present information concerning the most recent Ludlow caster, model "M", in commercial use.

TOPIC:

- A. Review of standard auxiliary equipment found in most general composing rooms and in Ludlow shops, or areas
  1. Proof presses
    - a. Manual and power
    - b. Galley and page proofing
    - c. "Repro" proofing
  2. Lead-and-slug cutter, hand operated
  3. Electric power saw, metal and wood cutting blades
  4. Mitering machine, hand operated, all angles
  5. Power miterer (45°)
- B. Special auxiliary equipment for Ludlow shop or area
  1. Slug cutter for Ludlow cast slugs exclusively
  2. Supersurfacers
    - a. To burnish large size slugs
    - b. To eliminate or reduce pitting on heavy faces
  3. "Shell-Hi" Slug Shear and Harrison Slug Stripper
    - a. To de-shank face-head of slug from body (.353")
    - b. To mount face-head on base material (.765")
    - c. To patch in on blocked plate
  4. Elrod strip caster
    - a. To cast leads and slugs for make-up
      - 1) From 1 to 36 pts. thick
      - 2) Casts and cuts material to desired pica and point lengths from 5 to 140 picas
    - b. Casts continuous line rules and combination rule borders
    - c. Casts base make-up materials
- C. The new Ludlow caster, model "M"
  1. Increased pressure and thermostatically controlled heat in mouthpiece and in throat
  2. Deeper crucible, resulting in higher metal level
  3. New flat table top, with more positive stick lock-down
  4. New electric system repeat casts one-third faster
  5. Motor raised 1 foot off floor, for easier maintenance
  6. New refrigerated cooling system, uniform 70° temperature of water

UNIT XII. OCCUPATIONAL INFORMATION

(5 days)

- OBJECTIVES: 1. To indicate the major shop systems and practices found in a printing shop or in a Ludlow department.
2. To inform students of the kinds of establishments where they may find employment as Ludlow typesetting operators.

- TOPIC: A. Shop practices and systems
1. Terminology for Ludlow and composing room
    - a. Setting type by hand
    - b. Make up materials and technique
    - c. Ludlow nomenclature
      - 1) Setting
      - 2) Casting
      - 3) Maintenance
    - d. Other related hand or machine typesetting activities
  2. Work or job envelopes or tickets
    - a. General instructions for entire job
    - b. Specific directions for Ludlow typography
    - c. Details for interdepartment schedules
- B. Establishments doing Ludlow typography
1. Commercial shops performing general job printing
  2. Newspaper plants and periodical printing shops
  3. Typesetting trade plants
    - a. Specialists in Ludlow typography for small job shops (usually in addition to other kinds of machine composition)
    - b. Provision for additional services
      - 1) Page and job make-up
      - 2) Look-up for press or foundry
      - 3) "Repro" proofing

UNIT XIII. DUTIES AND OPPORTUNITIES FOR ENTERING WORKERS

(5 days)

- OBJECTIVES: 1. To indicate some of the general duties assigned to entering workers.
2. To list the factors involved in achieving success on the job.
3. To suggest opportunities for advancement.

- TOPIC: A. Breaking-in period
1. In the shop or department
    - a. Scope and limitations of job
    - b. Delivering proofs, type matter, printed work
    - c. Receiving merchandise
    - d. General composing room usefulness

UNIT XIII. (Continued)

- 2. In the office
  - a. Telephoning-answering and message-taking
  - b. Making out and issuing receipts
  - c. Filing and other general office routines
- B. Work schedules and assignments
  - 1. Day, night, or other work shift
  - 2. Local and Federal wage scales and hours
    - a. Minimum hourly basic pay for maximum hours
    - b. Overtime assignments and compensation
- C. Safety practices
  - 1. Constant attention to rules of safe procedure
    - a. For the individual and other personnel
    - b. For prevention of damage to equipment
    - c. For avoidance of excess spoilage or waste
    - d. For conservation of expendables
  - 2. Observance of state and local factory and labor laws and regulations
    - a. By preventing violations
    - b. By notifying superior of unsafe work conditions or machine hazards
- D. Job opportunities and qualifications
  - 1. Working conditions and labor patterns in commercial printing shops
    - a. Organized shops (union)
      - 1) Craft union
      - 2) Local affiliation through I.T.U. (AFL-CIO)
    - b. Unorganized shops (non-union or "open")
      - 1) Usually poorer working conditions and benefits and lower wages
      - 2) Occasionally conditions, etc., equal to or higher than those in organized plants.
  - 2. Work opportunities in other printing areas
    - a. Printing departments of private establishments having Ludlow facilities
      - 1) Department stores and specialty shops
      - 2) Banks
      - 3) Insurance companies
    - b. U.S. government (G.P.O.) and military establishments

UNIT XIII. (Continued)

- K. Promotional opportunities
  - 1. Steps in up-grading
    - a. Pre-apprentice
    - b. Indentured apprentice
    - c. Journeyman
    - d. Shop foreman or plant superintendent
  - 2. Further education as an aid to promotion
    - a. In-plant training
    - b. Craftsman education programs
    - c. Higher education institutions
    - d. Correspondence courses
    - e. Specialization, diversification, or up-grading programs sponsored by industry-labor groups

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