TECHNOLOGY EDUCATION
RESIDENTIAL STRUCTURES

GRADES 9-12
ELECTIVE

The University of the State of New York
The State Education Department
Bureau of Home Economics
and Technology Education Programs
Division of Occupational Education
Albany, New York 12234

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THE UNIVERSITY OF THE STATE OF NEW YORK

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USE IN SEQUENCE: **Elective course**

This course is one of the New York State approved electives in Technology Education. It is one of several electives courses designed to give students a firm but broad exploration of the technical world in which they live.

Students completing a high school sequence in Technology Education must take a total of 1-3 units of elective course work to fulfill the "elective" portion of their sequence requirement. This course may also be taken by any student as an elective. If the instructor uses this syllabus as a guide for instruction, students may be granted Regents credit for the experience.

Several courses within Technology Education offerings can be offered on a 1/2-unit or 1-unit basis. Course work earning 1/2-unit must comprise a minimum of 54 hours of instruction and course work earning 1-unit must comprise a minimum of 108 hours of instructional time.

Students with Disabilities

The Board of Regents, through the part 100 Regulations of the Commissioner, the Action Plan, and The Compact for Learning, has made a strong commitment to integrating the education of students with disabilities into the total school program. According to Section 100.2(s) of the Regulations of the Commissioner of Education, "Each student with a handicapping condition as such term is defined in Section 200.1(ii) of this Chapter, shall have access to the full range of programs and services set forth in this Part to the extent that such programs and services are appropriate to such student's special educational needs." Districts must have policies and procedures in place to make sure that students with disabilities have equal opportunities to access diploma credits, courses, and requirements.

The majority of students with disabilities have the intellectual potential to master the curricula content requirements for a high school diploma. Most students who require special education attend regular education classes in conjunction with specialized instruction and/or related services. These students must attain the same academic standards as their nondisabled peers to meet graduation requirements, and, therefore, must receive instruction in the same content areas, at all grade levels. This will ensure that they have the same informational base necessary to pass statewide testing programs and meet diploma requirements.

Teachers certified in the subject area should become aware of the needs of students with disabilities who are participating in their classes. Instructional techniques and materials must be modified to the extent appropriate to provide students with disabilities the opportunity to meet diploma requirements. Information or assistance is available through special education teachers, administrators, the Committee on Special Education (CSE) or student's Individualized Education Program (IEP).

Strategies for Modifying Instructional Techniques and Materials

1. Students with disabilities may use alternative testing techniques. The needed testing modification must be identified in the student's Individualized Education Program (IEP). Both special and regular education teachers need to work in close cooperation so that the testing modifications can be used consistently throughout the student's program.

2. Identify, define and pre-teach key vocabulary. Many terms in this syllabus are specific and some students with disabilities will need continuous reinforcement to learn them. It would be helpful to provide a list of these key words to the special education teacher in order to provide additional reinforcement in the special educational setting.

3. Assign a partner for the duration of a unit to a student as an additional resource to facilitate clarification of daily assignments, timelines for assignments, and access to daily class notes.

4. When assigning long-term projects or reports, provide a timeline with benchmarks as indicators for completion of major sections. Students who have difficulty with organizational skills and time sequence may need to see completion of sections to maintain the organization of a lengthy project or report.

Infusing Awareness of Persons with Disabilities Through Curriculum

In keeping with the concept of integration, the following subgoal of the Action plan was established.

In all subject areas, revisions in the syllabi will include materials and activities related to generic subgoals such as problem solving, reasoning skills, speaking, capacity to search for information, the use of libraries and increasing student awareness of and information about the disabled.

The purpose of this subgoal is to ensure that appropriate activities and materials are available to increase student awareness of disabilities.

This curriculum, by design, includes information, activities, and materials regarding persons with disabilities. Teachers are encouraged to include other examples as may be appropriate to their classroom or the situation at hand.

STUDENT LEADERSHIP SKILLS

Development of leadership skills is an integral Part of occupational education in New York State. The New York State Education Department states that, "Each education agency should provide to every student the opportunity to participate in student leadership development activities. All occupational education students should be provided the opportunity to participate in the educational activities of the student organization(s) which most directly relate(s) to their chosen educational program."

Leadership skills should be incorporated in the New York State occupational education curricula to assist students to become better citizens with positive qualities and attitudes. Each individual should develop skills in communications, decision making/problem solving, human relations, management, and motivational techniques.

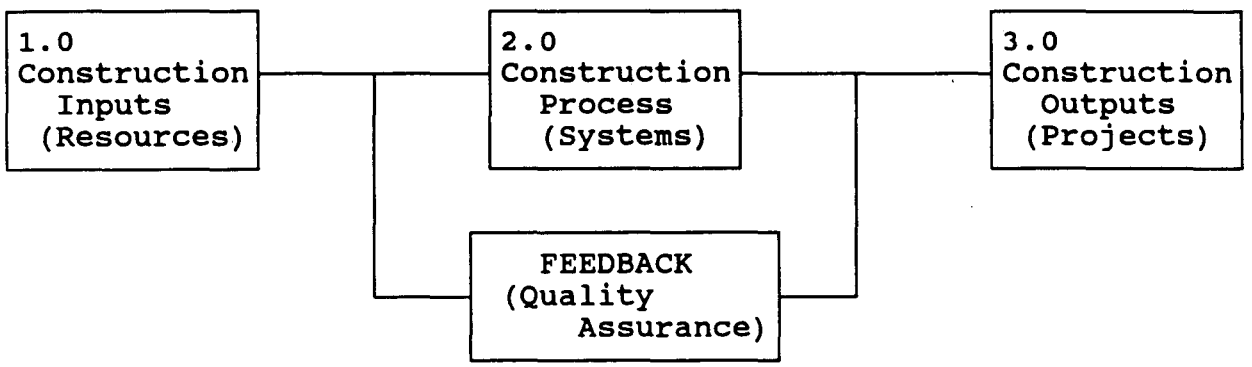
Leadership skills may be incorporated into the curricula as competencies (Performance Objectives) to be developed by every student or included within the Suggested Instructional Strategies. Teachers providing instruction through occupational educational curricula should familiarize themselves with the competencies. Assistance may be requested from the State advisor of the occupational student organization related to the program area.

Students who elect to become active members of one of the student leadership organizations chartered by the New York State Education Department have the advantage of the practical forum to practice leadership skills in an action oriented format and have the potential for recognition of their achievements at the local, State, and national level.

OVERVIEW OF THE MODULE

Goal: The student will be able to understand the many systems of a residential structure and develop specific skills in the construction process. This will occur given informative presentations and laboratory activities demonstrating these concepts.

Construction Systems Model



COURSE DESCRIPTION

One of the key basic needs of humankind is that of shelter. Residences have been used by humans since the early days of the caveman. The development of these structures have taken many forms depending on the needs of the people and the availability of resources.

Current residential structures utilize highly sophisticated materials and procedures combined in a manner to make homes economically possible for a large percentage of consumers. The systems used in current homebuilding are the focus of this module. It is to be considered a subset of total humankind's construction, as dams, roadways, commercial buildings, and other construction projects are not included in this module.

This module is an elective in a total program of technology education. It is considered general education and not specific career training, because this module is founded on the belief that all students will someday be home owners or home dwellers. They should possess the general knowledge of the systems used to construct their dwelling. Students could continue their education in the applied field of construction if their career directions follow that path.

The content outline offered is sequential in most residential construction procedures. For a further look at the totality of construction as it relates to human technical adaptive systems, the reader is directed to see the module entitled "Production: Construction".

GENERAL INSTRUCTIONAL STRATEGIES

The writers of this curriculum offer specific instructional strategies in the section to follow but it can appear somewhat fragmented without a description of the general strategy for the module. This section on ***General Instruction Strategies*** is included to communicate the nature of the module in a more cohesive form.

The overall strategy is to involve the students with hands-on activity of an actual construction project. With the time restraints that are given, a small scale project, something like a storage shed or a wall section, would probably be the most appropriate. There are other general strategies that the instructor might want to employ, however.

1. **Models.** Building models can provide useful activity for many of the stated objectives, but the instructor must realize the focus of the course should be more toward actual construction.

2. **Community Projects.** The instructor is encouraged to solicit the community for small building projects that can be handled by the size and ability of the class.

3. **Field Trip.** A field trip to a building project can be an invaluable strategy for accomplishing many of the objectives in rapid succession. the instructor should find a project such as a housing development that is in varying stages of completion. This will allow the opportunity for the students to see several of the construction steps as they are occurring.

4. **Slides.** Color 35mm slides provide an easy and valuable way for the instructor to bring construction projects to the laboratory. They are particularly useful if field trips are not possible, but they might be used along with the field trip strategy. An instructor could visit a project site with a camera and take two or three rolls of film to quickly capture the several stages of the project. Also, such large scale projects such as roads, dams, factories, and the like might best be captured on film.

5. **Computer Graphics.** The use of computer programs for the design and engineering of construction plans is a popular technique used today. Instructors could demonstrate this technology if the equipment is available.

6. **Written Responses.** Several of the objectives can be covered in this curriculum by written reports. The instructor is encouraged to offer these assignments as homework. This will allow the maximum amount of laboratory time available for the actual hands-on construction project.

7. **A Construction Company.** Many instructors may want to start an actual construction company with their class. This is an excellent strategy to get the students involved with the design, purchasing, scheduling and many other objectives of the course.

SUGGESTED SPECIFIC INSTRUCTIONAL STRATEGIES

The instructional strategies that follow are correlated with the content outline and the supporting competencies by the point-numeric coding system. Several strategies are offered for each supporting competency, and they are designated by the letters a, b, etc. The reader is encouraged to turn back to the *Performance Objectives/Supporting Competencies* beginning on page 4, and read the appropriate entry before reading the suggested instructional strategy. This will provide a more complete view of the nature and direction required by the instructor to complete the stated objectives.

The intent of offering so many of strategies is to allow the instructor a choice of methods to complete the objective. Certainly, not every strategy could be employed in any one offering of this module.

SKILLS, KNOWLEDGE, BEHAVIORS TO BE DEVELOPED:

The student will be able to develop the ability to:

1. Identify the process of construction from initial planning to final site completion for residential structures.

2. Utilize mathematical and scientific principles in the solving of residential construction problems.

3. Manipulate construction tools, equipment, and materials in laboratory activities that are designed to emulate the systems of residential construction.

4. Demonstrate consumer awareness skills as they relate to the purchase, use, and maintenance of a residential dwelling.

5. Demonstrate problem-solving and analytical thinking skills in solutions to simple engineering problems within the context of laboratory activities emulating construction technology.

CONTENT OUTLINE

I. **Inputs (Resources)** — **Estimated Teaching Time 18 hours**

A. History
   1. Human need
   2. Material availability

B. Personnel
   1. Job classifications and opportunities
   2. Career preparation

C. Planning
   1. Needs assessment
   2. Design considerations
   3. Print reading
   4. Owner/architect/contractor relationships

D. Finance Management
   1. Savings/credit
   2. Budgeting

E. Materials and Supplies
   1. Characteristics
   2. Procurement

F. Site
   1. Selection
   2. Preparation

G. Tools and Equipment
   1. Basic
   2. Specialty

H. Technical Ability
   1. Knowledge
   2. Experience

I. Safety
   1. Standards
   2. Programs

II. **Processes (Systems)** **30 hours**

A. Foundation Systems
   1. Material Utilization
   2. Methods
      a. Standard procedures
      b. Innovative techniques

B. Framing (walls, floor, roof, ceiling)
   1. Material utilization
   2. Methods
      a. Standard procedures
      b. Innovative techniques

C. Sheathing (walls, floors, roof)
   1. Material utilization
   2. Methods
      a. Standard procedures
      b. Innovative techniques

D. Roofing
   1. Material utilization
   2. Methods
      a. Standard procedures
      b. Innovative techniques

E. Exterior Doors, Windows
   1. Material utilization
   2. Methods
      a. Standard procedures
      b. Innovative techniques

F. Siding
   1. Material utilization
   2. Methods
      a. Standard procedures
      b. Innovative techniques

G. Electrical
   1. Material utilization
   2. Methods
      a. Standard procedures
      b. Innovative techniques

H. Plumbing
    1. Material utilization
    2. Methods
        a. Standard procedures
        b. Innovative techniques

I. Heating/Cooling
    1. Material utilization
    2. Methods
        a. Standard procedures
        b. Innovative techniques

J. Insulation
    1. Material utilization
    2. Methods
        a. Standard procedures
        b. Innovative techniques

K. Interior Wall and Ceiling Treatment
    1. Material utilization
    2. Methods
        a. Standard procedures
        b. Innovative techniques

L. Flooring
    1. Material utilization
    2. Methods
        a. Standard procedures
        b. Innovative techniques

K. Interior Trim, Doors, and Cabinetry
    1. Material utilization
    2. Methods
        a. Standard procedures
        b. Innovative techniques

III. **Outputs (Projects and Impacts)**

A. Project **6 hours**
    1. Quality assurance
    2. Site completion
    3. Maintenance
    4. Energy management

B. Impacts
    1. Environmental
    2. Economic
    3. Personal

Total Estimated Teaching Time 54 hours

COURSE: RESIDENTIAL CONSTRUCTION

PERFORMANCE OBJECTIVES/SUPPORTING COMPETENCIES

I. Module: **Inputs (Resources)**

A. Topic: **History**

1. **Performance Statement:**

The student will be able to analyze the history of shelter as influenced by human need and material availability, given informative lessons.

Competencies to be Developed:

After studying this topic, the student will:

a. Survey shelter types suitable and appropriate to meet human needs.
b. Identify how building material availability has influenced types of shelter in a given region.

Suggested Instructional Strategies for:

a. 1. Ask the students to describe the shelter needs for prehistoric man, medieval man, American pioneers, American Indians, Eskimos, and other groups of people.

2. Make a bulletin board collection of as many shelter types used by peoples throughout the world today. (Use magazines such as National Geographic.)

3. Each student will select a different region of the country and describe the shelters special to that region.

4. Through the use of a library or media center, have students search for various styles and types of shelter used over the years.

b. 1. Have the students identify the materials used by different cultural groups throughout history, in varying geographical locations.

2. Make a collection (or list) of natural resources that might be used for building, located in your school district today. (Not at the building supply year.)

3. Take a historical tour of your school district (township) or visit the local historical society to catalog the types of building materials that were used in earlier days. Discuss the probabilities of why these were selected.

4. Make a class project out of building a tepee for display.

5. Hold an igloo building competition between class teams.

6. Each student will research the most common material used in the construction of homes in a particular area.

B. Topic: **Personnel**

1. **Performance Statement:**

The student will be able to examine the preparation and utilization of personnel required in the process of residential construction, given the proper instruction and supportive learning aids. They will examine the utilization of personnel as a resource for residential construction, given appropriate instruction.

Competencies to be Developed:

After studying this topic, the student will:

a. Identify the various job classifications and opportunities associated with the residential construction industry.
b. Describe various opportunities for career preparation in residential construction.

Suggested Instructional Strategies for:

a. 1. The instructor might invite a guest speaker into the class so he could explain job classification and opportunities in the residential construction industry.

2. Collect ads from the local newspaper that pertain to building trades, and post on bulletin board.

3. Each student will conduct a career investigation on five jobs related to the residential construction field using the occupational outlook handbook.

4. Have students visit the career center of the guidance office and use the computer (if available) to analyze various job opportunities.

b. 1. Have the students, for homework, look up the career preparation needed for several construction job classifications, using the *Dictionary of Occupational Titles*.

2. Make a collection of community college catalogs where building trades are taught, list the course titles that are common.

3. Ask a union apprentice training official to speak to the class about preparation needed for various trades and what local opportunities exist.

4. Each student will conduct a career investigation on five jobs related to the residential construction field using the occupational outlook handbook.

C. Topic: **Planning**

1. **Performance Statement:**

The student will be able to analyze the various aspects of planning required in preparing to construct a residence, given appropriate instruction.

Competencies to be Developed:

After studying this topic, the student will:

a. Identify personal needs required in a residence.
b. Outline desirable design considerations to meet aesthetic and functional needs.
c. Read prints in the process of house planning.
d. Recognize the need to develop a good working relationship among the owner, architect, and contractor for the purpose of clear communication.

COURSE: RESIDENTIAL CONSTRUCTION

Suggested Instructional Strategies for:

a. 1. The student could interview his/her family with a teacher-prepared questionnaire on the needs required for a new house. Discussion could then follow in class.

2. Brainstorm with class all the needs and wants that students would like in a "dream house". Discuss and refine the list until it meets "basic needs".

b. 1. Have the students draw a floor-plan sketch of a house that would meet their families' needs and aesthetic desires.

2. Collect floor plans from newspapers, home building magazines, etc., and keep a log of features you really like.

3. Pick up the "free real estate sales" booklet at your local store, classify the various styles of architecture.

4. Obtain photos (of sold homes) from a local real estate agency and make a bulletin board of styles in your area.

5. Make a neighborhood survey and sketch a home that would "fit" well on an empty lot in your area.

6. Have students view their neighborhood to identify various structure styles.

c. 1. Develop a formative quiz with questions based on a print of residential house. The students would have to read the print correctly in order to answer the questions. Discussion could follow.

2. Obtain a series of floor plans, and have teams of students explain features of the house using an opaque projector. The class will have a questioning guide from which to cover aspects of design.

3. Play a competitive game between class teams where they have identical prints of a house. The teacher would ask specific questions that can be found in the prints.

4. Provide students with floor plans and review various symbols and markings.

d. 1. Have three students role-play a meeting between an owner, architect, and contractor. The instructor could intercede to stress the importance of clear communication.

2. Have a panel discussion consisting of an architect, a general contractor, and a home owner as a learning experience for the students after the home is built.

D. Topic: **Finance Management**

1. **Performance Statement:**

The student will be able to distinguish the various methods of financing residential construction, given lessons and learning activities.

Competencies to be Developed:

After studying this topic, the student will:

a. Recognize savings and credit as an important part of financial planning.
b. Outline several budgeting procedures that might be used in the construction of a residence.

Suggested Instructional Strategies for:

a. 1. Have the students develop a savings plan for a down payment on a home, given a specific yearly salary and a specific number of years.

2. Discuss with class, using mortgage/interest charts as aids; the importance of a substantial down payment in relation to total "real" costs of house.

3. Do a worksheet/budget sheet that will account for set personal "living expense" and determine how long it will take to save a down payment on a beginner's wage.

4. Suggest reading and reporting on one of the many self-help books dealing with real estate purchase.

5. Invite a bank representative in to talk to the class concerning credit.

6. Review bank and lending institution procedures including interest rates.

b. 1. Have the students write an itemized budget to cover the payment of various construction phases.

2. Have the students discuss the significance of various budgeting procedures on the construction of a residence.

3. Have the business teacher explain common budgeting procedures used in residential construction.

4. Develop a time line/budget chart to show sequence of cash flow needs.

E. Topic: **Materials and Supplies**

1. **Performance Statement:**

The student will be able to examine the characteristics of materials and supplies and how they are procured for residential construction.

Competencies to be Developed:

After studying this topic, the student will:

a. Distinguish among the various characteristics of building materials.
b. Identify the methods of procuring construction materials.

Suggested Instructional Strategies for:

a. 1. Assign each student one common material used in residential construction (2" x 4", asphalt shingles, vinyl siding, etc.) and have them answer specific questions on material characteristics.

2. Try to get an "old" but recent set of ***Sweet's Catalogs*** from your local architect/engineering firm and have students look up characteristics of commonly used building materials.

3. Make a panel board display of "scrap pieces" of building materials for lab reference and identification.

4. Have each student gather building materials and check physical, thermal, mechanical, and environmental characteristics under simple laboratory tests.

b. 1. Take a list of common materials and have the students place phone calls on the cost and availability.

2. Look through the "yellow pages" phone book, and list all the building material suppliers in a ten mile radius of your school.

3. Collect newspaper or (seasonal flyers) ads of building materials suppliers. Keep a "seasonal" chart of prices of selected materials.

4. During a given week, have class members check the prices of common building items at as many suppliers as possible. Check prices against school supply catalogs for the same type items.

F. Topic: **Site**

1. **Performance Statement:**

The student will be able to analyze the importance of site selection and preparation as a preliminary activity to building a residence, given the required instruction.

Competencies to be Developed:

After studying this topic, the student will:
a. List the criteria used to locate a desirable building site.
b. Determine the steps required to prepare a given site for construction.

Suggested Instructional Strategies for:

a. 1. The instructor could design scenarios with five very different sites and five types of house specified. The students must match the best site for a given house, given sketches of houses and views of lots.

2. Make a field trip to several "lots" that are for sale and make a comparison chart of good and bad features; discuss type of structures suitable for each.

3. Lead a discussion on land value, dealing with such items as, location, future prospects for the area, etc.

b. 1. Have the students visit a housing project and the instructor can show the steps required to prepare the site.

2. Students can demonstrate the "staking out of a building site" from a plot plan in the school yard.

3. Using a plot plan, have the students record how they would change the elevations to meet drainage requirements.

4. Review the need for permits, utility company with of ways, surveys, etc.

G. Topic: **Tools and Equipment**

1. **Performance Statement:**

The student will be able to demonstrate the safe use and application of basic tools and equipment and the knowledge of specialty tools and equipment used in residential construction, given a laboratory activity in construction.

Competencies to be Developed:

After studying this topic, the student will:
a. Use basic construction tools and equipment.

b. Recognize several specialty construction tools and equipment.

Suggested Instructional Strategies for:

a. 1. The students will use basic construction tools working on a class project that emulates the residential construction industry.

2. Using basic hand tools used in general construction (claw hammers, squares, hand saws, etc.) have a class/team contest hammering nails, cutting a 2 x 6 square, measuring and cutting a rafter angle, etc.

3. Have students break into groups using common tools to construct wall sections.

4. Review the tools needed in residential construction and demonstrate their proper use.

b. 1. The instructor could borrow several specialty construction tools from a local contractor and bring them into the laboratory.

2. Compare the time and ease of installing a clip of staples with a hand operated "gun"; a hammer tacker; and an electric driven staple gun. (Give the smallest student the electric gun.)

3. Demonstrate use of proper dry wall finishing trowels, eg., corner tool. Compare with "putty knife" application.

4. Invite a local contractor or local fastener company to class to demonstrate some of their specialty tools.

5. Review specialty tools used by the industry and identify how these tools speed up the process by making the task easier and faster.

COURSE: RESIDENTIAL CONSTRUCTION

H. Topic: **Technical Ability**

1. **Performance Statement:**

The student will be able to demonstrate technical ability to research data pertaining to residential construction by identifying sources of information and gathering data as it applies to practical laboratory problems and recognize the importance of technical knowledge and experience as a resource for residential construction, given appropriate instruction.

Competencies to be Developed:

After studying this topic, the student will:

a. Demonstrate the significance applied technical knowledge in residential construction projects.

b. Examine the importance of technical experience to residential construction projects.

Suggested Instructional Strategies for:

a. 1. Have each student identify one aspect of technical knowledge that is important in residential construction, such as; R-value in insulation, compressive strength of 2" x 4"'s; water permeability of vapor barriers; etc.

2. Write to the National Homebuilders Association for codes and research reports on building materials.

3. Use a word search game or crossword puzzle to find the names of standard building terms.

4. Have the students determine the size of a girder needed for a particular residence.

5. Discuss the importance of knowing specifications and codes within a given community.

b. 1. Have the students discuss why experience could be important to residential construction.

2. Have a well-experienced carpenter talk to the class about the "tricks of the trade".

3. Have students determine the best way to add a bedroom and bathroom to an existing home.

4. Relate to students something they may be doing now in which they have experience and how much easier it is for them to do then when they first attempted the task.

I. Topic: **Safety**

1. **Performance Statement:**

The student will be able to demonstrate a knowledge of safety standards and show involvement with a safety program given the standards and a program by the instructor. The standards and the program are to be developed by the instructor on an individual basis giving consideration to recognize federal, state and local standards.

Competencies to be Developed:

After studying this topic, the student will:

a. Perform to the set standards for safety on a daily basis, 100% of the time, while working in a laboratory setting.
b. Participate in the safety program responsibly, on a daily basis, while working in the laboratory setting.

Suggested Instructional Strategies for:

a. 1. All students will have a machine qualification card punched by instructor before using power equipment on their own.

2. Have a different student each day record safety infractions that occur, and discussion will follow at the end of the week.

3. Review the importance of obeying safety rules for the benefit of oneself and others.

b. 1. A classroom safety program should be set up, where safety infractions are reported to the instructor.

2. Safety will be an integral part of the whole program, but will have a defined program so that it is always before the students. (Posters, bulletin boards, safety equipment, out-of-order signs, first aid procedures, etc.)

3. Start each class with the safety reminder of the day. (Stanley safety charts, National Safety Council, Insurance Company, etc.)

4. Sponsor a "safety poster contest" as a prize gaining activity, or an assignment for extra credit.

5. Have a "safety person" from industry, insurance company, or a local fire department talk to class about experiences and hazards in the real world work place.

6. Have a system set up where each student loses points when observed working unsafely.

II. Module: **Processes (Systems)**

A. Topic: **Foundation Systems**

1. **Performance Statement:**

The student will be able to select an appropriate foundation system for a residential structure based on site conditions and requirements, given instructional date along with laboratory/field trip experiences.

Competencies to be Developed:

After studying this topic, the student will:

a. Identify the various residential foundation materials and give reasons for their utilization.
b. Demonstrate standard procedures and innovative techniques used in the construction of residential foundations.

COURSE: RESIDENTIAL CONSTRUCTION

Suggested Instructional Strategies for:

a. 1. Have the students select one foundation system and build a small example using full-scale materials.

2. Students could construct a form for a poured concrete corner section, scaled down to 4" wall thickness (two could be used as a compost holder as a useful "project" afterwards).

3. Have each student calculate the cubic yards needed to pour a concrete slab.

4. Students can identify the various foundation systems by reviewing scale models provided by the instructor.

b. 1. Have the students visit a construction site where a foundation system is being installed.

2. Demonstrate method of staking out foundation digging site with batter boards. (School yard activity)

3. Have teams of students stake out a squared corner by using 3-4-5 methods. (Contest for speed and accuracy; use large constructed square to measure.)

4. Build a "footer" box section, mix a hatch of concrete and pour. (Set a keyway, use finished example for patio stone/step or down-spout spillway.)

5. Have students build a scale model section in which they may pour a foundation floor and wall.

6. Have the students develop an example of an all-weather wood foundation system.

7. Collect literature on all weather wood/treated pole, and rammed earth foundations; chart advantages/ disadvantages.

8. Have each student provide recommendations for insulating the block foundation.

B. Topic: **Framing**

1. **Performance Statement:**

The student will be able to construct residential framing systems, given a specific job with a set of building plans.

Competencies to be Developed:

After studying this topic, the student will:

a. Identify and utilize various framing materials used in residential building.
b. Demonstrate the methods of construction residential framing systems.

Suggested Instructional Strategies for:

a. 1. The students could build small sections of walls using framing materials common in the residential construction industry. A discussion could follow on the relative merits of each, and the class would then select one to use in a larger class project.

2. Students will label the standard size and material types of the framing members in wall drawings.

3. Students will demonstrate methods of making standard corner posts using 2" x 4"'s. Teams can do four foot sections in competition.

4. Have each student determine the span of floor joists under different conditions.

b. 1. Have one or more students use 2" x 2"'s, 2" x 6"'s, and 2" x 8"'s to build wall sections and discuss the relative merits of each.

2. Discuss the use of metal structure framing for walls and ceilings. It is adaptable to residential construction?

3. Have each group of students draw up alternative approaches to the framing that was previously accomplished.

C. Topic: **Sheathing**

1. **Performance Statement:**

The student will be able to utilize sheathing materials for floors, walls, and roofs of residential structures, and properly apply them.

Competencies to be Developed:

After studying this topic, the student will:

a. Specify the appropriate sheathing materials to be used in the construction of a wall, floor, or roof.
b. Demonstrate the proper application of sheathing materials.

Suggested Instructional Strategies for:

a. 1. The instructor could have several small models available using the various sheathing materials. The students could view each and then decide which one to use on a class project based on their relative merits.

2. Have each student calculate the area and sheathing needed to cover specific wall and floor sections.

b. 1. Use one of the more common materials to sheath the lab "corner of structure" sample, e.g., plywood, insulation board, etc.

2. Look through building magazines such as the Architectural Form, Architectural Record, Architectural Digest, and identify any sheathing materials that are non-standard, e.g., enameled metal. (Make slide copies of photos for future use.)

3. Have students apply sheathing materials using glue and staple gun.

COURSE: RESIDENTIAL CONSTRUCTION

D. Topic: **Roofing**

1. **Performance Statement:**

The student will be able to determine the appropriate roofing materials and their proper application, given a laboratory activity utilizing this technology.

Competencies to be Developed:

After studying this topic, the student will:

a. Identify the various residential roofing materials and provide the reasons for their utilization.

Suggested Instructional Strategies for:

a. 1. The students could be involved in a homework assignment to find at least three different types of roofing materials in their town. (Asphalt shingle, slate, tile, stone, fiberglass, etc.)

2. Identify a variety of residential roofing materials from descriptive literature and chart the promotional qualities of each manufacturer. Write for sales literature, or use Sweet's Catalog.

3. Have the students calculate the amount of roofing material needed to cover a specific roof.

4. Prepare samples of various types of roofing - fiberglass, asphalt, slate, and discuss the qualities of each.

b. 1. Demonstrate a commonly used roofing material such as asphalt shingles, drip edge, starter strip, and valley construction on a full scale lab mock-up.

c. 1. The instructor could have several models of innovative roofing materials for the students to view.

2. Students could experiment with a model of a layer-up roof for an underground house and experiment to test waterproofing.

E. Topic: **Exterior Doors**

1. **Performance Statement:**

The student will be able to install the appropriate exterior doors and windows in a given laboratory activity.

Competencies to be Developed:

After studying this topic, the student will:

a. Specify the proper exterior door or window for residential construction.
b. Describe the procedure to install an exterior door and window.

Suggested Instructional Strategies for:

a. 1. Have the students research local suppliers for the various styles of exterior windows and doors available.

2. Research the types of doors and windows that are available for residential construction. See Sweet's Catalog. Chart the most common kinds by obtaining a Sears Roebuck Building Specialty Catalog for all class members.

3. Provide students with literature describing various types of door and window systems.

b. 1. Install a door and window in a mock-up in the laboratory.

2. Install a casement window and door unit into a house section being built.

c. 1. Show the students a model of triple-glazing and the reason for its performance.

2. Apply "sun-shield" type film to window glass and carry out experiments to test its properties.

3. Have the students collect literature on the latest in window and exterior door designs from local suppliers.

4. Discuss the combination of materials used in innovative door and window designs to improve such factors as insulation, cost, maintenance, aesthetics, etc.

F. Topic: **Siding**

1. **Performance Statement:**

The student will be able to apply siding materials in a laboratory activity.

Competencies to be Developed:

After studying this topic, the student will:

a. Identify various siding materials by their advantages and disadvantages.
b. Apply siding materials.

Suggested Instructional Strategies for:

a. 1. Have the students find at least five examples of different siding used in their community. (Vinyl, aluminum, vinyl-clad aluminum, cedar bevel-siding, other woods, etc.)

2. Make a collection of siding types for a display board in the room. (Most distributors have salesmen display cases that are free for asking.)

3. Have the students calculate the amount of siding needed to cover a specific residence.

b. 1. Have each student apply at least one course of siding to a class project.

c. 1. Have the students determine the R-value increase in a re-siding job that uses an insulation board under the siding, along with a backer board under each course of siding.

2. Do some experiments creating a "new siding material", e.g., using a modern adhesive, (epoxy) to glue stones and sand to plywood surface.

3. Have a discussion with the students concerning the new innovative ways siding is being used in conjunction with insulation.

G. Topic: **Electrical**

1. **Performance Statement:**

The student will be able to install electrical systems in a residential construction project, emulated by a laboratory activity.

Competencies to be Developed:

After studying this topic, the student will:

a. Specify the many types of electrical materials available for residential construction.
b. Demonstrate the methods of installing electrical systems.

Suggested Instructional Strategies for:

a. 1. Have the students build a display board showing various materials used in the electrical system of a home. Each student would be responsible for obtaining one or more contributions to the display.

2. Have the students make a materials list from an electrical layout plan.

3. Have available all materials used in a basic residential structure (service entrance panel, romex wire, boxes, receptacles, switches, fixtures, etc.)

b. 1. Have students wire a wall section including such things as a receptacle, three-way switch, GFI outlet, etc.

c. 1. Take the class to a home and point out the electrical service characteristics of that house.

2. Have a representative from the local power company come and speak and answer questions as to what innovations are coming in the "all electric home of the future".

3. Do a weather/wind survey of your area; calculate the possibilities of a home wind generation station. Discuss the pros/cons.

4. Have the students list electrical devices they would like to add to their homes.

5. Provide samples of plastic electrical boxes to show differences with metal boxes.

H. Topic: **Plumbing**

1. **Performance Statement:**

The student will be able to determine the elements of plumbing systems used and determine the elements of residential plumbing systems and how they are installed.

Competencies to be Developed:

After studying this topic, the student will:
a. Explain the materials commonly found in plumbing systems.
b. Demonstrate the methods for installing a plumbing system.

Suggested Instructional Strategies for:

a. 1. Have the students build a display board of common plumbing materials used in a modern house. Each student would be responsible for obtaining one contribution to the display.

2. Have the students draw a plumbing diagram of their homes.

b. 1. Have the students plumb a sink in a demonstration wall section. The materials could be used over and over again for each student.

2. Have the students layout, cut and solder copper tubing to make a specific configuration, given a plan by the teacher.

3. Have students sweat copper fittings and test their strength with compressed air and soapy water.

c. 1. Have the students brainstorm the advantages and limitations to plastic plumbing over other materials.

2. Investigate alternative type waste systems for residential use, e.g., composting toilets, chemical toilets, etc. Discuss codes; health factors; methane production.

3. Have the students layout and cut plastic pipe.

I. Topic: **Heating/Cooling**

1. **Performance Statement:**

The student will be able to utilize the materials and application methods for residential heating and cooling systems, given an appropriate laboratory experience.

Competencies to be Developed:

After studying this topic, the student will:

a. Identify the materials used in residential heating and cooling systems.
b. Demonstrate the methods for constructing heating and cooling systems.

Suggested Instructional Strategies for:

a. 1. The students could analyze the heating/cooling system in their own home and answer several questions on a teacher prepared worksheet.

2. Students could complete a teacher handout of heating system components by naming the parts as listed by the exploded view in a Sears Catalog.

3. Have the students investigate the best heating/cooling systems for residence in different parts of the country.

b. 1. Have the students install a small electric heating system in a demonstration wall section.

2. Have students assemble a collection of duct work to go from one specified location to another. Teams will compete for most efficient routing.

3. Invite a heating/cooling salesman to talk to the class.

c. 1. The instructor could take the students to the boiler room in the school and have the students identify the major components of that system.

2. Build a working model of a solar air or water heater and test efficiency in your locality. Discuss cost/utility worth of such a home project.

3. Make a bulletin board collection of articles, photos/diagrams of passive/active solar heating schemes.

J. Topic: **Insulation**

1. **Performance Statement:**

The student will be able to determine the appropriate insulation systems for specific applications in residential construction, given informative lessons by the instructor and suitable laboratory experiences.

COURSE: RESIDENTIAL CONSTRUCTION

Competencies to be Developed:

After studying this topic, the student will:

a. Identify the various insulating materials used in residential construction and differentiate between their advantages and limitations.
b. Demonstrate the materials for applying these insulating materials in walls, floors, and ceilings of residential structures to afford a thermal envelope resistant to weather change.

Suggested Instructional Strategies for:

a. 1. Have the students build a apparatus where several insulating materials are put into a small wall section.

2. Have the students calculate the R-value of their walls, floors, and ceilings at home.

3. Students can examine samples of various types of insulation and their R-values.

b. 1. Have the students analyze the type of insulation that is in the sidewalls and attic of their own house.

2. Insulate a wall section with fiberglass/or participate in a public works project in your town by helping a civic group insulate homes.

3. The instructor could have several examples of innovative insulation techniques available for the students to view.

4. Make some cellulose insulation by processing some old newspapers. Check on methods of discouraging vermin, and fire treat the product.

5. Have the students list suggestions on how they could conserve energy in their homes.

COURSE: RESIDENTIAL CONSTRUCTION

K. Topic: **Interior Wall and Ceiling Treatment**

1. **Performance Statement:**

The student will be able to demonstrate the knowledge of various interior wall and ceiling treatment systems used in the construction of residential structures, given informative presentations and laboratory instruction.

Competencies to be Developed:

After studying this topic, the student will:

a. Specify the appropriate materials to be used in a specific applications, based upon design factors.
b. Use standard procedures and special techniques in the application of these materials to interior walls and ceilings.

Suggested Instructional Strategies for:

a. 1. Have the students try different interior wall treatments on their individual wall sections.

2. Look through building magazines and study different wall and ceiling treatments. Make a comparison chart of material used.

3. Have the students make a materials list to finish off their basements at home.

4. Students should examine samples of drywall, paneling, and other wall and ceiling products and discuss differences in physical properties.

b. 1. Have each student use drywall on a section of the class project.

2. Have one group apply drywall system using seaming and taping; have another use double layer with screws and glue. Compare ease of application and finish.

3. Have the students calculate the amount of ceiling covering material needed for a particular home.

4. Have students install a suspended ceiling.

c. 1. Have students try a variety of wall treatments using innovative application techniques, e.g., adhesives, screws, clips, etc.

2. Have students gather literature from local suppliers on interior wall and ceiling treatments.

L. Topic: **Flooring**

1. **Performance Statement:**

The student will be able to apply application methods in residential structures with the proper acknowledgement of design and structural considerations, after receiving appropriate instruction.

Competencies to be Developed:

After studying this topic, the student will:

a. Use the proper materials for specific applications and differentiate between the advantages and limitations of other common flooring materials.
b. Utilize standard procedures for the application of flooring materials and also identify specific innovative techniques involved in residential flooring.

Suggested Instructional Strategies for:

a. 1. Have the students build a display of the various flooring materials used in residential homes today. Each student would be responsible for obtaining at least one example of a flooring material.

2. Make a collection of flooring samples by contacting retail/distributor outlets in your area for sales samples.

3. Have the students determine the amount of hardwood flooring needed to cover the floors of a home.

b. 1. Have the students lay a vinyl floor on the class project, if appropriate.

2. Cut vinyl flooring samples into two inch squares and apply to plywood base in conventional way to form a checker board pattern. (Trim edge with molding in next section.)

3. The teacher can borrow a floor nailer from a local lumber yard and demonstrate its use in class.

4. Have students set a section of ceramic floor tile.

c. 1. Make sections of the lab floor around machinery "skid proof" by using industrial flooring techniques.

2. Have students repair a section of flooring using a seam cement.

M. Topic: **Interior Trim, Doors, and Cabinetry**

1. **Performance Statement:**

The student will be able to utilize the appropriate application for the interior trim, doors, and cabinetry involved in the construction of residential structures, given appropriate laboratory instruction.

Competencies to be Developed:

After studying this topic, the student will:

a. Manipulate a selected number of materials used in the interior trim, doors, and cabinetry of modern residential structures.
b. Demonstrate the proper application of materials used in these procedures, depending upon available time and resources.

Suggested Instructional Strategies for:

a. 1. Visit a local building supply store as a class field trip and analyze the various interior trim, doors, and cabinetry available.

2. Make a collection/display of various common trim moldings. (Many times "shorts" can be had at a very reasonable price.)

3. Have the students make a door schedule for their home.

4. Have students check their homes to see what types of cabinetry and trimwork exist.

b. 1. Have the students hang an interior door in a demonstration wall section.

2. Have the students make a coped miter joint.

3. Have students install casing around a window or floor.

c. 1. Have an interior decorator (pro) come to speak to class on unusual treatments of interiors using custom created materials. (Slide show of past jobs.)

2. Have the students redesign their kitchen cabinetry.

III. **Outputs (Projects and Impacts)**

A. Topic: **Project**

1. **Performance Statement:**

The student will be able to appraise the importance of quality assurance, site completion, maintenance, and energy management to a completed residential structure, given appropriate informative lessons and laboratory activity.

COURSE: RESIDENTIAL CONSTRUCTION

Competencies to be Developed:

After study this topic, the student will:

a. Use a quality assurance system throughout the construction process and, most importantly, as a final evaluation of the construction activity.

b. Analyze the procedures and identify the importance of site completion to a finished residential structure.

c. Demonstration maintenance procedures used in residential structures for all of the systems identified in the process section of this module, that is, appropriate routine maintenance of:

Foundation systems	Electrical
Framing	Plumbing
Sheathing	Heating/cooling
Roofing	Insulation
Exterior doors and windows	Interior wall and ceilings
Siding	Flooring
Interior trim, doors, and cabinetry	

d. Formulate appropriate energy management principles of a residential structure for the short and long term use of the structure.

Suggested Instructional Strategies for:

a. 1. One student should be the quality assurance officer for the class project and make periodic reports to the class as the work progresses.

2. Introduce "Quality Circle" concept to students checking quality at each step of construction. Team meetings to share concerns.

3. Have a personnel system where one student can role play part of building inspector or concerned, "over the shoulder owner" to create realism.

4. Have the students examine the major classroom project and make a list of improvements.

5. Emphasize the importance of doing a good job which results in customer satisfaction.

b. 1. Visit a construction project that is having the site completed to view the various procedures involved.

2. Invite a landscape architect to speak to the class.

c. 1. Involve the students in making a list of possible maintenance needed on their own home.

2. Have students perform a variety of repair tasks in the lab, e.g., replace window pane; replace outside and inside door locks (see store models); replace washer on faucet; do a drywall hole repair; replace a window screen, lift a dent in wood, etc.

3. Have students come up with a maintenance schedule for the different areas of their homes.

d. 1. Have the students graph the energy use and costs of their own home for the last year, if the bills are available. Have a sample set of bills available for those that cannot obtain their own.

2. Have a fuel company make an energy audit of their home. Make a checklist of how many improvements students can accomplish themselves.

3. Students can learn to be wise consumers of energy by becoming aware of energy saving hints through consumer pamphlet collection.

COURSE: RESIDENTIAL CONSTRUCTION

B. Topic: **Impacts**

1. **Performance Statement:**

The student will be able to interpret the environmental, economic, and personal impacts associated with the construction of a residential structure, given appropriate instruction.

Competencies to be Developed:

After studying this topic, the student will be able to:

a. Explain the possible effects that one or many residential structures may have on the environment.
b. Determine the economic impacts that residential structures have on the individual consumer and the community (society) as a whole.
c. Analyze the personal impacts that a residential structure may have on the individual consumer.

Suggested Instructional Strategies for:

a. 1. The instructor might have the students make a list of possible environmental impacts that residential housing may have on a locale.

2. Have students discuss zoning rules in their locality in respect to waste disposal.

3. Have students identifying the various building materials used and their biodegradability.

b. 1. Have one student call the town office to get the figure of the tax base for their community and discuss how this could increase with more housing starts.

2. Contact the National Home Builders Association and have a representative speak about the economics the construction industry brings to an area.

3. Discuss the monthly financial needs to run a home.

c. 1. Brainstorm with the students all the possible personal effects that owning a home might have on an individual.

2. Make a comparison of factors on the advantages of home ownership versus renting.

3. Write a long range plan for obtaining the "dream house" you have always wanted, include a time line with key decision points. Discuss with parents/homeowners. Compare with other class members' ideas.

COURSE: RESIDENTIAL CONSTRUCTION

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Resources

Computer software: (architectural drafting, carpentry, and masonry)
Goodheart-Willcox Company, Inc.
123 West Taft Drive
South Holland, IL 60473
1-800-323-0440

COURSE: RESIDENTIAL CONSTRUCTION

Current Research Literature:

American Plywood Association
P.O. Box 11700
Tacoma, WA 98411
(206) 565-6600

Small Homes Council - Building Research Council
University of Illinois at Urbana-Champaign
One East Saint Mary's Road
Champaign, IL 61820

Films: "The Foundation" - 30 min.
"The Wood Shell" - 31 min.
Available from:
Circle Oak Productions, Inc.
260 Katanah Avenue
Katanah, NY 10536

Film: "To Touch The Sky" (Weyerhaeuser)
Available from:
Modern Talking Picture Service
Film Scheduling Center
2323 New Hyde Park Road
New Hyde Park, NY 11040

Filmstrips:
A complete selection on light and heavy construction available from:
Bobbs-Merrill Educational Publishing
4300 W. 62nd Street
P.O. Box 7080
Indianapolis, In 46260

Filmstrips:
A complete selection of sound filmstrips on residential construction available from:
McKnight Publishing Company
P.O. Box 2854
Bloomington, IL 61701

COURSE: RESIDENTIAL CONSTRUCTION

Filmstrips:

A complete selection of filmstrips on all phases of residential construction available from:

Prentice-Hall Media
Serv Code AJ
150 White Plains Road
Tarrytown, NY 10591

Overhead Transparencies:

A complete selection on construction techniques available from:

DCA Educational Products
424 Valley Road
Warrington, PA 18976

Public Television:

Consult local listings for:

"This Old House"
"The Old Houseworks"
"Housewarming with Charlie Wing"