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ABSTRACT

This document contains the report of a project conducted to make the concept of a world-class work force a reality. The project was intended to design a comprehensive strategy to link elements from the state's existing vocational-technical education, job training, adult education, tech prep, and apprenticeship programs with the components of SCANS (Secretary's Commission on Achieving Necessary Skills). For this pilot project, the demand occupation of electrical worker (electrician) was selected. The college partnered with an electrical apprenticeship program to develop curriculum applications for reading for information, writing, applied mathematics. listening, teamwork, locating information, and applied technology. Activities conducted included the following: occupational research, defining workplace skills, conducting job observations, creating a representative group or local subject-matter experts, conducting a profile session, developing a list of critical entry-level tasks, selecting workplace skills to be infused into existing curricula, identifying on-the-job behaviors associated with each skill, determining the level of workplace skills required to perform each job task, and developing a profile document summarizing the results. The curriculum development project resulted in four products that are included in this document: (1) an Occupational Profile Handbook; (2) a workplace skills Curriculum Review and Enhancements proposal; (3) a Faculty Development Plan; and (4) Licensure, Testing, and Certification strategies. The document also contains 17 appendixes of project documents, including task analyses, job skills, press clippings, and a competency profile for electricians. (KC)

ED 397 255

FINAL DOCUMENT

Skill Standards and Certification Project

Funded as a tri-agency initiative of the
Texas Higher Education Coordinating Board
Texas Department of Commerce
and
Texas Education Agency

North Lake College

CE 072 081

PROJECT TITLE
SKILL STANDARDS AND CERTIFICATION PROJECT

Funding Source: The Tri-Agency Partnership
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Texas Higher Education Coordinating Board

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North Lake College
Skill Standards and Certification Project

Work Keys OCCUPATIONAL PROFILING

- Conduct occupational research
- Define workplace skills
- Conduct job observations
- Contact/secure local subject matter experts
- Conduct profile session
- Develop list of most critical tasks performed at entry-level
- Select workplace skills to be infused into existing curricula
- Identify on-the-job behaviors associated with each skill
- Determine level of workplace skill required to perform each job task
- Develop profile document summarizing results

CURRICULUM ENHANCEMENT

- Establish curriculum enhancement team
- Gather information
- Conduct sampling course observations
- Study course syllabi and objectives
- Review instructional materials
- Review instructional methods
- Gather & review research materials
- Employ faculty content experts
- Select curriculum analysis method
- Study job profile
- Analyze & compare current curriculum
- Develop criteria for enhancement selection
- Select enhancement strategy
- Identify enhancements
- Improve course documentation and objectives

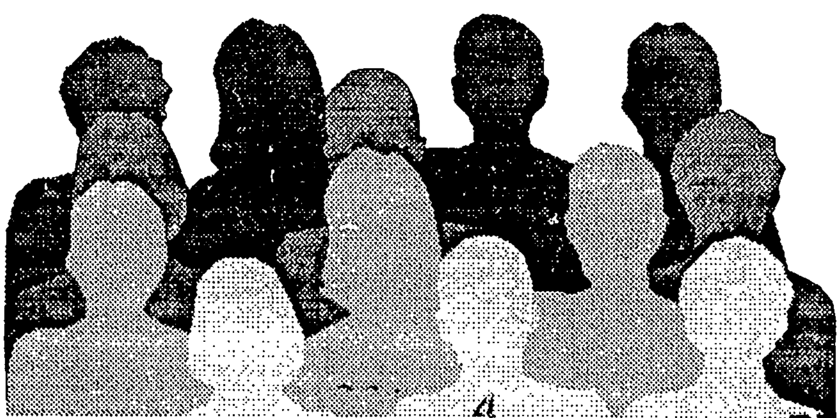
FACULTY DEVELOPMENT

- Conduct literature review
- Conduct interviews
- Develop faculty learning objectives
- Select learning activities/modes
- Determine instructional support factors
- Determine evaluation methods
- Establish timeline
- Secure funding

TESTING AND CERTIFICATION

- Research assessment strategies
- Analyze current assessments
- Identify assessment strategies

Trained Workforce



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SECTION A

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

I. PROJECT OVERVIEW

The North Lake College Skill Standards and Certification Project is part of a Texas state tri-agency initiative in workforce development and education. The Texas Department of Commerce, Texas Education Agency, and Texas Higher Education Coordinating Board jointly funded this project to design a seamless training application model for infusing workplace skills into academic and occupational programs at the secondary, post-secondary and apprenticeship levels.

II. PROJECT GOAL

In keeping with the spirit and intent of the U.S. Department of Labor ***Secretary's Commission on Achieving Necessary Skills, The Smart Jobs Strategy Report to the Governor, The Master Plan for Career and Technical Education and the School-to-Work Transition Plan,*** the overall goal of this project is to make the concept of a world-class workforce a reality. Thus, this project was researched and developed with the idea of designing a comprehensive strategy to link elements from the State's existing vocational-technical education, job training, adult education, tech-prep and apprenticeship programs with the components of SCANS and School-to-Work Transition.

III. PROJECT HISTORY

For the purpose of the pilot of this Project, the "demand" occupation of Electrical Worker was selected by North Lake College. Electricians are essential to economic development in Texas especially in areas of increased construction and renovation. According to the North Central Texas Interlink, Inc. "1993-2000 Demand Occupations" publication, electricians are included in their "Top 40" occupation list for those occupations that will be in high demand and will require formal education beyond high school.

North Lake College partnered with the Dallas Electrical Joint Apprenticeship and Training Committee (DJATC) to accomplish project objectives, activities, and products. The National Joint Apprenticeship and Training Committee, the International Brotherhood of Electrical Workers and the National Electrical Contractors Association are leading the development of National Skill Standards for the electrical industry. The IBEW is developing the occupational tasks, the NECA (with support from a Federal Grant) is developing the skill standards then the NJATC will review and dove-tail the two projects.

For the purpose of this project seven workplace skill areas were targeted for curriculum applications: Reading for Information, Writing, Applied Mathematics, Listening, Teamwork, Locating Information, and Applied Technology. Project deliverables include:

1. An ***Occupational Profile Handbook***
2. A workplace skills ***Curriculum Review and Enhancements*** proposal
3. A ***Faculty Development Plan***
4. ***Licensure, Testing, and Certification*** strategies

The American College Testing Program (ACT) was the occupational profiling contractor for the Project. Through their *Work Keys* process which utilizes local subject matter experts they provided an electrician job profile which involved the following three steps:

1. Developing a list of the most critical tasks to the occupation;
2. Identifying on-the-job behaviors associated with each skill as it is used in the occupation.
3. Determining the *Work Keys* skill levels of the occupation.

Texas A & M's Public Policy Research Institute performed Project evaluation activities. They will report Project results, conduct process and outcome evaluations, and provide public policy recommendations to the State.

IV. NORTH LAKE COLLEGE PROJECT PROCESS

The process followed by the North Lake College Project addressed the requirements of the RFP provided by the funding agencies. It was their determination that in order for the project to be successful the areas of Occupational Profiling, Curriculum Enhancement, Professional Development, and Testing/Certification needed to be addressed and reported as individual "pieces" (deliverables) of the project. Documents were drafted and submitted for each of these pieces.

The process, steps, and activities which evolved are reported here as a "whole". It is important to note that while activities for each component of the process can be conducted independently of the others, the final product could not be successfully achieved until all four components are brought together in a composite approach.

Before beginning the activities of the North Lake Project a strong foundation was established. It included: (1) selecting a demand occupation with an established training program to use as a pilot; (2) selecting qualified staff; (3) securing resources; and (4) securing institutional commitment.

Occupational Profiling Activities

Job/Task Analysis, the Developing a Curriculum (DACUM) Process, Competency or Occupational Profiling are all strategies for determining occupational requirements. For the purpose of this Project, North Lake College selected ACT to conduct their Occupational Analysis and Profile processes. The *Work Keys system* process develops job or occupational profiles using job task analysis and skills evaluation. For the North Lake College Project job tasks associated with entry-level employment at the apprentice level for the electrician occupation were identified. The process also applied a scale which served as a metric for determining workplace skill levels required for successful employment. The information generated from this type of in-depth analysis is critical to the curriculum enhancement process. Following are the steps and activities conducted in the pilot:

-Conduct Occupational Research
Available information was obtained on the selected occupation including job descriptions, duties, tasks, skills, and knowledge required for job performance. (The National Skill Standards for the electrical occupation are in development. In lieu of the Standards, alternative sources of information were gathered and validated locally.)

-Define Workplace Skills
Workplace skills were defined as they appear in SCANS, or as they are defined by local industry.

-Conduct Job Observations
Required task, skill, knowledge, tool and equipment information required for successful entry-level job performance was obtained by observing actual work in progress.

-Contact/Secure Representative Group of Local Subject Matter Experts
DJATC, the co-bidder, in conjunction with North Lake College recruited eight licensed journeyman electricians to serve as subject matter experts in the profiling process to provide their opinions about job tasks and skill levels required. A member of the National Electrical Contractors Association (NECA), the Association currently developing the National Skill Standards, acted as liaison to the Project.

-Conduct Profile Session
A preliminary task list for the occupation was presented to the journeyman electricians who expanded and modified the tasks to accurately describe the job duties of the first-year apprentice. Job tasks were then rated in terms of importance and relative time spent.

-Develop List of Most Critical Tasks Performed at Entry Level
A criticality rating was determined by multiplying the importance and relative time spent ratings. Tasks were then rank ordered and least important tasks were deleted generating a final task list.

-Select Workplace Skills to be Infused into Existing Curricula
For the purpose of this pilot the workplace skills selected for infusion and available through *Work Keys* included: Reading for Information, Writing, Applied Mathematics, Listening, Locating Information, Teamwork and Applied Technology.

-Identify On-The-Job Behaviors Associated with Each Skill
Subject matter experts identified on-the-job tasks associated with each skill as it is used by an entry-level worker in the occupation. Subject matter experts were asked to review skill definitions provided by ACT to determine the levels of each of the workplace skills needed to perform the occupation and assigned the appropriate level.

-Determine Level of Workplace Skill Required to Perform Each Job Task
Subject matter experts reviewed the *Work Keys* system descriptions of the skills to determine the levels needed to perform the tasks of the occupation.

-Develop Profile Document Summarizing Results
For the purpose of this project a ***Work Keys Profile*** was provided including the final task list, workplace skill level definitions, and the determined levels of Reading for Information, Writing, Applied Mathematics, Listening, Locating Information, Teamwork, and Applied Technology needed to perform the tasks of the occupation.

Curriculum Enhancement Activities

An analysis of the curriculum is an essential prerequisite to designing and conducting curriculum revisions. Knowledge of the curriculum through a review process establishes the need and provides the foundation for enhancements. The following activities were conducted:

-Establish Curriculum Analysis/Enhancement Team
A team approach to accomplish curriculum analysis and enhancement activities was taken. Team members included the North Lake College Skill Standards and Certification Project Director, the Coordinator of the North Lake College Electrical Technology Program, the Director of the Dallas Joint Apprenticeship and Training Committee, a training consultant to the Apprenticeship Program, and an independent instructional design consultant.

-Gather Information
The following information was gathered: course performance objectives and syllabi, instructional methods and activities used, current inclusion of workplace skills, course content, course assessments employed, and industry partnerships.

-Conduct Sampling Course Observations
Courses were observed and information on instructional methods, instructional resources, technical content, and workplace skills content was captured.

-Study Course Syllabi and Objectives
All course syllabi were reviewed noting the listing of syllabi information and objectives for baseline purposes. Criteria for components of a quality syllabi were utilized. Observations on the quality of the syllabi were made and inclusion of workplace skills noted.

-Review Instructional Materials
Instructional materials were reviewed. It was determined by the team that a clear and comprehensive picture of the current inclusion of workplace skills needed to be established. Then the enhancement process to infuse and measure these skills could proceed. This review included an assessment of the content and reading levels of textbooks currently used in the program.

-Review Instructional Methods
Through interviews more detailed information was gathered concerning instructional methods and learning strategies currently employed.

-Gather and Review Research Materials
The following activities provided resources for research materials: 1) an ERIC search on workplace skills and assessments; 2)"The 15th Annual Mid-America Competency based Education and Training Conference: Achieving Standards through Quality CBET School to Work Programs;" 3) securing DACUM materials; and 4) securing materials on instructional methods.

-Employ Faculty Content Experts
Since available information on some workplace skill areas was limited or non-existent faculty content experts were employed in the seven selected skill areas. They successfully identified learning concepts and associated learning/classroom activities that could be infused into the existing technical instruction and that would support the achievement of required workplace skill levels.

-Select Curriculum Analysis Method
The team met to discuss a course by course analysis strategy to identify the current inclusion of workplace skills in all of the required program courses. A decision was made to collect the data electronically using the software "Q & A." Additionally, a decision was made to reference all supporting documentation

which substantiated the level to which skills are currently being taught in the curriculum.

-Study *Work Keys Profile*

The ***Work Keys Job Profile*** was studied to prepare for the curriculum analysis process.

-Analyze and Compare Current Curriculum

Each course was reviewed by the Program Coordinator to systematically capture information and documentation of learning activities, textbook reading levels, course assignments, and laboratory exercises that substantiated the *Work Keys* assigned skill levels. The support materials were collected in three-ring binders, tabbed, and labeled for each workplace skill area. As a quality control feature the curriculum analysis was additionally evaluated and reviewed by the Project Director.

-Develop Criteria for Enhancement Selection

The team determined that the following criteria be used to guide the enhancement selection: the enhancement must *facilitate learning* in a required workplace skill area; it must be *feasible*; it must be *industry-driven*; it must address *student acceptance and accountability*; it must allow *faculty freedom* within parameters.

-Select Enhancement Strategy

The team decided to identify prototype enhancements for the seven selected skill areas in two ways: 1) existing enhancements that demonstrate the skill area as it is presently taught, and 2) new enhancements that demonstrate ways the skill area could be incorporated into the curriculum. Enhancements also addressed suggestions for improvements in areas of course documentation, course objectives, instructional methods, and instructional materials.

-Identify Enhancements

After careful deliberation about data gathered during the curriculum analysis and information provided by the faculty content experts, the team met to identify workplace skill areas to target for curriculum enhancements. Performance objectives paired with learning activities were then developed for each of the identified workplace skill areas. (See attached Curriculum Enhancements and

Assessments table)

-Improve Course Documentation and Objectives
The team offered several recommendations for developing or revising course documentation and performance objectives -- two key data inputs that serve as curriculum enhancements.

Faculty Development Activities

The North Lake College Project conducted a needs assessment and developed recommended strategies for a faculty development plan. The plan is for the purpose of training faculty to implement workforce skills into the existing curriculum and to develop faculty in some more general areas of teaching effectiveness. The following activities were conducted:

-Conduct Literature Review
Information gathered through an ERIC search, the SCANS reports, the College's Faculty Development Center, and local libraries provided needed resources of research materials.

-Conduct Interviews
Interviews were conducted with the North Lake College Director of the Returning Adults Center and Title III Faculty Development, the North Lake College Electrical Technology Program Coordinator, the Director of the DJATC Apprentice Program, and a training consultant to the Apprenticeship Program to determine what faculty development needs exist in addition to what is presently being offered.

-Develop Faculty Learning Objectives
It was determined that faculty need to be able to: 1) list technical and workplace competencies associated with entry-level skills for the occupation their curricula trains for and that students need to perform at a satisfactory level; 2) develop quality syllabi for their courses; 3) write performance objectives (state student outcomes for their curricula); 4) develop learning activities that facilitate workplace skills development; 5) apply student assessments that are criterion-referenced; and 6) use student competency profiles.

-Select Learning Activities/Modes
Learning outcomes, content, activities and modes of delivery, and evaluations were developed based on the previously identified faculty learning objectives. (See attached Faculty Development Plan Summary)

-Determine Instructional Support Factors
Organizational support is essential to the implementation of effective faculty development programs. The following support was suggested: curriculum specialist/instructional design expertise, policies for compensation for faculty development participation, compensation for curriculum development/modification, and growth contracting.

-Determine Evaluation Methods
Evaluations were determined by the learning objectives. Selection of evaluation methods was based on the feasibility, practicality, and cost of the evaluation.

-Establish Timeline
Full consideration must be given to adequate planning time for all activities. Time to elicit interest and participation of key faculty, the "innovators" in the college, for proper diffusion of change to fully-implement competency-based educational delivery with workplace skills infusion into the technical curriculum is essential and recommended.

-Secure Funding
Carl Perkins funds are intended by law, and available to all Texas community colleges, by formula, to fund faculty development especially as it relates to integration of academic and vocational education. These funds provide a likely

source for financial support of faculty development activities related to this Plan.

Testing/Certification Activities

The purpose of addressing testing and certification strategies as a component of this project as stated in the RFP was "to suggest recommended approaches and strategies for how the Project might promote criterion-referenced, skill-based testing to certify that students have attained the levels of SCANS and technical competency levels necessary for successful entry-level employment." The following activities were conducted:

-Research Assessment Strategies
Assessment information was gathered through an ERIC search, the SCANS reports, and the ACT organization.

-Analyze Current Assessments
Current assessment materials were collected and analyzed in the areas of licensure, testing, and certification.

-Identify Assessment Strategies
Recommendations were developed and proposed as assessment strategies for how the project might promote criterion-referenced, skill based testing. They include: 1) dissemination and incorporation of National Skill Standards for use in assessment review and revision; 2) implementation of sample pre- and post testing; 3) implementation of assessments for performance objectives developed during curriculum enhancement; and 4) utilization of initial mastery competency profiles that would represent the knowledge, skills, and attitudes that a student has demonstrated at a given time under given conditions.

V. RECOMMENDATIONS

There are elements that are integral to successful development of workplace skills enhanced curricula. Several were in place prior to the North Lake College Skill Standards and Certification Project and need to be shared for replication of results elsewhere. Others surfaced in meeting the objectives of this Project. Recommendations have been formulated for these elements in relation to the institutional context and the instructional design context.

Institutional Context

Organizational Commitment

The higher education institution needs to have administrative commitment to curricula revision both philosophically and practically. Philosophical support is in the form of at least four beliefs that operate as a working philosophy about curricula: 1) that workplace skills are integral to training youth for successful employment and economic viability; 2) that workplace skills should be infused into the curricula and not taught as a separate skill apart from the technical content of courses; 3) that community colleges should teach mastery learning and competency-based instruction should be provided in the curricula; 4) that the curricula offered by the college should be industry-driven reflecting the current and future needs of the local workforce.

Practical support from administration is needed in the form of resource allocation and decision making that enables the tasks of curricula development and enhancement to occur. In the organization, it is imperative for the curriculum project to be positioned so that it reports to the administrator in charge of instruction. Among other things, this allows for coordination of efforts within the institution regarding curricula revision, exploration, and development.

Business and Industry Partnerships

Partnerships with business and industry in the associated occupational area are crucial to: 1) the information exchange that needs to take place for the development of responsive curricula; 2) recruiting subject matter experts that are crucial for occupational profiling; 3) cooperative work experience and apprenticeship placements for hands-on experience; 4) sources of expertise for advisory committees for curricula advise and review; and 5) resource support.

Organizational Climate

An organizational climate to promote change and innovation is a key factor in successful curricula development and enhancement. Curricular modifications to keep apace of rapid changes in information and skill requirements are a necessary part of workforce development for the present and future and a responsibility of institutions of higher education. The leadership of community colleges can foster or inhibit success of curricula development depending upon their perspectives and personalities and how they view change--whether they welcome it and are visionary is absolutely crucial to success. Being receptive to alternative forms of instructional delivery systems is important and fostering positive external relations is critical. With innovative forms of community building comes innovative forms of fund development that enable change to take place that would otherwise be stifled by fiscal constraint and limited thinking. Governing boards and college administrators with vision enable responsive curricula to become a reality.

Faculty Development

Faculty are essential to the curricula development, enhancement and exploration process. Faculty need to be encouraged to embrace performance-based instruction and mastery learning as key factors in promoting educational outcomes that not only benefit the learner, but that are being demanded by higher education funding sources like the Texas Higher Education Coordinating Board and Texas Education Agency. It is the recommendation of Project staff that faculty need to be skilled in the following areas for program success: 1) awareness of the workplace skills that are integral to preparing students for their selected occupations and how to incorporate them into existing curricula; 2) awareness of how to write objectives, develop course documentation, develop performance-based lesson plans, and evaluate performance-based instruction; and 3) awareness of methods of instructional delivery that promote attainment of the workplace skills.

Faculty Support

Some support systems need to be in place and utilized for faculty to accomplish curricula enhancements. It is recommended that consideration be given to the following suggestions: 1) release time to focus on the time-consuming tasks involved and possible course documentation revision that is necessary for analysis; 2) compensation to motivate curricula revision that requires in-depth analysis and revision; 3) peer support encouraging faculty to share their efforts and collaborate with the faculty team; and 4) business and industry input to maintain an industry-driven focus to the curriculum.

Curriculum/Instructional Design Process Expertise

A curriculum specialist/instructional design expert provides technical support to faculty to enable curriculum revisions and development. Full and part-time faculty would benefit from assistance and leadership a staff with these skills could provide to development activities. Expertise in competency-based education and inclusion of workplace skills on-site is essential if an institution is going to move in the direction of adopting CBE as a means of providing instruction.

Faculty Expertise

When conducting the activities of this Project a barrier was encountered due to lack of available information on learning concepts and activities to support the achievement of the selected workplace skills. It was at this time faculty experts were selected from the North Lake College faculty who teach Teamwork, Speech, Reading, Writing, Mathematics, and Electrical Technology. These faculty were asked to and successfully developed identified learning concepts and associated learning/classroom activities for their subject areas of expertise. It is recommended that staff resources in the institution be engaged in providing expertise in their subject matter area and be involved in a team effort for curriculum enhancement.

Instructional Design Context

Utilizing the *Work Keys* or other Job Analysis Process

Information gathered through an analysis process such as a DACUM or that provided in the ACT ***Work Keys Process*** can be of true benefit to education and industry. The process pairs the requisite skills with job-relevant tasks. The information gathered communicates the expectations of the workplace to employers, educators, and students facilitating the transition from school-to-work. It is recommended that a job analysis process be employed as an initial component in curriculum enhancement.

Utilizing a Systematic Curriculum Analysis Process

A *comprehensive* method of curriculum analysis is required and recommended to identify need and to establish a baseline for developing enhancements.

Revising/Developing Syllabi and Performance Objectives Following a Set Criteria

Curriculum analysis and development necessarily depends upon complete and accurate course data. Course data provides the essential information that is one of the most pivotal inputs to the curriculum development process. Data quality, availability and organization are enabling characteristics that allow the curriculum development process to proceed. It is recommended pre-established criteria be used to guide the development of syllabi and objectives along an acceptable and consistent route.

Revising/Developing Curricula to meet National Skill Standard Levels and Needs of Local Industry

With the job analysis and systematic curriculum analysis complete - and a firm understanding of the importance of quality syllabi including fully developed performance objectives - the foundation has been set for the revision/development process to infuse workplace skills into existing curricula. For this Project enhancements began with the written recommendations provided by the faculty content experts for each of the selected workplace skill areas. From this information performance objectives were developed and paired with learning activities for the prototype enhancements in the seven selected skill areas.

Utilizing Competency Profiles (to demonstrate "initial mastery")

It is recommended an INITIAL MASTERY COMPETENCY PROFILE endorsed by industry and educators be developed. The PROFILE would represent the knowledge, skills, and attitudes that a student has demonstrated at a given time under given conditions.

Revising/Developing Assessments to Measure Skill Levels

It is recommended assessments for new or revised performance objectives developed during the curriculum enhancement phase be implemented. For this pilot a matrix was developed illustrating the performance objective, the learning activity, and the assessment for each enhancement. (See attached Curriculum Enhancements and Assessments table)

CURRICULUM ENHANCEMENTS AND ASSESSMENTS

SKILL AREA	NEW ENHANCEMENTS		EXISTING ENHANCEMENTS	
	Learning Activity and Assessment	**Performance Objective**	*Learning Activity and Assessment*	**Performance Objective**
Reading For Information	*ELE 105* *Read a basic job function provided by the instructor and list the steps to accomplish the tasks on the job function handout.* ***Assessment: Completed job function handout graded for correct sequence.***	Using the provided document, the student will read, identify, and list the steps required to accomplish a general wiring task. Performance will be satisfactory if the sequence of steps is correct.	*ELE 105/6* *Read the safety booklet and complete the written safety test.* ***Assessment: Completed multiple choice test.***	Using the Safety booklet, the student will read information and identify critical information. Performance will be satisfactory with a minimum score of 100% on the written safety test.
Applied Mathematics	*ELE 205* *Use a computer estimating program to perform construction cost calculations.* ***Assessment: Computer print out graded for calculations and final estimation.***	Using a computer estimating program, the student will calculate construction costs for an estimation. Performance will be satisfactory if the estimate is within 20% of the actual costs.	*ELE 106* *In the Electrical Technology Lab students will complete a Series Circuit project and worksheet.* ***Assessment: Completed Series Circuit Worksheet graded for calculated values.***	Using Series Circuit Project materials, the student will construct basic circuits and measure and calculate values for voltage, amperage, resistance, and power. Performance will be satisfactory if a score of 70% is achieved.

SKILL AREA	NEW ENHANCEMENTS		EXISTING ENHANCEMENTS	
	Learning Activity and Assessment	**Performance Objective**	***Learning Activity and Assessment***	**Performance Objective**
Listening	*ELE 108* *In a role play students will alternately act as a supervisor giving instructions and a worker receiving instructions. (You may wish to video tape this activity)* ***Assessment: Checklist completed by instructor during role play.***	Given verbal instructions, the student will paraphrase the instructions correctly. Performance will be satisfactory if all critical information is present in the communication.	*ELE 116* *Using the medium of video tape students will listen to, view, and take notes on key concepts.* ***Assessment: Multiple choice test.***	Using notes as a reference, the student will report key lighting concepts from a video tape presentation. Performance will be satisfactory with a minimum score of 70% on a written test.
Writing	*ELE 205* *Read the safety problem handout, discuss safety solutions in small groups, and write a memo.* ***Assessment: Written memo graded for critical information and mechanical errors.***	Presented with a problem related to safety the student will write a memo to a supervisor detailing proposed solutions to problems. Performance will be satisfactory if critical information is communicated in a clear and concise manner with a minimum of three mechanical errors.	*ELE 218* *Read chapter on "Single Family Dwellings" and write set of specifications.* ***Assessment: Three-to-four page, written, short-answer test graded for inclusion of basic elements and mechanical errors.***	Given a lecture and assigned reading the student will write a set of specifications for a single family dwelling. Performance will be satisfactory if all basic elements are present and are communicated in a clear and concise manner with two mechanical errors.

SKILL AREA	NEW ENHANCEMENTS		EXISTING ENHANCEMENTS	
	Learning Activity and Assessment	**Performance Objective**	*Learning Activity and Assessment*	**Performance Objective**
Locating Information	*ELE 108* *Use National Electrical Code software as a research tool.* ***Assessment: Informal instructor observation and feedback.***	Using a computer based National Electrical Code software program, the student will search the software using key words to locate essential information to research a stated problem. Performance will be satisfactory if essential information is located.	*ELE 116* *Study building plans to locate specifications.* ***Assessment: Multiple choice test.***	Using a set of building plans, the student will identify key specifications. Performance will be satisfactory if seven out of ten specifications are identified.
Teamwork	*ELE 116* *Apply the "Project Critique Checklist" in a team project evaluation.* ***Assessment: Checklist completed by the instructor during the evaluations and feedback provided by the instructor after the evaluations.***	Provided with complete class projects, student teams will evaluate other student's blueprints, papers or projects and provide feedback to the student. Performance will be satisfactory if students complete the assignment within the class period and identify two strengths and weaknesses of the Projects and work in teams to conduct the critique.	*ELE 116* *Convene in teams in the lab and complete the team installation of electrical service project following the checklist.* ***Assessment: Return demonstration using testing devices (volt meters, etc.) Checklist completed by the instructor during demonstration.***	Using training booths in labs and working in teams, students will connect a single-phase service entrance, panelboard, protective devices, switches, outlets and other related material. Performance will be satisfactory if the electrical service is installed and operates properly and students demonstrate teamwork skills identified on a teamwork checklist.

SKILL AREA	NEW ENHANCEMENTS		EXISTING ENHANCEMENTS	
	Learning Activity and Assessment	**Performance Objective**	***Learning Activity and Assessment***	**Performance Objective**
Applied Technology	*ELE 115* *In the lab environment students will practice with trainers and complete the checklists.* ***Assessment: Instructor observation and feedback.***	Using a fire and burglar alarm trainer the student will perform trouble-shooting techniques used to isolate selected problems. Performance will be satisfactory if the problem is isolated within the allotted time utilizing all safety procedures.	*ELE 106* *In the lab environment, students will use volt meters to measure electrical values.* ***Assessment: Completed fill-in-the-blank project sheet graded for values. In addition, instructor observation and feedback that students are following the correct steps and procedures to take the measurements.***	Using a multi-meter the student will measure voltage, current, and resistance in a series-parallel circuit. Performance will be satisfactory if values are properly measured and recorded.

FACULTY DEVELOPMENT PLAN
SUMMARY

LEARNING OUTCOMES (COMPETENCIES)	CONTENT	ACTIVITIES AND MODES OF DELIVERY	EVALUATION
List technical and workplace competencies associated with entry-level skills of the occupation.	Occupation Research Job Task Detailing DACUM Process Worker Interview Job Observation Advisory Committees	Conduct CBE Workshops Disseminate Fact Sheets Publish Email Newsletter Provide Instructional Design Expertise for Technical Support	Formative and Summative Evaluation for Workshop Sessions Faculty User Survey Email Usage Statistics
Develop quality syllabi for courses.	Components of Quality Syllabi NLC Student Support Services NLC Institutional Policies	Conduct CBE Workshops Provide Video Tapes Disseminate Fact Sheets Publish Email Newsletter Offer Instructional Design Software	Formative and Summative Evaluation for Workshop Sessions Checklist Critique of Course Syllabi using Components of Quality Syllabi Instructional Design Critique Faculty Critique

LEARNING OUTCOMES (COMPETENCIES)	CONTENT	ACTIVITIES AND MODES OF DELIVERY	EVALUATION
Write performance objectives.	Purpose of Performance Objectives Components of Performance Objectives: Performance, Conditions, and Criterion	Conduct CBE Workshops Disseminate Fact Sheets Provide Faculty Mentoring	Formative and Summative Evaluation for Workshop Sessions Checklist Critique of Performance Objectives Dean Division Review Faculty peer Review Instructional Design critique
Develop learning activities.	Effective Teaching Strategies Learning Styles Application of Teaching/Learning Strategies in Curriculum Learning Activities Specific to Workplace Skills Modes of Delivery	Conduct CBE Workshop Distribute Faculty Content Expert Guide Provide Video Tapes Schedule Opportunities to Observe Instructional Applications in the Classroom Provide Faculty Mentoring	Formative and Summative Evaluation for Workshop Sessions Dean Division review Faculty peer review Instructional Design Critique

LEARNING OUTCOMES (COMPETENCIES)	CONTENT	ACTIVITIES AND MODES OF DELIVERY	EVALUATION
Apply student assessments that are criterion-referenced.	Performance Evaluation Instruments Criterion & Norm-Referenced Testing Informal and Formal Methods of Assessment ACT Work Keys Assessments and Other Standardized Tests	Conduct CBE Workshops Disseminate Fact Sheets Use Email Forum for Discussion Provide Faculty Mentoring	Formative and Summative Evaluation for Workshop Sessions Email Usage Statistics Division Dean Review Faculty Peer Review
Use Student Competency Profiles.	Uses of Competency Profiles Contents of a Competency Profile Development of a Competency Profile	Conduct CBE Workshop Provide Faculty Mentoring	Formative and Summative Evaluation for Workshop Sessions Checklist Critique Employer/Division Dean/Student and Instructional Designer Critiques

SECTION B

OCCUPATIONAL PROFILE

Skill Standards and Certification Project
Occupational Profile Document: North Lake College
Electrical Technology Program

I. Introduction

The North Lake College Skills Standards and Certification Project is part of a Texas state tri-agency initiative in workforce development and education. The Texas Department of Commerce, Texas Education Agency and Texas Higher Education Coordinating Board are jointly funding this project.

In keeping with the spirit and intent of the Secretary's Commission on Achieving Necessary Skills (SCANS), The Smart Jobs Strategy Report to the Governor, The Master Plan for Career and Technical Education and the School-to-Work Transition Plan, the overall goal of this Project is to make the concept of a world-class workforce a reality. As stated in the article, "Skills Standards and Certification: A Bridge from Education to the Workplace," by David Dennis:

> "The consistent message from every stakeholder group ... is that in order to have a world-class workforce, we must have a world-class education system."

Thus, this Project was researched and developed with the idea of designing a comprehensive strategy to link elements from the State's existing vocational-technical education, job training, adult education, tech prep and apprenticeship programs with the components of SCANS and School-to-Work Transition. The

Skills Standards and Certification Project's purpose is to **develop a curriculum model** that provides a process for infusing SCANS skills into the technical content of technical/occupational programs. An ancillary objective is to **apply national occupational standards** to the development of technical and occupational programs. The result will be a newly-designed training application for academic and occupational programs at the secondary, post-secondary and apprenticeship levels.

For the purpose of this Project, the "demand" occupation of Electrical worker was selected by North Lake College. Electricians are essential to economic development in Texas especially in areas of increased construction and renovation. According to the North Central Texas Interlink, Inc. "1993-2000 Demand Occupations" publication, Electricians are included in their "Top 40" occupation list for those occupations that will be in high demand and will require formal education beyond high school. Texas SOICC predicts employment of Electrical workers to reach 31,800 by 1995 with average annual job openings of 1,355. (Appendix A)

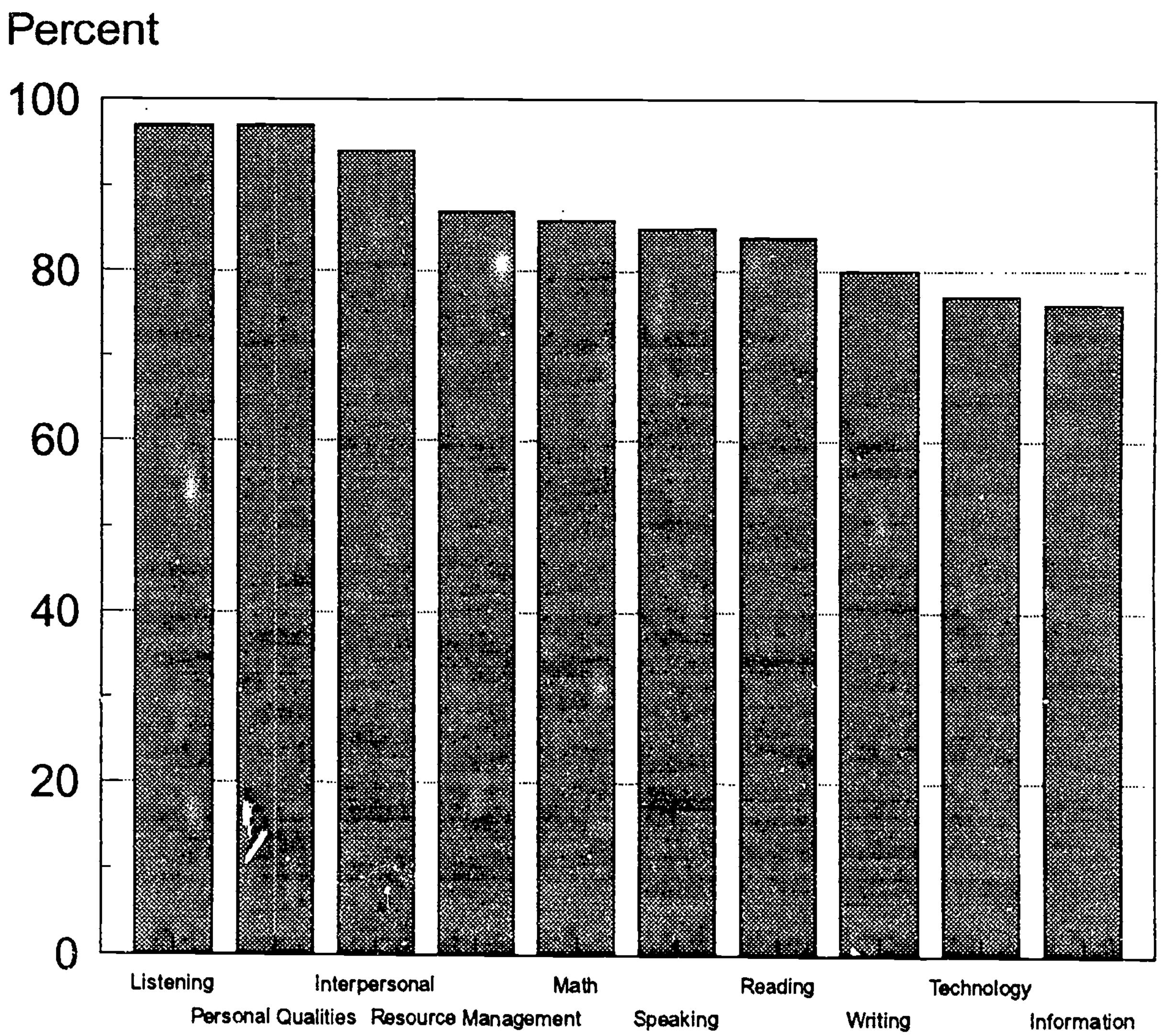
North Lake College has partnered with the Dallas Electrical Joint Apprenticeship and Training Committee (DJATC) to accomplish project objectives, activities, and products. Project activities concentrate on the application of national electrical industry skill standards and SCANS skills to the North Lake College Electrical Technology Associate of Applied Sciences Degree and Certificate Programs. The Electrical Apprenticeship and Dallas Independent School District Skyline Electrical Technology programs are also being reviewed and recommendations will be proposed for curriculum enhancements.

II. Workplace Needs and SCANS Skills

Recently, the Dallas Morning News, in a special report on June 23, 1994, captured the essence of the national movement toward linkage of national skills standards and workplace skill needs. Based upon a survey of 5,000 Dallas-Ft.Worth area companies, they reported that small business owners (500 or fewer employees) wanted but were unable to find entry-level job applicants with the following skills: listening, personal qualities, interpersonal, resource management, math, speaking, reading, writing, technology, and information. The survey, which was conducted by the National Alliance of Business, asked respondents to rate the importance of these skills and indicate how hard these skills are to find in entry-level applicants. Six hundred seventy-three companies responded. Results are graphically depicted on the following two pages. A complete copy of the article appears in Appendix B.

SKILLS SMALL BUSINESS OWNERS WANT FROM ENTRY-LEVEL WORKERS

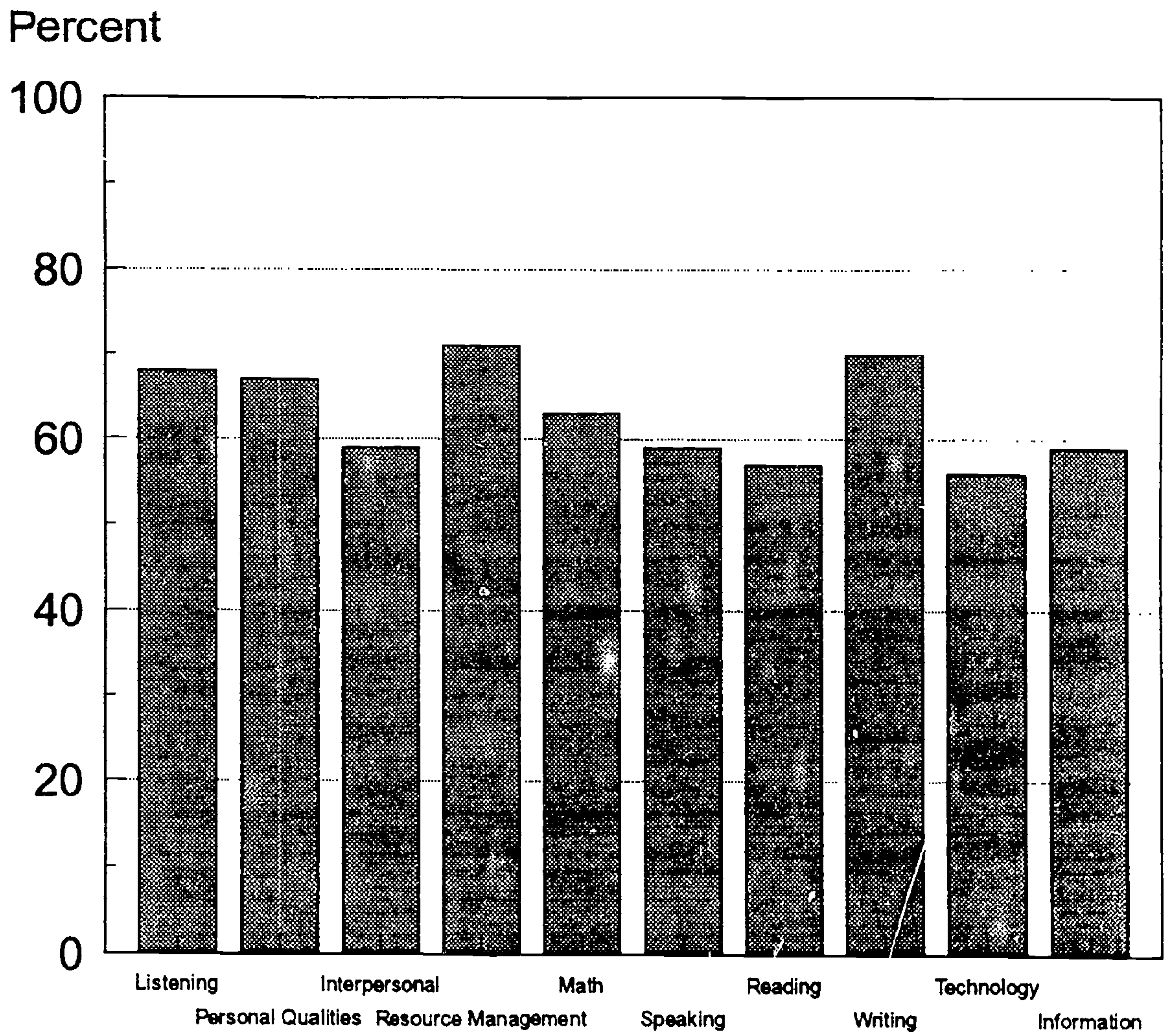
Based on a survey of 5,000 Dallas/Ft. Worth area companies with 500 or fewer employees.



Ranked by the percentage of companies saying skills are "fairly or "very" important.
Response: 673 companies
Source: National Alliance of Business
Published by: The Dallas Morning News, June 23, 1994

SKILLS SMALL BUSINESS OWNERS REPORT ARE HARDEST TO FIND

Based on a survey of 5,000 Dallas/Ft. Worth area companies with 500 or fewer employees.



Ranked by the percentage of companies saying they "sometimes" or "usually" have trouble finding employees with these skills..
Response: 673 companies
Source: National Alliance of Business
Published by: The Dallas Morning News, June 23, 1994

III. Linkage to National Skills Standards

The National Joint Apprenticeship and Training Committee (NJATC), the International Brotherhood of Electrical Workers (IBEW), and the National Electrical Contractors Association (NECA) have partnered and are taking the leadership in developing national skill standards for the electrical industry. The IBEW is developing the occupational tasks, the NECA (with support from a federal grant) is developing the skills standards, and the NJATC will review and dove-tail the two projects.

The Co-bidder organization is involved in providing data for the national job analysis project and will disseminate the national skill standards. A.C. McAfee, local training director for the Dallas-based Training Committee, will assist Project staff in applying the national skills standards. The skills standards and occupational tasks are projected to be available in August, 1994. These electrical industry skills standards can then be incorporated into this Project and provide the necessary linkage to national skills standards efforts. (See Appendix C)

The National Alliance of Business supports policy and program initiatives in education restructuring, enhanced job training and workforce quality. As part of the public policy initiative for educational reform, the Alliance has exerted a leadership role in supporting the development of the Goals 2000 legislation which seeks to:

establish a voluntary national system of occupational skill standards

develop state-based content standards

create a new educational assessment system

codify the national education goals

establish a permanent bipartisan national education goals panel.

The Alliance recognizes the need for legislation which fosters a connection between work and school learning for the economic development and ability of the United States to compete in a global economy. (Chairman's Message, "National Alliance of Business: 25 Years of Helping America Work," January 1, 1994)

Jim Horton, president of North Lake College, is a participant in the National Alliance of Business' Leadership Series addressing workforce issues, education reform and public policy initiatives. Further, Dr. Horton is associated with the national skills standards project funded by the Department of Labor for the development of voluntary skills standards for the Environmental Technician occupation. By participation in these and other related endeavors, Dr. Horton provides leadership and the connection needed between the National Skills Standards activities and the North Lake Skills Standards and Certification Project funded by the Texas tri-agency organizations.

Carol Marlow, director of the North Lake College Skills Standards and Certification Project, attended a recent midwest conference which provided a forum for interaction with and education about the voluntary national skills standards projects funded by the Department of Labor. She attended presentations on four of the skills standards projects and met the project directors. Further, the Manufacturing Skills Project Director (of the Foundation for Industrial Modernization, the reserach affiliate of the National Coalition for Advanced Manufacturing), C. J. Shroll, contacted Ms. Marlow concerning a site visit to the North Lake Project. It was felt a meeting to discuss the two projects and exchange information on methodology could be beneficial to both projects. This exemplies the interaction between the state and national skills standards efforts and provides the linkage to national efforts the tri-agency is striving toward.

IV. Methodology for Assessing and Measuring the Work Keys Skill Areas

For the purpose of this project North Lake College selected the American Collge Testing (ACT) association to conduct their Occupational Analysis and Profile process called Work Keys. The Work Keys process develops job profiles using job task analysis and skills evaluation. A Work Keys process flowchart appears in Appendix D. The profiling process identified occupational tasks associated with entry-level employment at the apprentice level for the Electrician occupation. The process also applied a scale which serves as a metric for determining the Work Keys skill levels required for successful employment as an apprentice.

The Dallas Electrical Joint Apprenticeship and Training Committee (DJATC), the co-bidder, in conjunction with North Lake College recruited eight licensed Journeyman electricians to serve as subject matter experts. The profiling was conducted on March 10, 1994 at the DJATC training center. A preliminary task list for the occupation was presented to the Journeymen who expanded and modified the tasks to accurately describe the job duties of the first-year Apprentice. Job tasks were then rated by the Journeyman in terms of importance and relative time spent. A criticality rating was then determined by multiplying the importance rating by the relative time spent rating. The tasks were then rank ordered and least important tasks were deleted generating the Final Task List.

OCCUPATION TITLE: ELECTRICIAN
ACT WORK KEYS IDENTIFIED TASKS
3/10/94

Final Task List	
1.	Measures, cuts, bends, threads, assembles, and installs electrical conduit, using tools such as hacksaws, pipe threaders, and conduit benders.
2.	Works and coordinates with others (including people practicing other crafts) to complete assigned projects.
3.	Cuts wires, cables, conduit, and raceway, threading and reaming conduit, boring and cutting chases under the direction of the foreman.
4.	Provides prompt and efficient service to customers by responding quickly to customer work orders.
5.	Connects wiring to accessories, such as relays, circuit breakers, plugs, condensers, switches, and solenoids; and installs accessory assemblies in electrical or electronic units using soldering gun and hand tools.
6.	Uses the proper rigging to pull wire and communication cable of all sizes through conduit, cable trays, and all other raceways using proper hand tools and power tools.
7.	Works safely to prevent on the job injuries by using appropriate safety equipment, such as rubber gloves and sleeves, and methods such as, grounding line equipment and jumpers.
8.	Connects conductors to switches, receptacles, or appliances with proper methods of splicing, or soldering and taping.
9.	Connects wiring to lighting fixtures and power equipment using hand tools.
10.	Installs control, distribution, and electronic apparatus, such as switches, relays, and circuit breaker panels, programmable controllers; using hand tool and power tools to fasten in place with screws or bolts.
11.	Lays out the various outlets, switches, receptacles, and other details of the job from blueprints or by direction of the superintendent of construction.
12.	Plans new or modified installations to minimize waste of materials, provide access for future maintenance, and avoid unsightly, hazardous, and unreliable wiring, consistent with specifications and local electrical codes.
13.	Plans, lays out, installs, and repairs wiring, electrical fixtures, apparatus, and control equipment using hand tools and power tools.

Final Task List	
14.	Splices wires by stripping insulation from terminal leads (using a knife or wire strippers), twisting or soldering wire together, and applying tape or terminal caps or necessary lugs.
15.	Using measuring instruments, such as rulers, plumb-bobs, levels, and wire gauges.
16.	Reads and understands construction standards manual and is familiar with electrical codes.
17.	Uses measuring instruments such as volt meters, ohm meters, and amp meters.
18.	Interprets maintenance manuals, schematics, and wiring diagrams, and repairs equipment, utilizing knowledge of electronics and using standard test instruments using hand tools and power tools.
19.	Reads work order to determine installation procedures specified by supervisor/technician.
20.	Studies and understands electrical theory (Ohm's Law; single-phase and three-phase circuits; and vectors, voltage drops, series and parallel circuits).
21.	Tests circuits and electric components to locate grounded wires, broken connections, or defective current-control mechanisms using electrical testing instruments.
22.	Installs and connects single-phase and three-phase bank transformer connections and capacitor banks/voltage regulators.
23.	Attends regular safety meetings and reads distributed material regarding new safety procedures.
24.	Completes company paperwork such as truck inspection forms, time sheets, panel and transformer cards, accident reports, work orders, and oil spill sheets.
25.	Performs and understands switching procedures of the distribution and transmissions system and fills out appropriate paperwork.
26.	Prepares sketches or as-built drawings showing location of wiring and equipment, or follows diagrams or blueprints, ensuring that concealed wiring is installed before completion of future walls ceilings, and flooring.
27.	Suggests improvements in work methods by reviewing current procedures and using on-the-job experience to make tasks more efficient.
28.	Troubleshoots, repairs, and maintains, in accordance with diagrams, sketches, operation manuals, and manufacture's specifications, machinery and equipment, such as transformers, tools, regulators, reclosers, capacitors, switches, fuses, and cut-outs.

Final Task List	
29.	Takes measurements, such as street and building dimensions, distances to be spanned by wire and cable, or space available in existing buildings and underground vaults, which affect installation and arrangement of equipment.
30.	Operate radio to communicate with co-workers and dispatchers.
31.	Recognizes and identifies the wide variety of conductors, such as underground and overhead.
32.	Assesses work environment for proper wiring methods and materials and hazardous locations.
33.	Digs trench and lays underground cable and conduit to connect source of power to customer's building, setup outdoor lighting as well as laying underground cable and conduit for data and communications (commercial, industrial, and residential).
34.	Drives and operates vehicles and equipment, such as trucks (may be required to have commercial driver's license) trenchers, and tractors.
35.	Installs and replaces duct systems and underground cable (works in underground vaults where cables are located).
36.	Installs, maintains, and repairs pedestals, equipment pads, switching cabinets, pad-mounted transformers, and other underground equipment.
37.	Locates cable and faults using fault and/or cable locating equipment.
38.	Observes functioning of installed equipment or system to detect hazards and need for adjustments, relocation, or replacement.
39.	Removes obstructions (steel structures, manhole covers, substation enclosures) and material in order to gain access to and remove defective parts or perform maintenance, using hoists, personnel lifts, cranes, hand tools and power tools.
40.	Replaces defective components and parts, such as transistors, coils, and integrated circuits, using soldering iron, wire cutters, hand tools, and power tools.
41.	Works on energized lines with rubber gloves, mats, and blankets and/or live line tools.
42.	Terminates, splices, and tests cable according to manufacturing specifications.
43.	Uses transit and tripod to establish grade and elevation.
44.	Cuts and welds steel structural members using flame cutting and welding equipment.

The eight subject matter experts (SMEs) then began the process of skills analysis. During this process, the 44 identified tasks were sorted into categories associated with the each of the seven Work Keys skills. These skills included reading for information, applied mathematics, listening, writing, locating information, teamwork, and applied technology and are defined in the text following this section.[1]

The SMEs then worked to identify on-the-job tasks associated with each skill as it is used by an Apprentice in the Electrical occupation. SMEs were asked to review the skill descriptions provided by ACT to determine the levels of each of the seven Work Keys skills needed to perform that occupation. The definition of levels (scale) appears in Appendix E. This information was used to develop the final product, the profile, which appears in Appendix F.

1. "Although the Work Keys scale does not identify the foundation and workplace skills in exactly the same way as SCANS, it is similar to SCANS and is sufficiently developed for purposes of this project." RFP, page 25.

V. SCANS Competencies and Foundation Skills

SCANS Competencies and Foundation Skills provide another framework for evaluating industry based skills. Competencies are the skills that were identified by the Secretary's Commission as necessary for success in the workplace, and foundations are the skills and qualities that underlie them. The SCANS skills are defined in the U. S. Department of Labor's Report: Skills and Tasks for Jobs: A SCANS Report for America 2000. They appear in Appendix G.

In this same report, an assessment of SCANS functional and enabling skills was cited for the occupation of Electrician. This was one of fifteen occupations initially selected by SCANS to be included in a small pilot test to refine their job analysis methods. The results of this pilot test appear in Appendix H.

The SCANS skills definitons are useful in providing a more descriptive explanation of the seven skill areas. The ACT Work Keys-identifed skills metric provides a continuum for guaging the level of skills needed for successful employment. In combination, these skill definitions provide both the basis for numeric comparison and identification of skill areas that can be applied for curriculum development purposes. They are paired in the following pages.

READING
ACT WORK KEYS AND SCANS SKILLS DEFINED

SCANS Reading Skill defined:

Locates, understands, and interprets written information in prose and documents including manuals, graphs, and schedules to perform tasks; learns from text by determining the main idea or essential message; identifies relevant details, facts, and specifications; infers or locates the meaning of unknown or technical vocabulary; judges the accuracy, appropriateness, style, and plausibility of reports, proposals, or theories of other writers. (1)

ACT Reading for Information Level 5 defined:

Employees must read moderately detailed and complicated company policies, procedures and announcements. These reading materials contain words and phrases that may be specialized (jargon and technical language) or words that have several meanings. All of the information employees need is stated clearly in the reading materials, but the employees must consider several factors in order to identify the course of action that will accomplish their goals.

Employees are required to:

-understand the paraphrased definition of specialized words or phrases (jargon or technical terms) defined in these reading materials

-use jargon or technical terms appropriately in describing situations stated in these reading materials

-understand the meaning of acronyms defined in these reading materials

-figure out which definition of a word with multiple meanings is appropriate in the context of these reading materials

-apply information given in these reading material to situations that are not directly described, but similar

-apply instructions or procedures with a number of steps to described situations. These instructions may include conditionals (if X happens, then you should do Y) (2)

ACT Reading for Information Level 6 defined:

Employees must read difficult company policies, procedures, and announcements. These reading materials present complicated information; for example, they may include excerpts from regulatory and legal documents. These reading materials use advanced vocabulary, jargon, and technical terms to describe elaborate procedures and concepts. Most of the information employees need in order to identify an appropriate course of action is not clearly stated in the reading material. Thus, employees may need to determine the principles underlying the described situation and apply those principles to new situations not depicted in the reading material.

Employees are required to:

-understand specialized words or phrases (jargon or technical terms) when used in an unfamiliar context

-apply complicated information to new situations

-figure out from context the less common meaning of a word with multiple meanings

-figure out the general principles underlying situations described in these reading materials and apply those principles to related situations

-understand implied details

-figure out the reasoning behind a procedures, policy, or communication (2)

MATHEMATICS
ACT WORK KEYS AND SCANS SKILLS DEFINED

SCANS Arithmetic Skill defined:

Performs basic computations; uses basic numerical concepts such as whole numbers and percentages in practical situations; makes reasonable estimates of arithmetic results without a calculator; and uses tables, graphs, diagrams, and charts to obtain or convey quantitative information. (1)

ACT Applied Mathematics Level 6 defined:

Employees are required to :

-set up problems and do several steps of calculations or conversions

-calculate using negative numbers, fractions, ratios, percentages, or mixed numbers (e.g., 121/8)

-transpose a formula before calculating (e.g., v = ir = r = v/i), or look up and use two formulas to change from one unit to another unit within the same system of measurement (e.g., 1 cup = 8 fl oz and 1 quart = 4 cups)

-find mistakes in calculations, such as those required in lower levels (2)

For example, employees might be required to calculate multiple rates, to find areas of rectangles and volumes of rectangular solids, or to solve problems that compare production rates and pricing schemes. (2)

ACT Applied Mathematics Level 7 defined:

Employees are required to:

-perform several steps of reasoning and calculations

-solve problems involving more than one unknown and nonlinear functions (e.g., rate of change)

-find mistakes in multiple-step calculations

-figure out the information needed to solve a problem when the information presented is incomplete or implicit

For example, employees might be required to convert between systems of measurement that involve fractions, mixed numbers, decimals, or percentages; to calculate multiple areas and volumes of spheres, cylinders, or cones; or to set up and manipulate complex ratios or proportions. (2)

LISTENING
ACT WORK KEYS AND SCANS SKILLS DEFINED

SCANS Listening Skill defined:

Receives, attends to, interprets, and responds to verbal messages and other cues such as body language in ways that are appropriate to the purpose; for example, to comprehend, to learn, to critically evaluate, to appreciate, or to support the speaker. (1)

ACT Listening Skill Level 4 defined:

Employees must understand all the important information from the spoken material. They may miss subtle details or tone or may have incorrect noncritical information that does not interfere with the main idea. (2)

ACT Profile Comments:

The group members agreed that a great deal of an apprentice's job is to listen either during classroom instruction or while working on the job with a journeyman electrician. (2)

WRITING
ACT WORK KEYS AND SCANS SKILLS DEFINED

SCANS Writing Skill defined:

Communicates thoughts, ideas, information, and messages in writing; records information completely and accurately; composes and creates documents such as letters, directions, manuals, reports, proposals, graphs, flow-charts; uses language, style, organization, and format appropriate to the subject matter, purpose and audience; includes supporting documentation and attends to level of detail; and checks, edits, and revises for correct information, appropriate emphasis, form, grammar, spelling, and punctuation. (1)

ACT Writing Skill Level 3 defined:

Employees' writing must convey information clearly. Most of the sentences in the messages are complete. There are some mechanical errors which do not interfere with understanding the meaning. Writing does not contain slang. (2)

ACT Writing Skill Level 4 defined:

Employees' writing conveys information clearly. All of the sentences in the writing are complete, though they may be choppy. Writing does not contain any slang. There may be a few minor mechanical errors, but these errors do not interfere with understanding the meaning. (2)

ACT Profile Comments:

Six members of the group felt individuals could start the apprenticeship program at Level 3 of this skill, while the remaining group members felt Level 4 was more appropriate. The group noted that, in their opinion, most of the current workforce is at Level 3. (2)

LOCATING INFORMATION
ACT WORK KEYS AND SCANS SKILLS DEFINED

SCANS Acquires and Evaluates Information defined:

Identifies need for data, obtains them from existing sources or creates them, and evaluates their relevance and accuracy. Competently performing the tasks of acquiring data and evaluating information includes analytic questions to determine specific information needs; selecting possible information and evaluating its appropriateness; and determining when new information must be created. (1)

ACT Level 5 defined:

Employees must read complicated workplace graphics, such as detailed forms, tables, graphs, diagrams, instrument gauges, and maps.

Employees are required to:

-summarize and/or compare information and trends in a single graphic

-summarize and/or compare information and trends among more than one workplace graphic, such as a bar chart and a table showing related information

TEAMWORK
ACT WORK KEYS AND SCANS SKILLS DEFINED

SCANS Teamwork Skill defined:

Works cooperatively with others and contributes to group with ideas, suggestions, and effort. Demonstrating competence in participating as a member of a team includes doing own share of tasks necessary to complete a project; encouraging team members by listening and responding appropriately to their contributions; building on individual team members' strengths; resolving differences for the benefit of the team; taking personal responsibility for accomplishing goals; and responsibly challenging existing procedures, policies, or authorities. (1)

ACT Teamwork Skill Level 3 defined:

Employees are required to recognize the behaviors or actions which would best support the team and contribute to work performance when faced with simple work situations involving one problem or one issue that needs to be handled. In these work situations, the team goals and consequences are clear, all the resources needed to deal with the problems are available, and the relationship among team members is good.

Employees may be required to:

-understand the goal that the team is trying to accomplish and how to work with other team members to accomplish that goal

-choose actions that support the ideas of other team members and try to use their suggestions to accomplish team goals

-determine if the team is having problems finishing a task and figure out what is causing these problems (2)

ACT Profile Comments:

The discussion focused around conflict that can occur in work groups and the SMEs decided that problems were handled in a speedy manner prior to getting out of control. (2)

TECHNOLOGY
ACT WORK KEYS AND SCANS SKILLS DEFINED

SCANS Technology Skill defined:

Understands the overall intent and the proper procedures of setting up and operating machines, including computers and their programming systems. Demonstrating competence in how to apply technology to task includes understanding how different parts of machines interact and how machines interact with broader production systems; on occasion installing machines including computers; setting up machines or systems of machines efficiently to get desired results; accurately interpreting machine output; and detecting errors from program output. (1)

ACT Technology Skill Level 5 defined:

Employees are required to solve problems involving one complex system, or one or more uncomplicated tools or systems. In solving some of these problems, employees must apply difficult physical principles, such as phase change or pressure equilibrium in a system.

Employees are required to:

-understand moderate and advanced principles of mechanics, electricity, thermodynamics, and fluid dynamics

-understand the operation of complex machines and systems, such as gasoline engines, complex appliances and building electrical systems (2)

Sources:
(1) Skills and Tasks for Jobs: A Scans Report for America 2000. Secretary's Commission on Achieving Necessary Skills, US Dept of Labor.
(2) ACT Work Keys Profile: Construction Electrician. March 10, 1994.

VI. Applicability of Scale Across Occupations

Information gathered through an analysis process such as that provided in the ACT Work Keys Profile can be of true benefit to education and industry. For example, the process pairs the requisite skills with job-relevant tasks letting employers know what skills are needed in employees performing a given job and provides the educator with a tool to match training to industry-specific requirements for a trained workforce.

Educational Applications

The results of the ACT Work Keys Occupational Profile can be used by the Dallas County Community College District and North Lake College to improve the development and delivery of education in the following ways:

- To communicate the expectations of the workplace to educators and students
- To facilitate the transition fr ın school-to-work by identifying needed skills so that they in turn may be incorporated into the curriculum
- To provide an assessment of student employability skills
- To provide a resource of identified skill levels required for successful on-the-job performance which can be used by facult; and curriculum designers during curriculum development.
- To provide a careeı planning resource for students

Business Applications

The results of the ACT Work Keys Occupational Profile can be used by the co-bidder organization and companies that hire trained workers in the following ways:

- To communicate industry expectations to schools and training providers
- To communicate common skill standards throughout the industry
- To identify and in turn develop the necessary training needed by employees to upgrade their skills
- To provide a resource for personnel decisions when hiring, placing, and promoting employees

In this way, a responsive partnership is promoted between industry/business and educational institutions/providers. Business articulates, via a systematic profiling process, what tasks are performed and associated skills needed in a specific occupation. The educational provider responds by training students in skills and job tasks that are industry relevant. Industry wins by getting a "job ready" employee and realizing savings on training costs and retention of employees, employees win by being able to perform successfully on the job immediately, and educational institutions win by both recruiting and retaining students as well as graduating and placing skilled workers in jobs. Ultimately, the economy benefits through this workforce partnership.

VII. Work Keys Profiling Process and Review

The tri-agency partnership via the RFP for this proposal requires as part of the handbook a critique of the ACT process following RFP guidelines on page 25-26. North Lake College has reviewed and is applying the Work Keys scale to the development of the enhanced curriculum for the Associate Degree in Electrical Technology program. NLC offers that there are a number of issues that need to be considered in applying the scale across occupations.

- ***Work Keys skills scale metric: Strengths & Modifications***

Strengths:

Employing a standard of measurement or metric to quantify industry-based skill areas is a necessary and long-awaited tool. The ACT Work Keys scale provides the means to begin to quantify skills. This is an area of great need in developing curricula and assessments for skill achievement. The development of the levels by discrete units is desirable and establishes a framework for developing proficiency levels or defining relative increments of competence on a scaling basis. Two examples of the usefulness of this approach are: remediation and establishment of career paths.

The *criticality rating* for job tasks is useful and is generated from the multiplication of the importance rating and time spent rating. It allows for prioritization of tasks which is useful for establishing emphasis in a curriculum development process.

Modifications:

A major consideration for application of the scale across occupations is deriving a standardized and detailed scale. The definitions of skills are inadequate in detail which creates barriers to understanding and applying the scales in a meaningful way. When the North Lake College content experts were identifying learning concepts and activities for the seven areas: locating information, reading for information, applied mathematics, applied technology, teamwork, writing, and listening there was difficulty associating learning concepts with skills that were so broadly defined.

In addition, the levels identified with each Work Keys skill need to be sufficiently discrete to allow subject matter experts (SME's) the ability to differentiate between levels in their assessment. Skill levels need to be distinguishable as a full step apart or as whole number steps by definition; otherwise, a lack of clarity and indecision about which level applies results.

This causes difficulty later in designing curricula for specific levels.

Also, additional levels could be identified that would allow for variances (increased choices) that occur below and above the range of levels presently offered. Math levels, for instance, could provide increments of 1-10 which would also make them more amenable to being measured for assessment purposes.

Examples for skill levels provided to the SME's need to match the skill area being assessed to derive an appropriate measure. For instance, phone messages would not normally be associated with examples of good writing since they are usually conversational in nature (slang), abbreviated in text, and usually intended to only capture key message content. Using this as a metric for standards of quality in writing mitigates against the intent of measuring writing ability.

Further considerations include the fact that examples for skill levels need to be grounded in the occupation being measured and use technical writing derived from the references and written resources of that occupation. The National Electric Code book is a commonly used reference in the Electrician occupation and provides a source that would achieve instant recognition by Electrician subject matter experts. The commonly used manuals and written policies of a given occupation would be more readily identified and relevant sources to employ.

♦ *Work Keys Profiling Process: Strengths and Modifications*

There are many positive features of the Work Keys methodology that provide useful information for job task analysis and skills evaluation.

Strengths:

Job Observation for Data Gathering

As a part of the Work Keys profiling methodology and research, a job profile analyst observes a job being performed prior to conducting the profiling session. This provides the job profile expert necessary information about how a particular job is actually performed and helps identify the tasks an employee must perform as a part of this occupation.

Computer Technology

Computers are employed on site during the profiling process which provide for quick turnaround of information. Wordprocessing allowing edits of task lists in an expedient manner which facilitates the development of the final task lists.

Subject Matter Experts

Subject matter experts are employed to participate in the profiling exercise which gives direct industry feedback and lends credibility to the quality of the information derived from the process. The SMEs are able to clarify and educate profiling facilitators about the occupation and there is a synergy that develops as a result.

Modifications

Consideration of these factors may be warranted for improving the process.

Sharing Job Tasks Paired with Skills

It would serve curriculum developers and college faculty if the matching exercise results could be shared from the profiling process. It is during this step that job tasks are paired with Work Keys skill levels. This is a valuable exercise and yields results that are needed for curriculum enhancements. We have found it necessary to duplicate this exercise in order to obtain the needed information although it was performed during the profiling process.

Occupation Task List Sources

The occupational task list should incorporate other sources of information besides the Dictionary of Occupational Titles. For example, incorporating DACUM information that is valid and current would be beneficial in deriving an initial task list that profilers could assess.

VIII. Application of ACT Work Keys Scale to Electrician Occupation

Matrix Development:

Using the ACT Work Keys Profile, North Lake College Project staff developed a matrix to pair the identified Electrician job tasks with the Work Keys skills. The purpose of this tool was to gather industry-validated information for decison making in curriculum development. It appears on the following five pages. Two Electrical industry experts completed the matrix to identify where these skills are needed in the performance of each task. A.C. McAfee, training director, Dallas Electrical and Joint Apprenticeship Program and Ronald O'Riley, consultant/presentor, Innovative Education, Inc., identified which skills apply to each task in the profile. Both experts have served as training directors in the apprenticeship program and are Master electricians. Their response overwhelmingly indicates the skills of reading, applied mathematics, listening, writing, locating information, teamwork, and applied technology are necessary for successful performance of job tasks as they are performed in the Electrician occupation. (Appendix I) This information will be used in the third quarter of the Project to match industry requirements for skilled workers with post secondary training provided in apprenticeship, certificate and associate degree programs.

OCCUPATION TITLE: ELECTRICIAN
WORK KEYS IDENTIFIED TASKS
AND SCANS MATRIX

Instructions: Please mark each SCANS skill that is necessary for successful performance of each task.

R	=	Reading for Information
AM	=	Applied Mathematics
L	=	Listening
W	=	Writing
LI	=	Locating Information
T	=	Teamwork
AT	=	Applied Technology

SCANS SKILLS

ACT Work Keys Final Task List	R	AM	L	W	LI	T	AT
1. Measures, cuts, bends, threads, assembles, and installs electrical conduit, using tools such as hacksaws, pipe threaders, and conduit benders.							
2. Works and coordinates with others (including people practicing other crafts) to complete assigned projects.							
3. Cuts wires, cables, conduit, and raceway, threading and reaming conduit, boring and cutting chases under the direction of the foreman.							
4. Provides prompt and efficient service to customers by responding quickly to customer work orders.							
5. Connects wiring to accessories, such as relays, circuit breakers, plugs, condensers, switches, and solenoids; and installs accessory assemblies in electrical or electronic units using soldering gun and hand tools.							
6. Uses the proper rigging to pull wire and communication cable of all sizes through conduit, cable trays, and all other raceways using proper hand tools and power tools.							
7. Works safely to prevent on the job injuries by using appropriate safety equipment, such as rubber gloves and sleeves, and methods such as, grounding line equipment and jumpers.							
8. Connects conductors to switches, receptacles, or appliances with proper methods of splicing, or soldering and taping.							
9. Connects wiring to lighting fixtures and power equipment using hand tools.							

R	=	Reading for Information
AM	=	Applied Math
L	=	Listening
W	=	Writing
LI	=	Locating Information
T	=	Teamwork
AT	=	Applied Technology

ACT Work Keys Final Task List	R	AM	L	W	LI	T	AT
10. Installs control, distribution, and electronic apparatus, such as switches, relays, and circuit breaker panels, programmable controllers; using hand tool and power tools to fasten in place with screws or bolts.							
11. Lays out the various outlets, switches, receptacles, and other details of the job from blueprints or by direction of the superintendent of construction.							
12. Plans new or modified installations to minimize waste of materials, provide access for future maintenance, and avoid unsightly, hazardous, and unreliable wiring, consistent with specifications and local electrical codes.							
13. Plans, lays out, installs, and repairs wiring, electrical fixtures, apparatus, and control equipment using hand tools and power tools.							
14. Splices wires by stripping insulation from terminal leads (using a knife or wire strippers), twisting or soldering wire together, and applying tape or terminal caps or necessary lugs.							
15. Using measuring instruments, such as rulers, plumb-bobs, levels, and wire gauges.							
16. Reads and understands construction standards manual and is familiar with electrical codes.							
17. Uses measuring instruments such as volt meters, ohm meters, and amp meters.							
18. Interprets maintenance manuals, schematics, and wiring diagrams, and repairs equipment, utilizing knowledge of electronics and using standard test instruments using hand tools and power tools.							
19. Reads work order to determine installation procedures specified by supervisor/technician.							
20. Studies and understands electrical theory (Ohm's Law; single-phase and three-phase circuits; and vectors, voltage drops, series and parallel circuits).							

R = Reading for Information
AM = Applied Math
L = Listening
W = Writing
LI = Locating Information
T = Teamwork
AT = Applied Technology

ACT Work Keys Final Task List	R	AM	L	W	LI	T	AT
21. Tests circuits and electric components to locate grounded wires, broken connections, or defective current-control mechanisms using electrical testing instruments.							
22. Installs and connects single-phase and three-phase bank transformer connections and capacitor banks/voltage regulators.							
23. Attends regular safety meetings and reads distributed material regarding new safety procedures.							
24. Completes company paperwork such as truck inspection forms, time sheets, panel and transformer cards, accident reports, work orders, and oil spill sheets.							
25. Performs and understands switching procedures of the distribution and transmissions system and fills out appropriate paperwork.							
26. Prepares sketches or as-built drawings showing location of wiring and equipment, or follows diagrams or blueprints, ensuring that concealed wiring is installed before completion of future walls ceilings, and flooring.							
27. Suggests improvements in work methods by reviewing current procedures and using on-the-job experience to make tasks more efficient.							
28. Troubleshoots, repairs, and maintains, in accordance with diagrams, sketches, operation manuals, and manufacture's specifications, machinery and equipment, such as transformers, tools, regulators, reclosers, capacitors, switches, fuses, and cut-outs.							
29. Takes measurements, such as street and building dimensions, distances to be spanned by wire and cable, or space available in existing buildings and underground vaults, which affect installation and arrangement of equipment.							
30. Operate radio to communicate with co-workers and dispatchers.							

R = Reading for Information
AM = Applied Math
L = Listening
W = Writing
LI = Locating Information
T = Teamwork
AT = Applied Technology

ACT Work Keys Final Task List	R	AM	L	W	LI	T	AT
31. Recognizes and identifies the wide variety of conductors, such as underground and overhead.							
32. Assesses work environment for proper wiring methods and materials and hazardous locations.							
33. Digs trench and lays underground cable and conduit to connect source of power to customer's building, setup outdoor lighting as well as laying underground cable and conduit for data and communications (commercial, industrial, and residential).							
34. Drives and operates vehicles and equipment, such as trucks (may be required to have commercial driver's license) trenchers, and tractors.							
35. Installs and replaces duct systems and underground cable (works in underground vaults where cables are located).							
36. Installs, maintains, and repairs pedestals, equipment pads, switching cabinets, pad-mounted transformers, and other underground equipment.							
37. Locates cable and faults using fault and/or cable locating equipment.							
38. Observes functioning of installed equipment or system to detect hazards and need for adjustments, relocation, or replacement.							
39. Removes obstructions (steel structures, manhole covers, substation enclosures) and material in order to gain access to and remove defective parts or perform maintenance, using hoists, personnel lifts, cranes, hand tools and power tools.							
40. Replaces defective components and parts, such as transistors, coils, and integrated circuits, using soldering iron, wire cutters, hand tools, and power tools.							
41. Works on energized lines with rubber gloves, mats, and blankets and/or live line tools.							

R = Reading for Information
AM = Applied Math
L = Listening
W = Writing
LI = Locating Information
T = Teamwork
AT = Applied Technology

ACT Work Keys Final Task List	R	AM	L	W	LI	T	AT
42. Terminates, splices, and tests cable according to manufacturing specifications.							
43. Uses transit and tripod to establish grade and elevation.							
44. Cuts and welds steel structural members using flame cutting and welding equipment.							

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Curriculum Analysis:

The process of curriculum analysis for the North Lake program has begun. Using the ACT Work Keys scale, Larry Blevins, North Lake College Electrical Technology Coordinator and Master electrician, has begun a critical review of the 18 program courses and is documenting where, how, and to what level the seven identified Work Keys skills are being taught in the curricula.

Additionally, using the same scale, the process of curriculum analysis for the first-year of the Dallas Electrical and Joint Apprenticeship program has been completed. The results of both of these reviews provide the baseline for the third quarter activities associated with the development of the curriculum enhancements.

SECTION C

CURRICULUM ENHANCEMENT

Skill Standards and Certification Project
Curriculum Enhancement Document: North Lake College
Electrical Technology Program

Introduction

The North Lake College Electrical Technology Program offers a two-year associate degree on the campus located in Irving, Texas. The Electrical Technology program is offered through the Business and Technology Division.

The overall Program is coordinated and taught by Larry Blevins. Larry is a faculty member who has over 15 years of teaching experience in the program at North Lake College. He has a Bachelor of Science degree in Occupational Education with majors in Electrical Technology and Business Management. He is a licensed, master electrician and has been the owner of an Electrical company. Additional sections of courses are taught by part-time instructors (adjunct faculty). All part-time instructors are experienced electricians who are employed in commercial and residential wiring businesses and bring the practical, applied approach to their instruction of electrical technology.

The Electrical Technology courses are delivered through a variety of methods and incorporate various teaching strategies to achieve course objectives. The semester-long courses are taught at the North Lake College Technology Building and delivered in classrooms, labs and on-site businesses (cooperative work experience). Instruction is delivered through lecture, discussion, lab projects, hands-on wiring exercises, and a variety of multi-media strategies. In the cooperative work experience, students spend the semester learning "on the job" at electrical businesses and construction sites.

The Electrical Technology Curriculum consists of these courses comprising 65 credits in the Associate of Applied Arts and Sciences Degree.

Introduction to Electrical Technology (2 cr)
Fundamentals of Electricity (4 cr)
Electrical Transformers (4 cr)
General Electrical Codes (2 cr)
Low Voltage Circuits (3 cr)
General Electrical Wiring (3 cr)
General Electrical Planning (4 cr)
Commercial Codes (2 cr)
Commercial Wiring (3 cr)
Commercial Planning (4 cr)
Industrial Planning (2 cr)
Industrial Codes (2 cr)
Electrical Motor Fundamentals (2 cr)
Solid State Controls (3 cr)
Motor Controls (3 cr)
Electrical Design (3 cr)
Cooperative Work Experience (3 cr)

Electrical Technology Program Courses

Course descriptions appear in Appendix J with the sequencing of courses by semester. Larry Blevins was instrumental in the development and revision of the current Electrical Technology curriculum. Additionally, the College has an advisory committee that provides linkage with the business community. The Committee advises on business trends and issues that need to be considered for curriculum development purposes.

Proposed Curriculum Analysis and Enhancement Activities

After the review of several approaches, The Curriculum Analysis and Enhancement team consisting of Larry Blevins, program coordinator, Carol Marlow, Skill Standards and Certification Project director, and Jill Gargano, instructional design consultant, selected the more comprehensive method of curriculum analysis which uses the process of systematically examining all documentation: course syllabi, examinations, all assignments, in class learning activities, textbooks, course projects, and lab manuals. The ACT Work Keys skill metrics and SCANS skill definitions provided the basis for comparison of existing skill levels taught.

The following activities were proposed to accomplish curriculum enhancements:

- Interview Program Coordinator
- Conduct Course Observations
- Study Course Syllabi/Objectives
- Review Instructional Materials
- Review Instruction Methods
- Gather and Review Research Materials
- Convene Curriculum Enhancement Team
- Review National Skill Standards and Job Task Analysis
- Study Work Keys Job Profile
- Analyze and Compare Current Curriculum
- Identify Curriculum Enhancements
- Develop SCANS Enhanced Curriculum

- Submit Draft SCANS Curriculum
- Revise Draft SCANS Curriculum
- Submit Final Enhanced Curriculum

Curriculum Analysis Steps and Outcomes

There was little variance between the proposed activities in the initial stage of the Project when the workplan was developed and the actual activities that were performed. This supports the internal validity of the process followed. The actual activities performed are described as steps below to show the appropriate sequencing of activity and outcomes.

In reality, there are contingencies that arise which are not expected nor can be planned for which require adjustments of proposed activities. In a few instances, this Project experienced that phenomenon and they are noted below.

Step 1: Interview Program Coordinator

Carol Marlow, project director, met with Larry Blevins, program coordinator, to gather information about these items:

- Course performance objectives and syllabi
- Instructional methods and activities used
- Seven SCANS skills levels taught in the courses
- Electrical technology courses content
- Course assessments employed
- Relationships with electrical industries/partners

Larry Blevins agreed to collect and organize the needed information for the curriculum analysis during the initial interview. Project objectives, goals and outcomes were discussed in detail. Work Keys profiling results were shared and explained to Mr. Blevins. Arrangements for extra service contracts were discussed in consideration of the volume of course material to review and the amount of time required to conduct a thorough analysis. Additional meetings were scheduled as follow up.

Step 2: Conduct Course Observations

Carol Marlow, project director, attended a sampling of the Electrical Technology courses taught during the Spring semester. Courses were observed and information was captured for the purpose of this Project. Items studied include: instructional methods, instructional resources, content, and SCANS skills taught.

Step 3: Study Course Syllabi and Objectives

Carol Marlow, project director, reviewed all course syllabi noting the listing of syllabi information and objectives for baseline purposes. Observations on the quality of the syllabi were made and identification of the areas where SCANS skills and ACT profiling information was present were noted. "Components of a Quality Syllabi" provided the criteria or elements being studied. It appears in the curriculum enhancement section of this document.

Step 4: Review Instructional Materials

Larry Blevins and Carol Marlow had several meetings to discuss all course materials currently being used in the 17 Program courses. The purpose of theses meetings was to educate each other about the Project, SCANS skills, and the Electrical Technology program. It was determined that a clear and comprehensive picture of "where we are" needed to be determined before the enhancement process could begin.

Reading Level Evaluation

The instructional materials review included an assessment of the reading levels of textbooks currently used in the North Lake College Electrical Technology Program. The Director of the Learning Skills Center, Donna Walker, conducted a reading level assessment of 11 textbooks used in the program. Five textbooks were assessed at the 11th grade reading level; four textbooks were rated at the 10th grade level; and one textbook received a 9th grade reading level assignment. A software program, "Grammatik," was used to derive the reading levels which applies the Flesch-Kincaid grade level formula. The Formula is as follows: (0.39) x (average number of words per sentence) + (11.8) x (average number of syllables per word) Total - 15.59 = grade level. She reports that a reading level of 6th-10th grade is useful for a general audience. In a sample of reading tests delivered by Ms. Walker to Electrical Technology students in 1992, it was revealed that 8 of 17 students scored at 9.9 grade level or below (range 6.0 - 9.9) and 9 of the 17 students had scores ranging from 10.6 - 14.4 grade level. While this is a small sample taken at one point in time, it demonstrates the wide range from low to above average reading grade levels present in the program at that time. When these test results are considered with the guidelines for general audience reading levels, it can be seen that the textbooks used in the Electrical Technology program are at an acceptable level for the mid-range of students. They conform to general accepted practice of targeting to the 10th grade reading level for written communications. These results were factored into the design of curriculum enhancements related to reading for information.

Step 5: Review Instructional Methods

Carol Marlow met with Larry Blevins to gather more detailed information concerning instructional methods and learning strategies currently employed in the Electrical Technology program. This information is not often detailed in course materials and therefore was supplemented through instructor interviews and course observation data collected in "Step 2."

Step 6: Gather and Review Research Materials

These activities provided needed sources of research materials:

- An ERIC search was conducted on the seven identified skill areas
- A Mid-West conference was attended by the Project Director entitled, "The 15th Annual Mid-America Competency Based Education and Training Conference: Achieving Standards through High Quality CBET School to Work Programs"
- DACUM materials were ordered and reviewed
- The SCANS reports were reviewed
- Syllabi criteria was obtained and reviewed
- Instructional Methods were obtained and reviewed
- North Lake faculty content experts were identified for the seven skill areas and interviewed

The information generated from this research was abundant in some of the topic and skill areas. However, in other areas it was limited or non-existent. It was during this time a decision was made to utilize faculty content experts as an additional source for information. This step was not proposed as an activity in the initial workplan, but was created to overcome the barrier created by lack of available information.

Step 7: Employment of North Lake Faculty Content Experts

Seven skill area experts were employed by the Project through special service contracts to identify learning concepts and associated learning/classroom activities that would support the achievement of the ACT identified skill levels. These experts were selected from the North Lake College faculty who teach Teamwork, Speech, Reading, Writing, Mathematics, and Electrical Technology.

The Experts were asked to provide written reports pairing identified learning concepts and associated learning/classroom activities with the SCANS skills and concepts for their subject. These reports appear in the curriculum enhancement section of this document.

Step 8: Convene Curriculum Analysis and Enhancement Team

The Curriculum Analysis and Enhancement team met to discuss the analysis strategy in light of the volume of materials to be reviewed for the 17 program courses. It was decided to collect the data electronically using the software "Q & A." Additionally, a decision was made to reference all supporting documentation which substantiated the current level to which skills are currently being taught in the curriculum. It was at this time that some of the difficulties in interpreting the ACT Work Keys skill definitions and the scale metrics surfaced. The difficulties were documented and the barriers they presented were discussed. A partial solution to this problem was derived by including the comparable SCANS skill definitions for clarity. In reality this measure did not fully address the problem and adjustments still need to be made to the ACT skill definitions and scales as recommended to ACT.

Step 9: Review National Skill Standards and Job Task Analysis

The National Skill Standards from the National Electrical Contractor's Association and the job task analysis information from the National Joint Apprenticeship and Training Committee for the Electrical Industry are not yet available. These standards are in the process of being developed by a grant from the U.S. Department of Labor. Originally, it was projected the Standards and Analysis would be published by late summer, 1994. Through continuing contact with Charles P. Kelly, the U.S. Department of Labor/NECA Skill Standards project manager, we have been briefed on difficulties they have encountered and subsequent delays. To date, the Standards are scheduled to be available for the Electrical Construction Worker by fall of 1994.

This is an obvious barrier to completion of the project objective relating to the application of national skill standards and certification as requested in the RFP.

Step 10: Study Work Keys Job Profile

The occupational tasks and skill levels that comprised the ACT Work Keys job profile were studied by the Curriculum Analysis and Enhancement team to prepare for the curriculum analysis process. It was felt the team would benefit and the process would run more smoothly if everyone became as familiar as possible with this information. This document appears in Appendix F.

Step 11: Analyze and Compare Current Curriculum

Primary Curriculum Review:

The ACT Work Keys scale was utilized in a course by course comparison of the 17 courses currently offered in the Associate Degree Program. The software database program "Q & A" was used to organize and catalog data for later analysis. Each course was reviewed to collect support material to determine the level to which identified skill areas are taught. Each course was reviewed systematically capturing information and documentation of learning activities, textbook reading levels, course assignments, and laboratory exercises that substantiated the ACT Work Keys assigned skill levels. Definitions of skill levels appear in Appendix E. The support material was collected in three-ring binders, tabbed, and labeled for each skill area. Where two skill levels were identified in the ACT Work Keys profiling process, the higher level was selected for comparison and analysis. Review data appears in Appendix K.

Secondary Curriculum Review:

As a "checks and balances" and a quality control feature of the process the curriculum analysis was additionally evaluated and reviewed by the Project Director. There was near total parity between the primary and secondary review. The discrepancies between the primary and secondary review occurred mainly in the differences in opinion about some examples being more appropriately assigned to another category like "Reading for Information" instead of "Locating Information." The primary review was considered to be valid and supported with documentation at each skill level for each course.

Analysis Results:

The tables which appear on the following two pages illustrate analysis results. The first table, Detailed Skills/Course Analysis, shows the selected skill level currently represented in each of the 17 North Lake Electrical Technology program courses.

The second table, Summary Skills/Course Analysis, pairs the ACT Work Keys Profile skill level results to the mean of the level represented in the North Lake Electrical Technology courses.

Detailed Skills/Course Analysis

SKILLS

COURSES	Reading for Information	Applied Math	Listening	Writing	Locating Information	Teamwork	Applied Technology
Introduction to Electrical Technology	6	6	4	4	6	4	6
Fundamentals of Electricity	7	7	4	4	6	4	6
Electrical Transformers	6	7	4	4	6	4	6
General Electrical Codes	6	7	4	4	6	N/A	5
Low Voltage Circuits	6	6	4	4	6	4	6
General Electrical Wiring	6	7	4	4	6	4	6
General Electrical Planning	7	7	4	4	6	3	6
Commercial Code	6	6	4	4	6	N/A	5
Commercial Wiring	6	7	4	4	6	4	6
Commercial Planning	7	7	4	4	6	3	6
Industrial Planning	7	7	4	4	6	3	6
Industrial Codes	6	7	4	4	6	N/A	6
Electrical Motor Fundamentals	6	6	4	4	6	4	6
Solid State Controls	6	6	4	4	6	4	5

Motor Controls	7	6	5	4	6	4	6
Electrical Design	7	7	5	5	6	4	6
Cooperative Work Experience	6	N/A	4	5	4	6	6
AVERAGES	**6.35**	**6.63**	**4.12**	**4.12**	**5.88**	**3.93**	**5.82**

Summary Skills/Course Analysis

	SKILLS						
	Reading for Information	Applied Math	Listening	Writing	Locating Information	Teamwork	Applied Technology
Profiler's Selection	5 or 6	6 or 7	4	3 or 4	5	3	5
North Lake Program	6.35	6.63	4.12	4.12	5.88	3.93	5.82

Profiler's Selection: This rating represents the consensus of the group of occupational experts brought together for the profiling session facilitated by ACT. In their opinion this level is required for successful on the job performance.

North Lake Program: This rating represents the mean of the level selected for each of the required program courses to which Larry Blevins, Electrical Technology coordinator, feels the North Lake College curriculum currently teaches each of the skills. Supporting data was provided and validated. Each skill was incorporated into the curriculum in a minimum of 14 of the 17 required courses.

The Summary Skills/Course Analysis table illustrates that across the curriculum the North Lake College Electrical Technology courses teach at the ACT Work Keys identified levels or exceed the levels ACT states are industry appropriate for entry level electricians. It is interesting to note that the Electrical Technology curriculum conforms to what the ACT profiling exercise results deemed appropriate skill levels for successful performance of this occupation. For example, Teamwork is at a lower skill level according to the ACT Profile and in the Electrical Technology curriculum is not as heavily emphasized as applied mathematics which ACT rates at a much higher skill level. The frequency of skill usage, which is a component of the ACT formula, is less for Teamwork, according to ACT profile results and this is borne out by the lesser emphasis in the present curriculum in teaching teamwork skills, although some teamwork learning activities do take place. Applied mathematics is heavily taught in the present curriculum which is, again, matched to the ACT profiling results where applied mathematics received the highest possible level rating. The review revealed that there was almost total parity between the ACT profiling results from skill level assignment and the frequency and levels these skills are taught in the Electrical Technology curriculum at North Lake College.

Task/Course Analysis:

Using the ACT Work Keys Profile results a second analysis was conducted matching identified job tasks to North Lake College Electrical Technology program courses. The purpose of this was to determine where these tasks were addressed in the current curriculum. The table which follows illustrates analysis results.

OCCUPATION TITLE: ELECTRICIAN
WORK KEYS IDENTIFIED TASKS
MATCHED TO NORTH LAKE COLLEGE COURSES

ACT WORK KEYS FINAL TASK LIST	NORTH LAKE COLLEGE COURSES																
	ELE 105	ELE 106	ELE 107	ELE 108	ELE 115	ELE 116	ELE 117	ELE 118	ELE 205	ELE 206	ELE 207	ELE 208	ELE 213	ELE 214	ELE 216	ELE 218	ELE 703/4
1. Measures, cuts, bends, threads, assembles, and installs electrical conduit, using tools such as hacksaws, pipe threaders, and conduit benders.									X								
2. Works and coordinates with others (including people practicing other crafts) to complete assigned projects.		X			X	X			X						X		
3. Cuts wires, cables, conduit, and raceway, threading and reaming conduit, boring and cutting chases under the direction of the foreman.									X								
4. Provides prompt and efficient service to customers by responding quickly to customer work orders.																	

		ELE 105	ELE 106	ELE 107	ELE 108	ELE 115	ELE 116	ELE 117	ELE 118	ELE 205	ELE 206	ELE 207	ELE 208	ELE 213	ELE 214	ELE 216	ELE 218	ELE 703/4
5.	Connects wiring to accessories, such as relays, circuit breakers, plugs, condensers, switches, and solenoids; and installs accessory assemblies in electrical or electronic units using soldering gun and hand tools.	X	X			X	X			X					X	X		
6.	Uses the proper rigging to pull wire and communication cable of all sizes through conduit, cable trays, and all other raceways using proper hand tools and power tools.					X												
7.	Works safely to prevent on the job injuries by using appropriate safety equipment, such as rubber gloves and sleeves, and methods such as, grounding line equipment and jumpers.	X	X	X		X	X			X						X		
8.	Connects conductors to switches, receptacles, or appliances with proper methods of splicing, or soldering and taping.	X					X			X								
9.	Connects wiring to lighting fixtures and power equipment using hand tools.	X					X			X								

	ELE 105	ELE 106	ELE 107	ELE 108	ELE 115	ELE 116	ELE 117	ELE 118	ELE 205	ELE 206	ELE 207	ELE 208	ELE 213	ELE 214	ELE 216	ELE 218	ELE 703/4
10. Installs control, distribution, and electronic apparatus, such as switches, relays, and circuit breaker panels, programmable controllers; using hand tool and power tools to fasten in place with screws or bolts.					X									X	X		
11. Lays out the various outlets, switches, receptacles, and other details of the job from blueprints or by direction of the superintendent of construction.	X					X	X		X	X	X					X	
12. Plans new or modifie·' installations to minimize waste of materials, provide access for future maintenance, and avoid unsightly, hazardous, and unreliable wiring, consistent with specifications and local electrical codes.							X			X	X					X	
13. Plans, lays out, installs, and repairs wiring, electrical fixtures, apparatus, and control equipment using hand tools and power tools.					X	X			X				X		X		
14. Splices wires by stripping insulation from terminal leads (using a knife or wire strippers), twisting or soldering wire together, and applying tape or terminal caps or necessary lugs.	X				X	X			X				X				
15. Using measuring instruments, such as rulers, plumb-bobs, levels, and wire gauges.	X					X			X				X		X		

		ELE 105	ELE 106	ELE 107	ELE 108	ELE 115	ELE 116	ELE 117	ELE 118	ELE 205	ELE 206	ELE 207	ELE 208	ELE 213	ELE 214	ELE 216	ELE 218	ELE 703/4
16.	Reads and understands construction standards manual and is familiar with electrical codes.				X		X		X	X			X				X	
17.	Uses measuring instruments such as volt meters, ohm meters, and amp meters.	X	X	X		X	X			X				X	X	X		
18.	Interprets maintenance manuals, schematics, and wiring diagrams, and repairs equipment, utilizing knowledge of electronics and using standard test instruments using hand tools and power tools.	X	X			X	X			X					X	X		
19.	Reads work order to determine installation procedures specified by supervisor/technician.																	
20.	Studies and understands electrical theory (Ohm's Law; single-phase and three-phase circuits; and vectors, voltage drops, series and parallel circuits).		X												X			
21.	Tests circuits and electric components to locate grounded wires, broken connections, or defective current-control mechanisms using electrical testing instruments.	X	X	X		X	X			X				X		X		
22.	Installs and connects single-phase and three-phase bank transformer connections and capacitor banks/voltage regulators.			X														

		ELE 105	ELE 106	ELE 107	ELE 108	ELE 115	ELE 116	ELE 117	ELE 118	ELE 205	ELE 206	ELE 207	ELE 208	ELE 213	ELE 214	ELE 216	ELE 218	ELE 703/4
23.	Attends regular safety meetings and reads distributed material regarding new safety procedures.	X	X	X		X	X			X				X	X	X		
24.	Completes company paperwork such as truck inspection forms, time sheets, panel and transformer cards, accident reports, work orders, and oil spill sheets.																	
25.	Performs and understands switching procedures of the distribution and transmissions system and fills out appropriate paperwork.			X														
26.	Prepares sketches or as-built drawings showing location of wiring and equipment, or follows diagrams or blueprints, ensuring that concealed wiring is installed before completion of future walls ceilings, and flooring.						X			X								
27.	Suggests improvements in work methods by reviewing current procedures and using on-the-job experience to make tasks more efficient.																	X

		ELE 105	ELE 106	ELE 107	ELE 108	ELE 115	ELE 116	ELE 117	ELE 118	ELE 205	ELE 206	ELE 207	ELE 208	ELE 213	ELE 214	ELE 216	ELE 218	ELE 703/4
28.	Troubleshoots, repairs, and maintains, in accordance with diagrams, sketches, operation manuals, and manufacture's specificat[illegible]s, machinery and equipment, such as transformers, tools, regulators, reclosers, capacitors, switches, fuses, and cut-outs.			X														
29.	Takes measurements, such as street and building dimensions, distances to be spanned by wire and cable, or space available in existing buildings and underground vaults, which affect installation and arrangement of equipment.							X			X	X					X	
30.	Operate radio to communicate with co-workers and dispatchers.																	
31.	Recognizes and identifies the wide variety of conductors, such as underground and overhead.	X		X														
32.	Assesses work environment for proper wiring methods and materials and hazardous locations.						X		X	X						X		

	ELE 105	ELE 106	ELE 107	ELE 108	ELE 115	ELE 116	ELE 117	ELE 118	ELE 205	ELE 206	ELE 207	ELE 208	ELE 213	ELE 214	ELE 216	ELE 218	ELE 703/4
33. Digs trench and lays underground cable and conduit to connect source of power to customer's building, setup outdoor lighting as well as laying underground cable and conduit for data and communications (commercial, industrial, and residential).																	
34. Drives and operates vehicles and equipment, such as trucks (may be required to have commercial driver's license) trenchers, and tractors.																	
35. Installs and replaces duct systems and underground cable (works in underground vaults where cables are located).																	
36. Installs, maintains, and repairs pedestals, equipment pads, switching cabinets, pad-mounted transformers, and other underground equipment.																	
37. Locates cable and faults using fault and/or cable locating equipment.					X	X			X								
38. Observes functioning of installed equipment or system to detect hazards and need for adjustments, relocation, or replacement.					X										X		

102 103

	ELE 105	ELE 106	ELE 107	ELE 108	ELE 115	ELE 116	ELE 117	ELE 118	ELE 205	ELE 206	ELE 207	ELE 208	ELE 213	ELE 214	ELE 216	ELE 218	ELE 703/4
39. Removes obstructions (steel structures, manhole covers, substation enclosures) and material in order to gain access to and remove defective parts or perform maintenance, using hoists, personnel lifts, cranes, hand tools and power tools.																	
40. Replaces defective components and parts, such as transistors, coils, and integrated circuits, using soldering iron, wire cutters, hand tools, and power tools.		X			X									X	X		
41. Works on energized lines with rubber gloves, mats, and blankets and/or live line tools.																	
42. Terminates, splices, and tests cable according to manufacturing specifications.																	
43. Uses transit and tripod to establish grade and elevation.																	
44. Cuts and welds steel structural members using flame cutting and welding equipment.																	

The analysis matching the Work Keys identified tasks to the North Lake Electrical Technology program courses identified that 31 of the 44 identified tasks are currently addressed in one or more of the required courses. An evaluation of the 13 tasks not currently included in the instruction was conducted. The tasks appear below.

Task 4:
Provides prompt and efficient service to customers by responding quickly to customer work orders.

Task 19:
Reads work order to determine installation procedures specified by supervisor/technician.

Task 24:
Completes company paperwork such as truck inspection forms, time sheets, panel and transformer cards, accident reports, work orders and oil spill sheets.

Task 30:
Operate radio to communicate with co-workers and dispatches.

Task 33:
Digs trench and lays underground cable and conduit to connect source of power to customer's building, setup outdoor lighting as well as laying underground cable and conduit for data and communications (commercial, industrial, and residential).

Task 34:
Drives and operates vehicles and equipment, such as trucks (may be required to have commercial driver's license) trenchers, and tractors.

Task 35:
Installs and replaces duct systems and underground cable (works in underground vaults where cables are located).

Task 36:
Installs, maintains, and repairs pedestals, equipment pads, switching cabinets, padmounted transformers, and other underground equipment.

Task 39:
Removes obstructions (steel structures, manhole covers, substation enclosures) and material in order to gain access to and remove defective parts or perform maintenance, using hoists, personnel lifts, cranes, hand tools and power tools.

Task 41:
Works on energized lines with rubber gloves, mats, and blankets and/or live line tools.

Task 42:
Terminates, splices, and tests cable according to manufacturing specifications.

Task 43:
Uses transit and tripod to establish grade and elevation.

Task 44:
Cuts and welds steel structural members using flame cutting and welding equipment.

Tasks 34, 35, 36, 39, 41, 42, and 44 are not feasible for inclusion in the North Lake Electrical Technology program. Tasks 4, 19, 24, 30, 33, and 43 are feasible and have been recommended for curriculum enhancements. These could be paired with work place skill activities implemented in year two of the Project.

Dallas Joint Electrical Apprenticeship Program

The Dallas Joint Electrical Apprenticeship Training Program participates with the Project in two ways: first, as the Co-bidder organization, providing information about the Electrician occupation and second, as an educational provider, sharing information about training electricians for the workforce.

As the Co-bidder organization, the DJATC provided valuable information about the tasks Electricians perform on the job as well as coordinating efforts to obtain the National Skill Standards and Job Task Analysis information when it becomes available. As a provider of education, the DJATC participated in a curriculum review and analysis for the purposes of this Project. The Director, A.C. McAfee and the educational consultant, Ronald O'Riley (former DJATC training director), did a systematic and thorough review of the first year of the five year apprenticeship training program studying and documenting where in the curriculum the seven ACT skill areas are presently taught. The results of this analysis appear in Appendix L.

As an initial step in this process, the Project Director Carol Marlow met with AC McAfee and Ronald O'Riley to discuss the Project's focus and share information from the ACT profiling process which Mr. McAfee participated in during March, 1994. They discussed the dual roles the DJATC would fulfill as Co-bidder and training provider. Mr. McAfee gave an overview of the five year apprenticeship training program, shared insights about the ACT profiling session and gave an update on the national skills standards and job analysis process. A discussion of the course outlines, instructional methods and activities, course assessments and course content for the apprenticeship training program took place over several meetings. The apprenticeship in-class training is provided twice a week in the evening and apprentices are "on-the-job" for 40 hours per week Monday - Friday. A copy of the Course Outline appears in Appendix M.

During the meetings, AC McAfee, in conjunction with Ronald O'Riley, agreed to review the first year program to conduct a skills analysis to determine where the seven skill areas are taught. They were very receptive to the idea of sharing any information from the Project with the National Joint Electrical Apprenticeship Training Committee for possible consideration of potential curriculum changes. The apprenticeship curricula is developed at the national level and the Program is provided through the auspices of the Bureau of Apprenticeship Programs in the U.S. Department of Labor. As a national curriculum, it is reviewed and revised annually.

Mr. O'Riley and Mr. McAfee reviewed each lesson of the first year program and documented where the skills were taught. They also explained that the nature of the Apprenticeship program, as an on-the-job training program, requires the daily use of SCANS and ACT workplace skills as apprentices interact and perform job duties under the direct supervision of the journeylevel supervisor. Thus, listening, teamwork, applied mathematics, reading, writing, applied technology, and locating information are in daily use repeatedly in this on-the-job learning environment. The apprentices are a part of the work team consisting of other apprentices, journeylevel and master electricians that interact with a variety of tradespeople at the job site, customers, suppliers and contractors. The apprentice observes the journeylevel supervisor and actually performs the tasks - as they are able - during the day at the worksite. Later, twice a week, in the evenings the apprentices convene at the Training Center for their classroom instruction in the technical content covering those areas which include: electrical and electronic devices; electric units and Ohm's law; magnetism and electromagnetism; principles of generation - a total of 73 lessons in electrical theory and job technology.

Using the ACT profile with defined skill levels and the SCANS skill definitions, a lesson-by-lesson review and analysis was conducted on the first year program curriculum.

As stated earlier, the results revealed that the skills are presently taught to apprentices while they are on the job under the supervision of the journeylevel supervisor. It is during the 40-hour job placement that students attain the skills ACT identified as important to successful performance of the electrician occupation and in the classroom in the 73 lessons that apprentices attend the first year. The analysis was expanded to include additional SCANS skills as depicted in Appendix L covering "personal qualities" and "thinking skills" that are demonstrated, taught and honed (practiced) on the job. This analysis information is useful in documenting the important contribution apprenticeship training makes to the training of workplace skills and also is useful to review for the North Lake Electrical Technology program. The DJATC is receptive to information this Project generates in terms of the "Consultant Reports" for possible curriculum enhancements and for dissemination to the NJATC. Further, the DJATC will provide assistance to the Project by participating in the development of the Faculty Development and Assessment/Certification Project deliverables. It is via these collaborative efforts that the Project is able to meet the various objectives for the various electrical programs.

Curriculum Enhancements

After review of the analysis process used and the results generated, the Curriculum Analysis and Enhancement team felt that all information gathered was thorough and valid and the decision was made to proceed with the enhancement process. Identification of curriculum enhancements requires the use of a decision making process that takes into account certain criteria that are established in advance of the enhancement selection phase. These criteria should be established by the curriculum enhancement team and are used as a filter to glean the most appropriate enhancements from the plethora of possible strategies.

Step 12: Criteria for Enhancement Selections

The team determined that these *criteria* (questions) should be used to guide the enhancement selection:

Does the enhancement *facilitate learning* in one of seven needed skill areas?

Is the enhancement *feasible*?

Is the enhancement *industry-driven*?

Does the enhancement address *student acceptance and accountability*?

Does the enhancement allow *faculty freedom* within parameters?

Step 13: Select Enhancement Strategy

Although the primary and secondary reviews substantiated that the North Lake Electrical Technology program taught to the industry validated levels of work place skills required for successful job performance, it was a decision of the Project team to "enhance" certain areas using the criteria for enhancement selections for demonstration purposes. These enhancements serve as "prototypes" of what is possible for an enhancement approach across the curriculum. The team decided to identify enhancements for each of the seven skills in two ways: 1) existing enhancements that demonstrated the skill area as it is presently taught and 2) new enhancements that demonstrate ways the skill area could be incorporated into the curriculum. Enhancements also address suggestions for improvements in areas of course documentation, course objectives, instructional methods, and instructional materials. Suggestions for assessment and faculty development, also curriculum enhancements, appear in sections which follow this document.

Step 14: Identify Enhancement Prototypes

The team met to identify seven prototype areas to target for curriculum enhancements after consideration of two pieces of data: 1) Results from the curriculum review; 2)

Information provided by the faculty content experts.

Curriculum Review:

As previously reported in the Curriculum Analysis section, the Review revealed that these skill areas are presently taught to the levels specified by the ACT Work Keys profile. The Review was useful in revealing this fact and offered areas where additional enhancements could be incorporated. This information aids the curriculum developer and instructor in making course modifications.

Information from Faculty Content Experts: Consultant Reports

The "Consultant Reports" for the seven skill areas that follow were utilized in identifying possible enhancements to incorporate on the basis of the competencies and concepts associated with the skills selected. These reports pair the competencies of the SCANS skill areas of Reading, Writing, Applied Math, Listening, Locating Information, Teamwork and Applied Technology with associated learning activities that facilitate development of these skills. The Reports provide a large selection of learning activities that can be infused into the existing curriculum to promote mastery of the skill areas.

SKILL STANDARDS AND CERTIFICATION PROJECT

Consultant Report: Reading Component
Submitted by: Jan Franke
Date: June, 1994

COMPETENCIES AND CONCEPTS FROM SCANS

I. Locate, understand and interpret written information in prose and documents including manuals, graphs and schedules to perform tasks.

II. Learn from text by determining the main idea or essential message.

III. Identify relevant details, facts and specifications.

IV. Infer or locate the meanings of unknown or technical vocabulary.

V. Judge the accuracy, appropriateness, style, and plausibility of reports, proposals, or theories of other writers.

IDENTIFIED LEARNING CONCEPTS AND ASSOCIATED LEARNING/CLASSROOM ACTIVITIES

I. Basic comprehension skills of written material

A. CONTEXT ACTIVITY - Read an employee handbook to learn about safety policies. Develop questions specific to safety policies.

B. CONTEXT ACTIVITY - Read a basic job function and list in sequence the steps to accomplish the task.

C. CONTEXT ACTIVITY - Read printed material about the job and rewrite the job description in the reader's words.

D. CONTEXT ACTIVITY - Read material about the function of a particular tool and answer main idea and detail questions about the material.

E. CONTEXT ACTIVITY - Develop activities that questions differences and similarities with procedures or tools.

F. CONTEXT ACTIVITY - Using charts and forms, develop activities that address the main idea of the text of the chart and forms.

G. CONTEXT ACTIVITY - Read product information to make a buying decision.

H. Using work-related forms, develop activities that question the message of the form. What is it really communicating to the reader?

I. Using job situations, develop role play situations for small groups to read, process and discuss. (Job Cards-Group Dynamics.)

J. Choose specific sections from required readings from manuals an develop multiple choice questions over the material.

II. Interpret written information

A. Present work orders and prompt the reader to interpret a work order be specific with the directions, i.e. for the task you will interpret the codes on the display above. You will use the Electrician's Code manual to translate these codes onto the final work order.

B. Create activities that use text and visual materials together for the reader to interpret.

C. Create activities that address and utilize flowchart sequences, codes and symbols and their relationships with the individual job tasks.

D. SELECT a variety of texts from technical materials and develop activities that will give the reader an opportunity to interpret the material in his own words? (can he give the material back to you in his own words? This is clear indication of his comprehension level of reading.)

E. Use job specific material, choose paragraphs and ask the reader to identify the main idea of each individual paragraph, i.e. electrical theory, circuits, voltage drops, etc.)

III. Locate written information

A. Develop activities that will help the reader become familiar with parts of a book or manual. (table of contents, index, glossary, etc.)

B. Develop activities that include reading specific materials to determine outcomes:

Truck inspection form-details to be check off time sheets-which employee works at particular times panel and transformer cards-accident report-when, who, where and what happen?

Work orders-sequence of job to be accomplished; installation procedures specified by supervisor/technician.

Oil spill sheet-records of spill

IV. Infer or locates the meaning of technical vocabulary

A. Develop a technical vocabulary list for each text.

B. Create activities to teach and enhance the usage of the technical vocabulary to become a part of the reader. "Claim ownership of this vocabulary."

C. To understand specialized words or phrases in an unfamiliar context, develop paragraphs where these words are used in their functional context.

D. Create vocabulary cells or packets in short "doses." be sure to use the words in context of the job task. Develop activities that not only require the reader to fill in the blank with the correct words, but also will challenge his reading skills.

E. Develop "jargon words banks" for each course of study. The reader will add to the bank as he masters the word with short and long term memory.

F. Ask the reader to use the words in his own sentences in many different types of settings, i.e. small groups, on paper, role-playing, etc.

V. Judges the accuracy, appropriateness, style and plausibility of report, proposals theories of other writers.

A. Compare/contrast-develop materials that will enable the reader to learn:

To identify factual details and specifications.
To identify similarities and differences in work forms
To make inferences and judgments from the text
To draw conclusions about situations having to do with the workplace

B. Develop sample reports and instruct the reader to judge the accuracy and appropriateness of the written material.

SKILL STANDARDS AND CERTIFICATION PROJECT

Consultant Report: Mathematics Component
Submitted by: Derek Mpinga
Date: August, 1994

COMPETENCIES AND CONCEPTS FROM SCANS

I. Perform basic computations

II. Use basic numerical concepts such as whole numbers and percentages in practical situations.

III. Make reasonable estimates of arithmetic results without a calculator.

IV. Use tables, graphs, diagrams, and charts to obtain or convey quantitative information.

IDENTIFIED LEARNING CONCEPTS AND ASSOCIATED LEARNING/CLASSROOM ACTIVITIES

UNIT 1-WHOLE NUMBERS

1. Identify the order relation between two numbers
2. Write whole numbers in words and standard form
3. Round whole numbers without/with carrying
4. Add whole numbers without/with carrying
5. Subtract whole numbers with/without borrowing
6. Multiply a number by a single digit/multiply large whole numbers
7. Divide by a single digit with/without a remainder in the quotient and divide by a large whole number
8. Simplify expressions containing exponents or powers. Write large/small numbers in powers of ten notation and be able to use a calculator--entering/reading scientific notation.
9. Use the order of operations to simplify expressions.

UNIT 2-FRACTIONS AND MIXED NUMBERS

1. Find the least common multiple/greatest common factor
2. Write a fraction that represents part of a whole
3. Write an improper fraction as a mixed number
4. Find equivalent fractions by raising to higher terms
5. Simplify fractions
6. Add fractions with same/unlike denominators
7. Add whole numbers, mixed numbers and fractions
8. Subtract fractions with same/unlike denominators
9. Subtract whole numbers, mixed numbers, and fractions
10. Multiply fractions, mixed numbers, and whole numbers
11. Divide fractions, mixed numbers, and whole numbers
12. Use order of operations to simplify expressions

UNIT 3-DECIMALS

1. Read and write decimals in standard form and words
2. Round and truncate decimal numbers to a given place value or number of digit
3. Add/Subtract/Multiply/Divide Decimals
4. Write fractions as decimals and decimals as fractions
5. Estimate answer to problems involving decimals

UNIT 4-RATIO AND PROPORTION

1. Write the ratio of two quantities in simplest form
2. Write rates and unit rates
3. Write a proportion and determine if it is true
4. Distinguish between direct/indirect relationships

UNIT 5-PERCENTS

1. Write a percent as a fraction or decimal
2. Write a fraction or decimal as a percent
3. Identify parts in percent problem
4. Use proportions to solve percent problems
5. Calculate percent increase/decrease/interest/commissions

UNIT 6-UNITS OF MEASUREMENT

1. Apply U.S. Customary Units of Measurement
2. Apply Metric Units of Measurement
3. Calculate conversion of Units within a system
4. Calculate conversion of Unit: U.S. to Metric, Metric to U.S.
5. Distinguish between counting/measuring and precision/accuracy
6. Use precision tools to make measurements
7. Calculate with measurements and round off the results
8. Read and use the scale of a drawing
9. Find dimensions of an object from a scale drawing
10. Make simple scale drawings

UNIT 7-GEOMETRY

1. Name and identify lines, angles, and circles
2. Recognize parallel and perpendicular lines
3. Draw lines, angles, and circles
4. Measure line segments and angles
5. Identify geometric figures-rectangles, squares, triangles, parallelograms, trapezoids, and circles
6. Calculate perimeter, area of geometric figures
7. Calculate circumference and area of a circle
8. Identify: cylinders, rectangular solids, cones, spheres and calculate surface area/volume
9. Name and identify parts of a right-triangle
10. Use Pythagorean Theorem to find unknown side of a right triangle
11. Use ratios of sine, cosine, and tangent that involve triangles
12. Define/describe similar triangles
13. Use calculator to solve problems

UNIT 8-STATISTIC

1. Read and Draw pictographs, bar graphs, line graphs, circle graphs
2. Read and draw a histogram and frequency polygon
3. Collect-organize-interpret data
4. Calculate mean, median, and mode for a set of data
5. Distinguish range and standard deviation
6. Interpret characteristics of a normal curve

7. Calculate range and standard deviation
8. Find probability of simple event
9. Use diagrams/charts to find probability
10. Use calculator to find probabilities

UNIT 9-SIGNED NUMBERS/RATIONAL NUMBERS

1. Identify order between two integers
2. Identify signed numbers
3. Add/subtract signed numbers
4. Multiply/divide signed numbers
5. Evaluate expressions containing absolute value symbol
6. Find magnitude and direction of a vector

UNIT 10-INTRODUCTION TO ALGEBRA

1, Define/identify a variable or variables
2. Evaluate variable expressions with/without parentheses
3. Translate a problem into an equation
4. Simplify and solve linear equations
5. Read and write a formula
6. Rearrange parts of formula to find the required part
7. Define, draw and identify the coordinate system
8. Graph data points on a coordinate system
9. Graph an equation
10. Find slope/intercepts of graphed lines

SPECIAL NOTES ON THE ABOVE MATHEMATICS OBJECTS:

1. **Each unit must have APPLICATION PROBLEMS to be solved or worked out**
2. **The use of calculators should be encouraged where appropriate.**
3. **Working problems should require step-by-step to involve students in reasoning.**
4. **Use of computers should be encouraged where appropriate.**
5. **A laboratory for problem solving (mostly the application problems) must be required of the students to build up skills/confidence.**

SKILL STANDARDS AND CERTIFICATION PROJECT

Consultant Report: Listening Component
Submitted by: Carlajo Cancillo
Date: June, 1994

COMPETENCIES AND CONCEPTS FROM SCANS

I. Receive, attend to, interpret, and respond to verbal messages and other cues such as body language in ways that are appropriate to the purpose; for example, to comprehend, to learn, to critically evaluate, to appreciate, or to support the speaker.

IDENTIFIED LEARNING CONCEPTS AND ASSOCIATED LEARNING/CLASSROOM ACTIVITIES

The following activities have been compiled for the electrical technology program area. They demonstrate that listening is not simply a physiological process, but a skill that can and should be learned.

A. Learning Activity - Demonstrate to the class that their listening skills need improvement through a quiz over a story or lecture.

B. Learning Activity - Teach students the barriers to effective listening and explain differences between inferential and objective listening. The instructor might wish to show the video, "The Power of Listening," (revised edition), CRM/McGraw Hill, 20 minutes, available through the North Lake College Media Library.

C. Learning Activity - Engage students in a listening recall activity. A sample appears in Appendix N. The story could be changed to apply to the electrical industry.

D. Learning Activity - Frustrate students through limited or no-feedback exercises which illustrate that listening is active, requiring participation by the listener. A sample feedback exercise appears in Appendix N.

E. Learning Activity - Give students an activity in which they must paraphrase what they think they hear their partner saying. A sample paraphrase activity appears in Appendix N.

F. Learning Activity - Show students how to take effective notes.

SKILL STANDARDS AND CERTIFICATION PROJECT

Consultant Report: Writing Component
Submitted by: Joe R. Bishop
June 1994

COMPETENCIES AND CONCEPTS FROM SCANS

I. Communicate thoughts, ideas, information, and messages in writing

II. Record information accurately and completely.

III. Compose and create documents such as letters, directions, manuals, reports, proposals, graphs, and flow charts.

IV. Use language, style, organization, and format appropriate to the subject matter, purpose, and audience.

V. Include supporting documentation and attend to level of detail.

VI. Check, edit, and revise for correct information, appropriate emphasis, form, grammar, spelling, and punctuation.

IDENTIFIED LEARNING CONCEPTS AND ASSOCIATED LEARNING/CLASSROOM ACTIVITIES

I. Communicate thoughts, ideas, information, and message in writing.

A. More frequent use of essay or short answer questions on exams should be used to encourage students to express themselves more often in writing.

B. Students may be required to write memos to "supervisors" detailing proposed solutions to problems supplied by the instructor. relating to safety or the National Electrical Code.

C. Students may be required to read sections of the NEC or textbooks and to write a summary of the key points.

D. Students may be required to write an essay interpreting a motor control ladder diagram.

E. Students may be required to read a particular section of the NEC which is subject to interpretation and write a clear explanation of the meaning of the particular passage.

II. Record information accurately and completely.

A. Students may be required to record information and/or instructions given orally by the instructor and to answer questions based on the information given or perform a task based upon the instructions.

B. Students may be required to make detailed entries into charts, graphs, or tables dealing with student experiments or projects. A written evaluation of the date collected may be required with each other project or experiment.

C. Students may be required to write an accident report, detailing conditions, description of events, and overall evaluation of an accident either real or staged.

D. Students should be required to take data from a wiring diagram on a blueprint and complete a branch circuit schedule.

E. Students should be required to write detailed material lists and tool requests for lab work.

III. Compose and create documents such as letters, directions, manuals, reports, proposals, graphs, and flow charts.

A. Students may be required to compose a letter of application for a job or a letter applying for a line of credit with an electrical supply company.

B. Students may be required to investigate licensing or permit procedures and write a report containing their findings.

C. Students may be required to prepare a proposals for an electrical installation based on blueprints and specifications provided by the instructor.

D. Students may be required to prepare flow charts detailing a process such as designing a motor control system, designing the writing system for a residence or business, troubleshooting systems etc.

E. Students may be required to prepare graphs and/or charts detailing results from a series of experiments. Students may be required to accompany the graphs or charts with an explanation of how the data was collected, what the data means, and what conclusions may be drawn from the data.

IV. Use language, style, organization, and format appropriate to the subject matter, purpose, and audience.

A. Students may be required to write their own resume' based on form and format information provided by the instructor and compatible with current employment practices.

B. Students may be required to write letters to memos to a variety of audiences for different purposes. For example, some may be written to customers requesting payment on overdue accounts, some may be written to potential customers soliciting their business, some may be written to government agencies soliciting information on licensing and permitting practices in that municipality or state, or some may be written as memos "in house" information to other employees or management.

V. Include supporting documentation and attend to level of detail.

A. Students may be require to do a research project in trade magazines or journals or other industry publications which discuss new materials, tools, regulations, methods, or discoveries and innovations, especially in solid state controls and equipment. Students should be required to document sources and use endnotes appropriately.

B. Students may be required to research a variety of company benefit plans, including but not limited to insurance, profit sharing, pension plans, tax deferred annuities, employee ownership, etc. The students would then be required to write a report summarizing and documenting their findings.

C. Students may be required to document answers on essay questions concerning the NEC, by quoting the exact article and section of the code which governs the response.

VI. Check, edit, and revise, and revise for correct information, appropriate emphasis, form, grammar, spelling, and punctuation.

A. Students may be required to submit all drafts and reports or research papers with the expectation that evidence of revision and/or editing would appear on first and second drafts.

B. Students papers (first or second drafts) may be required to bear the signature of a member of the writing lab staff in the Learning Skills Center, indicating that the student has gone to the lab and received advice and assistance on a "major" paper being prepared.

C. Students should be required to use standard English grammar and correct spelling on all essay answers in examinations, lab reports, and essays.

SKILL STANDARDS AND CERTIFICATION PROJECT

Consultant Report: Locating and Evaluating Information Component
Submitted by: A.C. McAfee
Date: June, 1994

COMPETENCIES AND CONCEPTS FROM SCANS

I. Identify need for data, obtain them from existing sources or create them, and evaluate their relevance and accuracy. Competently performing the tasks of acquiring data and evaluating information includes analytic questions to determine specific information needs, selecting possible information and evaluating its appropriateness, and determining when new information must be created.

IDENTIFIED LEARNING CONCEPTS AND ASSOCIATED LEARNING/CLASSROOM ACTIVITIES

I. Identify need for data, obtain them from existing sources or create them, and evaluate their relevance and accuracy. Competently performing the tasks of acquiring data and evaluating information includes analytic questions to determine specific information needs, selecting possible information and evaluating its appropriateness, and determining when new information must be created.

A. Teach students to study in a step-by-step manner. Teach them to locate information in a logical sequence.
   1. Read introductory information
   2. Study learning objectives
   3. Read the questions
   4. Study references
   5. Answer questions
   6. Re-study the references as needed

B. Provide lessons that contain information students are required to evaluate as an employer or supervisor. Electrical students can learn the importance of the organization of assets and expenses. Locating information and communication skills are essential and can be practiced by giving assignments that require students to acquire jobs through bidding and negotiation.

C. Give assignments where students are required to locate information in order to select the proper tools for a specific task.

D. Provide assignments that teach students pictorially how to accomplish a task. Electrical students could learn how to tie various knots for lifting or securing of material or equipment. More complicated information could be presented with pictures and written directions.

E. Supply students with and teach them how to use conversion charts. For example, how to convert U.S. standard measurement to the metric system and vice versa.

F. Teach electrical students electrical and electronic devices by the combined use of pictorial and schematic diagrams with a written description of each.

G. Provide pictures and written directions to teach students how to use a state-of-the-art instrument for test and troubleshooting purposes. This would reinforce technology, as well as locating information skills.

H. Use schematic diagrams and symbols to represent a circuit for calculation of values needed for current, voltage, and resistance in parallel circuits.

I. Teach electrical students how to use references such as the National Electrical Code book through practice exercises. Illustrate through pictures, charts, and words how the Code book is arranged.

J. Teach students how to read blueprints by using pictures, examples, and practice exercises.

SKILL STANDARDS AND CERTIFICATION PROJECT

Consultant Report: Teamwork Component
Submitted by: Yvonne Abatso
Date: August, 1994

COMPETENCIES AND CONCEPTS FROM SCANS

I. Work cooperatively with others and contributes to group with ideas, suggestions, and effort.

II. Demonstrate competence in participating as a member of a team including doing own share of tasks necessary to complete a project.

III. Encourage team members by listening and responding appropriately to their contributions.

IV. Build on individual team members' strengths - resolving differences for the benefit of the team.

V. Take personal responsibility for accomplishing goals, and responsibly challenge existing procedures, policies, or authorities.

IDENTIFIED LEARNING CONCEPTS AND ASSOCIATED LEARNING/CLASSROOM ACTIVITIES

I. Work cooperatively with others and contributes to group with ideas suggestion, and effort.

A. Think/Pair/Share Activity

Pose the question. How has Electrical Technology already changed our everyday lives in many ways? Make a list by yourself of **ALL** the ways you can think of that technology has changed your everyday life. (Give them an example: my alarm clock has two alarms, option to wake to music or buzzer, snooze, go to sleep to music, battery backup.)

After a few minutes, ask students to draw a line under the last item on their list. Turn to your neighbor and compare lists. Add items to your list that your neighbor had and you didn't. Come up with new items together.

After a few minutes, ask them to draw a line under the last item on the list. Turn to another group of two and compare lists (there are now four in the group). Add items to your list that you didn't have. Come up with new items together.

After a few minutes, ask them to stop. Point out this wasn't a particularly mind boggling question, but their list really grew when they were able to discuss it with others. Explain that this is the foundation for the collaborative learning that we will be doing. We will be working in groups of two or four to better solve problems and remember information. This format can be used repeatedly whenever the learning objective is to generate ideas.

B. Each student interviews another student about his/her choice of electrical technology, as a career path, past experiences with technical knowledge and skills, and anticipated challenges in learning.

   The two partners join another two forming a group of four, each introduces their interviewee. The group brainstorms on ways to help each successfully master the course objectives.

C. After lecture or demonstration of proper use of tools, pair up four students to demonstrate and critique each other. Switch partners so each student has the opportunity to explain and demonstrate more than once and also receives feedback from more than one.

D. After a presentation, students work together in groups or pairs to master the concepts through taking turns asking questions of each other and clarifying answers.

E. Teams or partners make flash cards of material which must be memorized. Each coaches the other. Useful for review.

F. Student teams have one pad of paper on which each writes as they state their ideas aloud. As the tablet circulates, more information is added until many aspects of the topic is explored. Each gets a copy of the entire list. Can be used to generate use of tools, testing procedures, codes specifications etc.

II. Demonstrate competence in participating as a member of a team including doing their own share of tasks necessary to complete a project.

A. After a lecture on safety procedures, form a group which divides up standards or rules. Each member chooses one to elaborate discussing its importance and possible consequences if not followed. The group decides how to best illustrate these in a permanent way for its members, distributing to each person a specific section to be completed and returned to the group at the next class session. (May be a chart, visual, video, slides, etc.) Each group shares their visual aid for remembering their rules to the entire class.

B. Assign a different chapter or section to each team. Team members must further divide chapter into smaller sections so each group member has a part. Each group must teach their chapter to the class after practicing with each other. Group members suggest ways of perfecting presentations before they teach to the entire class.

C. Students observe small groups noting behaviors which demonstrate class norms. Observer offers feedback to groups so that they may improve their group efforts. All student should have an opportunity to serve in this role. Emphasize positive feedback.

D. Assign the task of group building of a residential electrical design project. Each member has a specific part of the plan to complete. The group puts the pieces together and evaluates the whole. This is good preparation for individual projects. Depending on the course, it may consist of creating some part of a large electrical project.

E. Have teams create residential or commercial situations which violate electrical codes. Groups exchange plans and are challenged to find all the errors and correct them.

F. Offer groups guidelines for problem solving:

Work together in groups of four.

COOPERATE with other group members.

Achieve a group solution for each problem.

Make sure that everyone understands the solution before the group goes on.

Listen carefully to others and try, whenever possible, to build upon their ideas.

Share the leadership of the group.

Make sure that everyone participates and no one dominates.

Take turns writing problem solutions on the board.

Proceed at a pace that is comfortable for your own group.

Neil Davidson, 1990

III. Encourage team members by listening and responding appropriately to their contributions.

A. Form teams of three or four whose assignment is to produce a list of guidelines for team meetings. Each team shares their list with the entire class from which class norms are established. These can be posted. Give some ideas to get group thinking started. Such as:

Do not interrupt each other.
Respond to ideas not persons.
Everyone participates.
Confront problems squarely.

B. Have a student demonstrate a procedure in wiring. Team members offer comments on strengths of presentation and alternatives for parts needing further clarification.

C. Each member of the group shares a part of the electrical code with team members discussing the concepts and reasoning for its inclusion. The group asks questions or offers suggestions to fully explore each section of the code. Various sections may be given to different teams so that the teams work together for comprehending the whole.

D. Another version of the above activity is to have members from different groups working on the same part to meet together for enhanced comprehension. They then return to their original groups to become the expert in teaching section to their groups.

E. Listening skills are enhanced by having team members take different approaches to solving an electrical problem. The group must summarize each solution accurately (orally and/or written) before moving on to explore another. The accuracy check is provided by the person who proposed the solution.

IV. Build on individual team members' strengths - resolving differences for the benefit of the team.

A. Enlarge the perspective of students by having multiple small groups discuss problems associated with the installation of low voltage circuits and appropriate preventative procedures. Have groups share problem solving through giving concrete examples for each other.

B. Each student shares an answer to a study question or lab problem with teammates. Recorder copies the complete set and distributes to entire group.

C. Each student has a partner who double checks calculations before students turn in homework.

D. Students exchanges blueprints, paper, projects with another student who proofreads it and offers feedback. Both parties benefit from objective feedback as well as evaluator.

E. Students create typical workplace scenarios which involve working with other technicians and customers. Have two members of the group role play before the class.

Listening groups supply possible resolutions. This enlarges their repertory of appropriate behaviors.

F. Team members assume different positions on an issue, procedure or problem which has alternative approaches. They each discuss, research and share findings with the group. The group analyzes each by examining strengths and weaknesses and then synthesizes or selects the best for given situations.

V. Take personal responsibility for accomplishing goals, and responsibly challenge existing procedures, policies, or authorities.

A. Prepare a list of problems commonly found in electrical wiring. Let a team of three jointly work on how to solve the problems. Assign a fourth member to the role of checker who asks other members to explain the reasoning and rationale underlying group answers.

B. Given an individual test or evaluation first, then follow with a test or evaluation which the group completes together. Groups should be informed of this early on so that they are aware of expectations.

C. Give group a problematic situation which utilizes established procedures in (wiring, circuit, layout, testing, etc.) Have them discuss/list what would happen if different procedures were used. Promotes higher order critical thinking skills.

D. Mid-semester have groups analyze their group experience. Why did it go well or not so well? Let them indicate the behaviors, language and thought processes which permitted the team to move ahead versus those that hindered creativity and problem solving. Groups should retain a copy for their final self evaluation.

E. Each team writes a final self evaluation report based on established group norms and course learning objectives. Include any new activities and procedures.

F. Assign roles to learning groups to increase interdependence and goal completion. The following roles can be rotated among members so each experiences the range of skills necessary for teamwork:

Summarize
Checking of understanding
Recorder

Research
Facilitator
Observer of group interaction

G. Each person keeps a journal of their personal participation in the group for periodic evaluation. Reviews with instructor during office hours.

TEAMWORK STRUCTURES

Three kinds of cooperative learning groups can be established to promote teamwork.

A. Long term, cooperative learning groups of four to five students formed after the class stabilizes and lasting throughout the semester in each course. These have the purpose of:

_____Offering motivation, support and assistance to each student in completing assignments.

_____Holding each other accountable for attempting to master course objectives.

The first five minutes of class can be spent for these meetings to permit students to crosscheck homework or prepare for today's class.

B. Informal learning groups to ensure that students are actively processing specific course content being presented.

_____Use periodically throughout the class to give everyone an opportunity to recite in their own language or hear in another's student's language the course material. These are also helpful for short discussion purposes which allow for application of theory and accuracy checks.

C. Formal learning groups are used for achieving conceptual and skill learning. Useful for reviews before tests and practice for skill developing.

_____Develops well honed problem solving skills which expand an individual perspective through the use of problem situations and long term projects which require groups to remain on task and examine the most efficient ways of achieving goals.

SKILLS STANDARDS AND CERTIFICATION PROJECT

Consultant Report: Technology Component
Submitted by: Larry Blevins
Date: September, 1994

COMPETENCIES AND CONCEPTS FROM SCANS

I. Understand the overall intent and the proper procedures of setting up and operating machines, including computers and their programming systems.

II. Demonstrate competence in how to apply technology to task including understanding how different parts of machines interact and how machines interact with broader production systems.

III. (On occasion) install machines including computers; set up machines or systems of machines efficiently to get desired results; accurately interpreting machine output; and detecting errors from program output.

IDENTIFIED LEARNING CONCEPTS AND ASSOCIATED LEARNING/CLASSROOM ACTIVITIES

A. Apply Ohms law to lab projects
B. Determine electrical services for single family dwelling
C. List inventory of standard electrical tools
D. Demonstrate wiring procedures to single & three-way switches
E. Connect circuit boards using patch cords
F. Compare circuit test results to calculated values
G. Test & repair transformer trainers
H. Determine overcurrent protection for transformers
I. Determine proper size and type conductors for circuits
J. Determine proper components and install alarm system
K. Demonstrate troubleshooting techniques for alarm systems
L. Complete wiring projects
M. Design dwelling project
N. Design branch circuit
O. Select proper component size based on NEC

P. Develop Cable Layout/Wiring Diagram
Q. Design commercial planning projects
R. Complete industrial planning projects
S. Determine the circuits sizes for specific problems
T. Identify common circuit components for special problems
U. Complete motor building project (load test)
V. Conduct Growler test
W. Test solid-state components
X. Trouble-shoot trainer (multiple trouble options)

Curriculum Enhancement Prototypes:

Fourteen prototype enhancements have been selected to illustrate how learning activities and performance objectives support the attainment of the selected workplace skills of reading for information, applied math, listening, writing, locating information, teamwork and applied technology. The following table depicts in matrix form the seven new enhancements and seven existing enhancements paired with the skill areas. After careful deliberation of all the data gathered during the curriculum analysis, these enhancements are featured as recommendations to facilitate the learning of work place skills as they are taught in the existing technical curriculum. It is important to note that these enhancements are a sampling representing the beginning of what is possible in a retooling of the curriculum.

Enhancement Prototypes

SKILL AREA	**NEW ENHANCEMENTS**		**EXISTING ENHANCEMENTS**	
	Learning Activity	Performance Objective	*Learning Activity*	Performance Objective
Reading For Information	*Read a basic job function provided by the instructor and list the steps to accomplish the tasks on the job function handout.*	Using the provided document, the student will read, identify, and list the steps required to accomplish a general wiring task. Performance will be satisfactory if the sequence of steps is correct.	*Read the safety booklet and complete the written safety test.*	Using the Safety booklet, the student will read information and identify critical information. Performance will be satisfactory with a minimum score of 94% on the written safety test.
Applied Mathematics	*Use a computer estimating program to perform construction cost calculations.*	Using a computer estimating program, the student will calculate construction costs for an estimation. Performance will be satisfactory if the estimate is within 20% of the actual costs.	*In the Electrical Technology Lab students will complete a Series Circuit project and worksheet.*	Using Series Circuit Project materials, the student will construct basic circuits and measure and calculate values for voltage, amperage, resistance, and power. Performance will be satisfactory if a score of 70% is achieved.

SKILL AREA	NEW ENHANCEMENTS		EXISTING ENHANCEMENTS	
	Learning Activity	Performance Objective	*Learning Activity*	Performance Objective
Listening	*In a role play students will alternately act as a supervisor giving instructions and a worker receiving instructions.*	Given verbal instructions, the student will paraphrase the instructions correctly. Performance will be satisfactory if all critical information is present in the communication.	*Using the medium of video tape students will listen to, view, and take notes on key concepts.*	Using notes as a reference, the student will report key lighting concepts from a video tape presentation. Performance will be satisfactory with a minimum score of 70% on a written test.
Writing	*Read the safety problem handout, discuss safety solutions in small groups, and write a memo.*	Presented with a problem related to safety the student will write a memo to a supervisor detailing proposed solutions to problems. Performance will be satisfactory if critical information is communicated in a clear and concise manner with a minimum of three mechanical errors.	*Read chapter on "Single Family Dwellings" and write set of specifications.*	Given a lecture and assigned reading the student will write a set of specifications for a single family dwelling. Performance will be satisfactory if all basic elements are present and are communicated in a clear and concise manner with two mechanical errors.

SKILL AREA	NEW ENHANCEMENTS		EXISTING ENHANCEMENTS	
	Learning Activity	Performance Objective	*Learning Activity*	Performance Objective
Locating Information	*Use National Electrical Code software as a research tool.*	Using a computer based National Electrical Code software program, the student will search the software using key words to locate essential information to research a stated problem. Performance will be satisfactory if essential information is located.	*Study building plans to locate specifications.*	Using a set of building plans, the student will identify key specifications. Performance will be satisfactory if seven out of ten specifications are identified.

SKILL AREA	NEW ENHANCEMENTS		EXISTING ENHANCEMENTS	
	Learning Activity	Performance Objective	*Learning Activity*	Performance Objective
Teamwork	*Apply the "Project Critique Checklist" in a team project evaluation.*	Provided with complete class projects, student teams will evaluate other student's blueprints, papers or projects and provide feedback to the student. Performance will be satisfactory if students complete the assignment within the class period and identify two strengths and weaknesses of the Projects and work in teams to conduct the critique.	*Convene in teams in the lab and complete the team installation of electrical service project following the checklist.*	Using training booths in labs and working in teams, students will connect a single-phase service entrance, panelboard, protective devices, switches, outlets and other related material. Performance will be satisfactory if the electrical service is installed and operates properly and students demonstrate teamwork skills identified on a teamwork checklist.

SKILL AREA	NEW ENHANCEMENTS		EXISTING ENHANCEMENTS	
	Learning Activity	Performance Objective	*Learning Activity*	Performance Objective
Applied Technology	*In the lab environment students will practice with trainers and complete the checklists.*	Using a fire and burglar alarm trainer the student will perform trouble-shooting techniques used to isolate selected problems. Performance will be satisfactory if the problem is isolated within the allotted time utilizing all safety procedures.	*In the lab environment, students will use volt meters to measure electrical values.*	Using a multi-meter the student will measure voltage, current, and resistance in a series-parallel circuit. Performance will be satisfactory if values are properly measured and recorded.

Step 15: Improve Course Documentation and Performance Objectives

Curriculum analysis and development necessarily depends upon complete and accurate course data. Course data provides the essential information that is one of the most pivotal inputs to the curriculum development process. Data quality, availability and organization are enabling (or disabling) characteristics that allow the curriculum development process to proceed or can stymie curriculum development efforts. The team offers several recommendations for developing or revising course documentation and performance objectives, two key data inputs, that serve as curriculum enhancements.

Course Documentation: The Syllabus

The team refers to course documentation as all of the existing written material that describes course offerings like syllabi. The course syllabus is a key piece of course documentation that is required by institutions, offers students course detail essential for enrollment decisions and other purposes, and serves as a statement about the nature of the course. There are certain characteristics that are common to all syllabi; however, the team recommends the essential elements listed on the "Components of a Quality Syllabus" which follows. While our review of syllabi indicates most syllabi do have many of these components, it is rare that all are present. We recommend as a course enhancement that syllabi be revised to include all of these components. Understandably, revising or creating syllabi that conform to this standard takes time (especially where performance objectives are not well developed); however, the exercise of creating syllabi that do conform to this standard will improve course delivery. For example, in order to list course objectives as they should be stated, instructors will necessarily need to review course content, be deliberate about what they state they expect students *to be able to do* as a result of taking their course, and, in a sense, contract with the student in terms of what the instructor plans *to deliver or facilitate* in terms of course outcomes. It is certainly implicit that students will be responsible for their own contributions to the learning endeavor.

Components of a Quality Syllabus

Course Information: *Put this first and include the following:*

Course Title
Course Number
Credit Hours
Prerequisites
Instructor Permission
Classroom Location
Days and Hours Class/Lab Meets

Instructor Information: *This follows course information. Include teaching assistants and the following:*

Instructor's Full Name and Title
Office Location and Hours (also where to leave assignments)
Office Phone Number (possibly an emergency number also)
Home Phone Number (with restrictions on calling times)
Office Hours

Texts, Readings, Materials: *This contains detailed information about course readings and print material:*

Textbooks

  Title, author, date, edition, publisher, cost, where available (can include why this reference was selected and how often it will be used)

Supplementary Readings

  Same Bibliographic information as Textbooks
  Indicate recommended/required
  Library reserve/purchase

Materials

  Lab/safety equipment
  Art supplies, calculators, computers, software

Course Description: *This should be consistent with the College's catalog:*

Paragraph on general content
Why course is important
Include instructional methods (lecture, discussion)

Course Objectives: *State what students do and identify expectations. Include these elements:*

Statement of the learning outcome
The condition(s) for outcome achievement
Acceptable standard or level of achievement

Course Calendar/Schedule: *State that this is tentative and subject to change:*

Weekly schedule of topics
Exam, quiz, and other assessment dates
Due dates for major assignments
Required special events

Course Policies: *Parity is needed with College Board policies:*

Attendance/lateness
Class participation
Missed exams or assignments
Lab safety/health
Academic dishonesty

Grading:

Factors for evaluation and weighting
How factors translate to grades
Appeals procedures
Extra credit options

Available Support Services: *Provide a listing of instructional support services:*

Library
Learning Center
Computers

Source: Idea Paper No. 27: "Writing a Syllabus," September, 1992 and Idea Paper No. 18, "Matching Instructional Objectives, Subject Matter, Tests, and Score Interpretations," September, 1987. Center for Faculty Evaluation and Development, Division of Continuing Education, Kansas State University.

Performance Objectives

The beauty of well developed objectives is that everyone in the learning endeavor *understands* up front what is *expected* and what learners will be *able to do* as a result of instruction. Developing performance objectives is absolutely essential to the functioning of the educational enterprise. Everything else that occurs in the course relates back to the identified performance objectives--the learning activities, the instructional materials, assessment, instructional delivery--it all emanates from the central source of the performance objectives (or so it should). The team recommends as a curriculum enhancement that performance objectives be developed for each course that include the "characteristics of useful objectives" described in the document that follows "Developing Performance Objectives for Competency Based Instruction."

The recommended enhancements to improve course documents and to more fully develop performance objectives may seem simplisfic in nature, yet these are recommended for very important reasons: Syllabi make a statement about the quality of courses because certain fundamental elements must be in place for quality syllabi (and instruction) to occur. Written, well-developed performance objectives are fundamental to quality instruction and are recommended at all levels of instructional delivery. In addition to aiding instruction and ensuring quality, it is recommended that syllabi routinely be used as a communication tool. A quality syllabus will provide students with essential information for course enrollment decisions and necessary information concerning course policies, instructor access, instructional materials, and support services. The student will know what is expected of them *before* they ever enter the course since fully developed course objectives appear in the syllabus. Unfortunately, syllabi and objectives do not routinely conform to these standards that are considered fundamental to quality instruction.

Developing Performance Objectives for Competency Based Instruction

"If you don't know where you're going, it is difficult to select a suitable means for getting there." Robert Mager

Objective:

"A description of a performance you want learners to be able to exhibit before you consider them competent. An objective describes an intended *result* of instruction, rather than the *process* of instruction itself." (Preparing Instructional Objectives, Robert Mager, 1984)

Purpose of Stating Objectives:

Specifying and communicating instructional intent worth achieving

Why Explicit Objectives are Important:

1) Provides the basis for selection/designing instructional materials, content, or methods
2) Provides the basis for evaluating or assessing the success of instruction
3) Provides the basis for students to organize their learning efforts to accomplish objectives

Characteristics of Useful Objectives:

1. *Performance: An objective always says what a learner is expected to be able to do; the objective sometimes describes the product or result of the doing.*

2. *Conditions: An objective always describes the important conditions (if any) under which the performance is to occur.*

3. *Criterion: Wherever possible, an objective describes the criterion of acceptable performance by describing how well the learner must perform in order to be considered acceptable.*

Examples:

Given five centrifugal pumps, each containing one malfunction, and being told one symptom of each malfunction, be able to locate (describe and point to) the malfunction. Any tools, instruments, and references may be used. Four of five malfunctions must be located within ten minutes each.

Given a list of thirty-five chemical elements, be able to recall (write) the valences of at least thirty.

Be able to write a musical composition with a single tonal base within four hours. The composition must be at least sixteen bars long and must contain at least twenty-four notes. You must apply at least three rules of good composition in the development of your score.

Source: Robert F. Mager, Preparing Instructional Objectives. Pitman Learning, Inc. 1984.

Keys to Success

There are elements that are integral to successful development of SCANS-enhanced curricula in community colleges that were in place in this Project and need to be shared for replication of results elsewhere. These are considered "keys to success:"

- Organizational Commitment
- Business and Industry Partnerships
- Organizational Climate
- Faculty Development and Support

Organizational Commitment

The higher education institution needs to have administrative commitment to curricula revision both philosophically and practically.

Philosophy

Philosophical support is in the form of at least four beliefs that operate as a working philosophy about curricula:

1.) That workplace skills are integral to training of youth for successful employment and economic viability

2.) That workplace skills should be infused into the curricula and not taught as a separate skill apart from the technical content of the courses

3.) That community colleges should teach mastery learning and competency based instruction should be provided in the curricula

4.) That the curricula offered by the college should be industry-driven reflecting the current and future needs of the local workforce

Practical Support

Practical support from administration is needed in the form of resource allocation and decision making that enables the tasks of curricula development and enhancement to occur. In the organization, it is imperative for the curriculum project to be positioned so that it reports to the administrator in charge of instruction. Among other things, this allows for coordination of efforts within the institution regarding curricula revision, exploration, and development.

Business and Industry Partnerships

Partnerships with business and industry in the associated occupational area are crucial to:

1.) the information exchange that needs to take place for development of responsive curricula

2.) recruiting subject matter experts that are crucial for the occupational profiling

3.) cooperative work experiences and apprentice placements for hands-on experience

4.) sources of expertise for advisory committees for curricular advise and review, and

5.) resource support

Organizational Climate

The organizational climate or propensity to promote change and innovation is a key factor in successful curricula development and enhancement. Certainly curricular modifications to keep apace of rapid changes in information and skill requirements is a necessary part of workforce development for the present and future and a responsibility of institutions of higher education. The leadership of community colleges can foster or inhibit success of curricula development depending upon their perspectives and personalities and how they view change--whether they welcome it and are visionary is absolutely crucial to success. Being receptive to alternative forms of instructional delivery systems is important and fostering positive external relations is critical. With innovative forms of community building comes innovative forms of fund development that enable change to take place that would otherwise be stifled by fiscal constraint and limited thinking. Governing boards and college administrators with vision enable responsive curricula to become a reality.

Faculty Development and Support

Faculty are essential to the curricula development, enhancement and exploration process. Faculty need to be encouraged to embrace performance-based instruction and mastery learning as key factors in promoting educational outcomes that not only benefit the learner, but that are being demanded by higher education funding sources like the Texas Higher Education Coordinating Board and Texas Education Agency.

Professional development of faculty

Faculty need to be skilled in these areas for program success:

1.) Awareness of the workplace skills that are integral to preparing students for their selected occupation and how to incorporate them into the existing curricula

2.) Awareness of how to write objectives, develop course documentation, develop performance-based lesson plans, and evaluate performance-based instruction

3.) Awareness of data sources for capturing information about workforce development

4.) Awareness of methods of instructional delivery that promote attainment of the workplace skills

Faculty support

Some systems need to be in place and utilized for faculty support to accomplish curricula enhancements:

1.) Release time to focus on the time-consuming tasks involved and possible course documentation revision that is necessary for analysis

2.) Compensation to motivate curricula revision that requires in-depth analysis and revision

3.) Peer support encouraging faculty to share their efforts and collaborate with the faculty team

4.) Curriculum or instructional design staff resources to facilitate curricula revisions and provide assistance

5.) Business-industry input to maintain industry-driven focus to the curriculum.

SECTION D

FACULTY DEVELOPMENT

Skill Standards and Certification Project
Faculty Development Plan: North Lake College
Electrical Technology Program

Introduction

Professional development of the faculty and part-time instructional staff known as "adjunct faculty" in community colleges is an on-going responsibility and commitment to the college's mission of providing quality instruction and educational programs to develop tomorrow's workforce. It also speaks to the College's own plan for human resource development.

The North Lake College Skill Standards Project conducted a needs assessment and developed recommended strategies for a faculty development plan as required by the Project contract. The Plan is for the purpose of training faculty to implement workforce skills infusion into the existing curriculum and to develop faculty in some more general areas of teaching effectiveness which then enables them to implement workforce skills as an integral part of their teaching practice.

The Plan consists of two major sections, **Needs Assessment and Recommendations** containing eight total **steps** embedded in the two sections to illustrate how to systematically develop a plan for faculty development.

Needs Assessment

Needs assessment activities consisted of the following: 1) a review of some of the literature about faculty development; 2) interviews with select North Lake College and DJATC faculty/directors regarding what is currently being offered and recommendations; and 3) reviews of 1-3 quarter activities and results to glean ideas from the Project documents and staff discussions for the purpose of identifying professional development needs of faculty in implementing SCANS/workplace skills in the curriculum.

Step 1: Conduct Literature Review

Project staff reviewed literature pertaining to faculty development after conducting a literature search using the ERIC system located at the University of Texas--Dallas. In addition, SCANS documents which are out of print now, were located through the Government Documents archives, obtained through inter-library loan and reviewed to be used in research and development of the faculty development plan.

Because a majority of faculty in community colleges are part-time or "adjunct" faculty, the literature review that was conducted focused centrally on the issues of concern with professional development of part-time faculty while pertaining to full time faculty as well. A synthesis of key ideas from the literature is cited as the basis for the criteria which led to strategy selections proposed in the Recommendations section of this report.

In The Care and Feeding of Part-Time Faculty, it is reported that part-time faculty receive little orientation as rule in community colleges even though they are often the main contact with the College for students. Further, the expectation is that part-time faculty will be familiar with college policies and rules and provide the same quality of instruction as full time faculty. It was also reported that community colleges usually do not have "competencies that need to be met by adjunct staff." Other challenges in training part-time faculty include time constraints and pay scales and the hours (usually evening) they work which usually do not place them in direct contact or communication with division directors or deans. In addition, faculty for vocational-technical programs are typically drawn from business and industry and may possess only limited educational/teaching experience. Staff development needs include:

> "developing teaching techniques and methods appropriate to the various needs of its clientele. Training is needed also in preparing faculty to work with adults and minority groups in a variety of situations, helping instructors improve their performance with traditional teaching strategies and introducing them to a number of alternate strategies..." (p 32)

Further, a report from California University says,

> "Since a large number of community college part-time teachers come from the secondary schools or from the technical areas in which they work, the need for orientation and in-service training would appear especially great to the majority of part-time teachers." (p 32)

Recommendations for staff development were cited for part-time faculty as:

1. Development of more materials on administrative procedures to be included in the part-time faculty handbook.
2. Specific inservice training workshops should include part-time instructors with full-time instructors.
3. Establish a procedure whereby full---and part-time instructors can meet for course articulation sessions.
4. Assure that part-time instructors have received adequate orientation prior to assuming instructional assignments.
5. Assure that someone knowledgeable is available to answer part-time faculty members questions.
6. Implement periodical communication for the part-time instructors--at a minimum, coming events on campus of interest to them.
7. Consider discount rates or passes to campus activities.(38-9)

While the need is documented for orientation and training of part-time faculty, certainly it is important to also consider certain *standards* for training when developing in-service programs for faculty. The following guidelines were cited for workshop planning for faculty. They document the need and recommendations for orientation and training of part-time faculty. This report also addresses the importance of establishing standards for the development of in-service programs. They state:

1. All faculty participants must be volunteers
2. Division or department chairmen and academic deans should be required to be present and should be treated exactly as other participants
3. The real purpose of the workshop should be made perfectly clear from the very beginning
4. Give careful consideration to the number of "innovators" who can be adequately supported
5. Participation in faculty workshop activities and subsequent experimentation must be tied into the institutional reward system for faculty members
6. Provide opportunities for those persons involved in the workshops to periodically get together as they begin experimenting

7. At the time a faculty workshop is planned, a follow-up visit by the same workshop leader should be scheduled six months later
8. Always have consultants provide the participants with a bibliography related to the workshop topics.
9. Guarantee the "right to fail."
10. Do not expect change overnight. (34)

In a text, Personalized Faculty Development, an exhaustive study of the literature on faculty development was conducted and through conversations with faculty development program directors, results were synthesized into a list of 16 elements (for successful development programs):

1. Participation is voluntary
2. Program is planned with "multiplier possibilities"
3. Staff are involved in the planning, implementing, and evaluating
4. Activities are directed toward change in the direction the institution wishes to move
5. Activities are designed for all personnel
6. Staff recognize and accept the need for development activities
7. Administrative commitment is stated regarding importance
8. One individual has responsibility for the program
9. Activities are based on assessed needs of participants
10. Institution expects a reasonable return from the program
11. Clear goals and objectives are established
12. Program is related to institution's purposes, missions and needs
13. A reward system is available and acceptable to those who participate
14. There is enough flexibility to satisfy needs
15. Financial support is adequate (p 30-1)

The various faculty roles in institutions of higher education offers some insight as to how to address faculty development needs in plans for professional development. For example, in "New Tasks for Teachers: The Changing Personnel" from the text, Evaluating Learning and Teaching, these roles come into play: teacher as **dreamer** (conceptualizing new ways of developing students); teacher as **designer** (innovative instructional planning to cultivate each student's sense of initiative, independence and ability to make choices); teacher as **developer** (promoting students' sense of inquiry, discovery and inquisitiveness about problem solving). The author states "Few things teachers do can be more lasting than those aimed at cultivating habits of disciplined thinking." (49) The teacher as **diagnostician** (student appraisal/achievement and being able to assess attitudes, values, and personal adjustments). The roles are varied for faculty in institutions of higher education, but clearly relate to the key role of developing students in generic skills of critical thinking, problem solving, discovery, inquiry, and learning how to learn.

In Evaluating Faculty Performance, the chapter entitled, "The Professor as Teacher," outlines many sources of information that can be used in aggregate for evaluating teaching effectiveness and also can be rich sources for designing professional development programs for faculty. These are reported in descending order of frequency of use as reported by 1100 colleges and universities:

> chairman evaluation; dean evaluation; colleagues' opinions; scholarly research and publications; informal student opinions, grade distributions; course syllabi and examinations; committee evaluation; student examination performance; self-evaluation or report; classroom visits; systematic student ratings; enrollment in elective courses; long-term follow-up of students; and alumni opinions. (23)

Since the study was conducted, student evaluations have taken on more importance in teacher evaluations of effectiveness.

In the same reference, twelve **criteria** for effective teaching are listed which were gleaned from an exhaustive study by the University of Toledo conducted with students, faculty, and alumni categorizing sixty effective teaching behaviors. These top twelve are:

Being well prepared for class
Establishing sincere interest in subject being taught
Demonstrating comprehensive knowledge of his subject
Using teaching methods which enable students to achieve objectives of the course
Constructing tests which search for understanding on part of students rather than rote memory ability
Being fair and reasonable to students in evaluation procedure
Communicating effectively at levels appropriate to the preparedness of students
Encouraging intelligent independent thought by students
Organizing the course in logical fashion
Treating students with respect
Acknowledging all questions to the best of his ability (p 25)

Again sources for evaluating classroom teaching are described in the chapter and give inputs for the faculty development plan: Student evaluation, classroom visitation, teaching materials and procedures; special incident; and self-evaluation. Common elements in these evaluation are:

course objectives and how they related to lesson assignments,
planning and organizing of class presentation,
instructor mastery of course content,
use of class time,
whether critical thinking and analysis was encouraged,
acceptance of differing student viewpoints,
promoting student involvement in the class,
attitudes of other students toward the teacher,

comparative rating to other teachers.

The publication, Teaching the SCANS Competencies, is a resource to faculty to review and apply to the integration of workplace skills into the curriculum. A faculty development plan would need to include distribution of excerpts from this document which demonstrates how classroom assignments can be paired with the skill area to achieve skill mastery. Additionally, this report provides other information that is useful to the teacher practitioner.

Key concepts that surface from the literature for faculty development were noted by Project staff as described in the preceding text. These concepts were utilized in making decisions about the design of the faculty development plan including activity and modes of delivery selections as proposed in the Recommendations section.

Step 2: Conduct Interviews

Interviews were conducted with the following North Lake College faculty and DJATC Directors to determine what professional development needs exist in addition to what is presently offered. These NLC and DJATC faculty offered their insights concerning professional development needs:

Yvonne Abatso, Director, Returning Adults Center and Title III Faculty

Development, North Lake College

Larry Blevins, Program Coordinator, Electrical Technology Program, North Lake College

AC McAfee, Director, Dallas Electrical Joint Apprenticeship Program

Ronald O'Riley, Consultant, Innovative Education, Inc.

Faculty Development: Current Practice

Dallas County Community College District

Professional development activities offered through the Dallas Community College District cover the gamut from attendance at national, state and local conferences/professional meetings, and teleconferences. to sabbaticals, workshops and seminars, and self-study. The activities and opportunities are too extensive to describe in this text; however, a sampling of offerings appears in Appendix O of this report as listed in the "1994-1995 Professional Development Calendar: Dallas County Community College District."

In addition, faculty development is also decentralized and offered at each of the colleges within the DCCCD. It is the responsibility of the Division Deans at North Lake College.

North Lake College Faculty Development

Yvonne Abatso, Director, Title III Grant, described some of the numerous faculty development activities and opportunities at North Lake College and those that are evolving that will directly impact the development of innovative curricula. A sampling of those opportunities appears in the "Faculty Development Newsletter" Spring, 1994 in Appendix P of this report. The Report shows that faculty development activities at North Lake College includes, but is not limited to, these areas: curriculum development activities, workshops, teleconferences, professional conferences, Faculty Development Center activities, seminars, email discussion groups, mentors, and orientation sessions.

Innovative curriculum development is conducted by faculty in such areas as "computer assisted program for TASP preparation," "new curriculum modules in Holocaust research," and "computer simulations for introductory physics courses." Faculty develop their skills as they develop innovative curricula and the real purpose of any faculty development program is to have better instruction as the bottom line or end result. While faculty are about the business of developing new curricula they are necessarily developing their skills in curricula design and broadening their knowledge in their subject matter as well. Faculty are given stipends for compensation for considerable expenditures of time involved.

In addition to curriculum development activities, NLC offers *workshops* on such subjects as "collaborative/cooperative learning and critical thinking." Dr. Abatso says in a needs assessment survey of faculty at NLC the overarching topic faculty wanted information on was teaching "critical thinking" skills. In response to this, a workshop was designed and offered featuring a nationally-known expert on critical thinking instruction.

Teleconferences are also available on topics like "Teaching Strategies: I Taught It But Didn't Learn It" and "Sharpening Your Teaching Skills." Multi-cultural lectures and discussion are also offered on topics such as "Africa's contributions in Mathematics and Science."

Professional conferences are offered locally such as the North Texas Consortium Spring Conference, "Using Technology to Improve Teaching and Learning."

Instructional technology training sessions are also offered within the *Faculty Development Center* including the topics, "Exploration of Software Packages" and "Toolbook" and "Internet." The Faculty Development Center was created from Title III funds in the Spring semester, 1994. The purpose of the Center is to train faculty in the use of computer technology to enhance classroom instruction. The salary of a faculty member is provided through Title III to provide technical support, individualized training, audio-visual production for faculty presentations and instruction. Future plans for the

Center focus on developing faculty in the areas of Internet usage for research purposes and distance learning.

Some longer term *seminars* are also available to faculty for teaching improvement like the "Great Teachers Seminar" and "Summer Seminars for College Teachers" from the National Endowment for the Humanities.

Literature on Instructional Improvement is also disseminated to faculty. Articles on such subjects as principles for improving instruction and learning strategies and college teaching are provided to NLC faculty as part of faculty development activities.

Electronic mail is also being utilized for book discussions among NLC faculty and a new humanities series is being featured.

Dr. Abatso further projects that in 1995, innovation in curriculum development will center on development of team teaching in an interdisciplinary model where faculty will be awarded stipends on a competitive basis to research, develop and implement the curricula in the Fall, 1995. Faculty will travel and study other models that are effectively implementing this approach to instructional delivery. Title III will provide the seed money for this endeavor.

Dr. Abatso also said that professional development should be an expectation written into the faculty contract and understood as a professional responsibility. Curriculum development that requires considerable faculty time should be supported in the institution with such incentives as faculty stipends (extra service contracts) and release time from regular class loads. Innovative faculty should be encouraged to develop innovative curricula and serve as models to other faculty to see the importance of continuous improvement of instruction. Quality pre-service instruction on effective teaching will also relieve some of the need for faculty development as teachers-in-training can more quickly reach goals toward becoming effective teachers prior to employment in faculty positions.

North Lake College Electrical Technology Program

During discussions held with Larry Blevins, coordinator, NLC Electrical Technology Program, professional development of adjunct faculty for the program was described as consisting of: *orientation sessions* with faculty held at the College each semester; *individual meetings* with adjunct instructors throughout the semester offering opportunities for individual, customized training; *continuous "needs-based faculty development training"* throughout the semester and *written information* provided by Mr. Blevins that was disseminated at the beginning of each semester containing College rules and regulations and teaching practice. Mr. Blevins cited that in addition to these methods of orienting part-time faculty to the Program, he serves as a *mentor and resource* to faculty throughout the semester covering all issues pertaining to teaching and learning that occur in the Program. He provides instructors ways to handle difficult students that comes easily for seasoned instructors, but is difficult for the neophyte teacher. He spends a good deal of time on classroom management techniques, for example.

New instructor *observations* are conducted by College administrative staff and faculty are critiqued on the quality of instruction. While most adjunct faculty are master electricians and very knowledgeable in their subject matter, Mr. Blevins observes that they do require assistance with instructional methods and makes the recommendation that an enhancement for faculty development would be the viewing of a video tape on teaching and learning principles in technical programs. In addition, he concurs that workshops on competency based education and performance based instruction would be useful for new and veteran faculty, both part-time and full-time, due to the variability in skills.

Responsibility for curriculum development, syllabi construction, lesson planning, and student assessment resides with Mr. Blevins; however, he sees merit in also developing adjunct faculty skills in these areas. Additional topics he suggests include: constructing tests and testing procedures. He says it is important to clarify professional development expectations initially and inclusion of SCANS skills in instruction of technological programs as expectations of faculty "up front" in the initial meetings and contract arrangements with part-time faculty.

Apprenticeship Training Program

The Dallas Joint Electrical Apprenticeship Training Program offers faculty development training in a variety of ways to ensure that new and veteran instructors are effective teachers in the Program. Professional development opportunities are provided through: a formal training program, weekly meetings with instructors, class observations of teaching, and instructor orientation sessions at the beginning of each semester. Student evaluation is an integral part of the assessment of instructional quality and provides an additional input for professional development and instructor critique of teaching effectiveness.

Formal Training:

Formal training is offered through a contract with Corpus Christi State University, a campus of Texas A&M University System. The training consists of three twelve-hour modules where instructors are able to earn 3 college credits upon completion of the three modules. The three modules have these stated course objectives and topical outlines:

Module I: Analysis and Instructional Material Development

Course Objectives:

1. Select instructional skills and information from an occupation to be utilized for training.
2. Write behavioral objectives to accomplish training goals.
3. Plan and write instructional sheets to meet the learning needs of individual students.
4. Derive test items from course content and develop tests to measure student progress.

Course Outline:

1. Introductions (student, instructor, course)
2. Job Analysis (teaching content, teaching priorities)
3. Behavioral Objectives (planning, writing)
4. Supporting Instructional Material (job sheet, task sheet, information sheet, assignment sheet)
5. Student Evaluation (test content, methods of rating, types and preparation of tests, progress charts)

Module II: Use of Aids and Equipment

Course Objectives:

1. Identify needs for using aids in teaching a course.
2. Select the appropriate aid to reinforce instructional methods.
3. Follow correct procedures in utilizing various instructional aids and equipment.
4. Identify options for using computers in an instructional setting for teaching and classroom management.

Course Outline:

1. Introductions (students, instructor, course)
2. Principles of Learning and Teaching (how we learn, learning retention, lesson delivery systems, organizing a lesson, teacher responsibilities)
3. Needs and Characteristics of Instructional Aids (definition of instructional aids, needs and reasons for using aids, characteristics of good aids)
4. Types and Use of Selected Instructional Aids (chalkboards/marker boards, charts and posters, models and mockups, actual equipment, drawings/books/manuals)
5. Preparation and Use of Instructional Aids
6. Planning and Preparation of Slide Presentation (importance of planning, steps in preparation)
7. Effective Utilization of Films and Video (types and uses, sources of films and video, value of films and video, procedure for using educational films and video)
8. Use of Projection Equipment (overhead, opaque, slide, filmstrip, motion picture, audio/slide viewer, video equipment)
9. Use of Computers (instructional, class organization and management)

Module III: Methods of Teaching Vocational Subjects

Course Objectives:

1. Select appropriate methods for teaching a lesson
2. Choose material to incorporate in a lesson
3. Write a complete lesson based on material chosen
4. Use the completed lesson in teaching a selected group of learners.

Course Outline:

1. Introductions (students, instructor, course)
2. Methods of Teaching (lecture, demonstration, illustration, directed activity, practice/drill, oral questions, discussion, reading)
3. The Lesson (definition, characteristic, planning, writing)
4. Practice Teaching

Corpus Christi State University provides on-site instruction at the Dallas apprenticeship facility in the evenings. The Program is funded through the general fund of $30,000 which is allocated state-wide for all professional development programs for instructors of apprenticeship programs in Texas.

Weekly Meetings

The Director of the Dallas Joint Apprenticeship Training Committee conducts meetings with all instructors on a weekly basis which address many subjects including teaching-learning issues that instructors face in the classroom. The Director, A.C. McAfee, is a veteran instructor and master electrician, and provides sage advice about the instructional process and student problem management during these meetings.

Class Observations

North Lake College provides instructional support and additional instructor evaluation for the Apprenticeship program. Instructional support is provided through the many services the College provides for faculty and staff development. Student support services like developmental studies which Apprentices can avail themselves of if they request assistance in remediation for math or writing are also available. Paul Keleman, counselor instructor in the Counseling Division, conducts observations of all instructors, new and veteran, who teach in the Apprenticeship program each semester. These observations include the video taping of instructors and a written evaluation which are both provided to the instructor and Director for review, discussion, and, if necessary, improvement plans. Ronnie O'Riley, former DJAıC Director, and AC McAfee both strongly support the video taping of these instructional sessions as a valuable way instructors can critique and improve their teaching after they view themselves in the actual teaching situation. These are better than simulations as they provide the instructor with insights into such areas as classroom management and useful teaching strategies. Universities that prepare teachers for the profession often use video taping of instruction during student teaching as a very useful way to give instructors feedback as they observe themselves in practice teaching settings.

Instructor Orientation

Each semester, Apprenticeship Program Director, AC McAfee holds orientation sessions with all new and veteran instructors. During these sessions, he provides information about teaching methods and information essential to instructional performance for the Apprenticeship program. During the orientation sessions, instructors are given written information on teaching methodology and appropriate instructional practice. Manuals like the "Basic Ideas of Electrical Instructors," a compilation of information on teaching practice, taken from numerous publications are provided for instructor development.

Student Evaluation

Written student evaluations of instructors are done at the conclusion of each semester where students comment on instructor effectiveness and offer suggestions for improvement. These comments are compiled for each instructor and the program as a whole and disseminated as aggregate data to all instructors and as individual data to each instructor for program improvement purposes. Trends and repetitious comments provide information for program and instructional changes.

Step 3: Develop Faculty Learning Objectives

The following learning objectives (competencies) were determined from the interviews and from the research done on the Project for professional development to be able to infuse workplace skills into the curricula. Faculty need to:

1) Be able to list technical and workplace competencies associated with entry level

skills for the occupation their curricula trains for and that students need to perform at a satisfactory level

2) Be able to develop quality syllabi for their courses

3) Be able to write performance objectives (state student outcomes for their curricula)

4) Be able to develop learning activities that facilitate SCANS/workplace skills development

5) Be able to apply student assessments that are criterion-referenced

6) Be able to use student competency profiles.

Recommendations

Step 4: Select Learning Activities and Modes of Delivery

The following faculty development **learning outcomes, content, activities and modes of delivery, and evaluation** were generated for the purposes of this Project and for infusing workplace skills into the regular instruction of technical programs. They were selected because they fit these criteria:

- They are practical and cost-effective;
- They fit the lifestyle of the majority of faculty who are part-time;
- They are delivered via affordable, familiar and accessible technology for most Texas community and public technical colleges;
- They can be "home-grown" and produced with local, available resources typically or purchased at a nominal cost;
- They provide a "mix" of media that would appeal to various learning styles;
- They are simple and therefore, are likely to be done and useful;
- They combine individual with group instruction modes of learning to suit different preferences;
- They utilize the concepts reported earlier in the review of the literature on faculty development.

LEARNING OUTCOMES (COMPETENCIES)	CONTENT	ACTIVITIES AND MODES OF DELIVERY	EVALUATION
List technical and workplace competencies associated with entry-level skills of the occupation.	Occupation Research Job Task Detailing DACUM Process Worker Interview Job Observation Advisory Committees	Conduct CBE Workshops Disseminate Fact Sheets Publish Email Newsletter Provide Instructional Design Expertise for Technical Support	Formative and Summative Evaluation for Workshop Sessions Faculty User Survey Email Usage Statistics
Develop quality syllabi for courses.	Components of Quality Syllabi NLC Student Support Services NLC Institutional Policies	Conduct CBE Workshops Provide Video Tapes Disseminate Fact Sheets Publish Email Newsletter Offer Instructional Design Software	Formative and Summative Evaluation for Workshop Sessions Checklist Critique of Course Syllabi using Components of Quality Syllabi Instructional Design Critique Faculty Critique

LEARNING OUTCOMES (COMPETENCIES)	CONTENT	ACTIVITIES AND MODES OF DELIVERY	EVALUATION
Write performance objectives.	Purpose of Performance Objectives Components of Performance Objectives: Performance, Conditions, and Criterion	Conduct CBE Workshops Disseminate Fact Sheets Provide Faculty Mentoring	Formative and Summative Evaluation for Workshop Sessions Checklist Critique of Performance Objectives Dean Division Review Faculty peer Review Instructional Design Critique
Develop learning activities.	Effective Teaching Strategies Learning Styles Application of Teaching/Learning Strategies in Curriculum Learning Activities Specific to Workplace Skills Modes of Delivery	Conduct CBE Workshop Distribute Faculty Content Expert Guide Provide Video Tapes Schedule Opportunities to Observe Instructional Applications in the Classroom Provide Faculty Mentoring	Formative and Summative Evaluation for Workshop Sessions Dean Division review Faculty peer review Instructional Design Critique

LEARNING OUTCOMES (COMPETENCIES)	CONTENT	ACTIVITIES AND MODES OF DELIVERY	EVALUATION
Apply student assessments that are criterion-referenced.	Performance Evaluation Instruments Criterion & Norm-Referenced Testing Informal and Formal Methods of Assessment ACT Work Keys and Other Standardized Tests	Conduct CBE Workshops Disseminate Fact Sheets Use Email Forum for Discussion Provide Faculty Mentoring	Formative and Summative Evaluation for Workshop Sessions Email Usage Statistics Division Dean Review Faculty Peer Review
Use Student Competency Profiles.	Uses of Competency Profiles Contents of a Competency Profile Development of a Competency Profile	Conduct CBE Workshop Provide Faculty Mentoring	Formative and Summative Evaluation for Workshop Sessions Checklist Critique Employer/Division Dean/Student and Instructional Designer Critiques

Content and activities for faculty development utilize a variety of modes of delivery related to teaching faculty how to improve their instruction and incorporate workplace skills into their program so that the curriculum is industry-driven. These incorporate sound concepts from the literature on faculty development, consider the selection criteria mentioned earlier, and emanate from the recommendations and current faculty development activities offered by North Lake College and the Dallas Joint Apprenticeship Training Committee. It should be noted that whenever possible these activities should become assimilated into the existing faculty development offerings of a College.

They are briefly described as:

1) Multi-media communications (Videotapes, Email Newsletter, Fact Sheets)

2) Workshops

3) Faculty Content Experts Learning Activity Guide

Multi-media Communications:

Video Tapes:

Using the format of video tape, professional development briefings would be available to instructors on a loan basis. The video tapes could be commercially produced purchases or locally produced in the North Lake College Video Technology Program featuring instructors demonstrating the appropriate application of skills. A tape could be developed or purchased, for example, around the theme of developing platform skills of instructors to develop skills of students in listening (better instructor communications = better quality listening). Source: "Improving Instructors' Speaking Skills" by Nancy E. Goulden, Kansas State University, Idea Paper No. 24, January, 1991. Instructors could borrow the video tape and play it on their home video playback unit at their convenience. The tape would feature a North Lake College Speech instructor(s) modeling appropriate speaking skills as they present the content which would cover:

The Importance of Speaking Skills

What is Effective Speaking

How Can Lecturers Analyze Their Delivery

Improving Delivery (vocal delivery and use of body)

Putting it into Practice

Instructional Scenarios (do's and don'ts)

Electronic Mail Newsletter:

Using the College's existing electronic mail system that is available throughout the District on the computer network, full time faculty could have access to an electronic newsletter which they could read and print out on their printers. The newsletter could be published semi-annually on the email system and provide information on instructional resources, short articles on topics related to teaching and learning as stated in, "Teaching Adult Students" by Cheryl J. Polson, Idea Paper No 29, Kansas State University, September, 1993 covering items as:

Characteristics of Adult Learners (multiple roles, life experiences, varied developmental tasks, and other characteristics)

Implications for Teaching Adults (meet specific needs, assist with everyday tasks, experiences impact teaching/learning, consequences of aging)

Recommendations for Further Learning

Part-time faculty could access e-mail from a remote station like home via their home computer and modem and some additional software. A dialogue and comments section could foster regular e-mail discourse and continuous technical support.

Fact Sheets

Written materials are also useful ways of disseminating information that is valuable in professional development. Curriculum development staff could research and write a series of brief papers on subject areas that faculty find interesting and germane to their development needs. Topic areas could include, but not be limited to:

"Improving Lectures and Discussions,"

"Using Simulation Games in the College Classroom,"

"Conducting the Feedback Lecture,"

"Improving Questioning Techniques in the College Classroom (critical thinking skills development).

These could be like the "Idea Papers" series developed by Kansas State University's Center for Faculty Evaluation and Development which summarize the current research in adult education on select topics and provides practical, succinct suggestions for instructional improvement.

Faculty Content Expert Guide to Learning Activities for SCANS Skills

The information that was collected and formatted into "Consultant Reports" in the "Curriculum Analysis and Enhancements" document provides the basis for the development of a **learning guide** that could be compiled into a more comprehensive guide for instructors. This Guide would define the seven skill areas and provide useful information on associated learning activities to develop those skill areas in technical programs. The Guide might also include information on writing performance objectives and assessment associated with evaluating performance based instruction infusing workplace skills in technical programs.

Competency-Based Education Workshops

"Competency based vocational education allows for a description in advance of instruction of the knowledge, attitudes, and skills (competencies) that a student should possess for job entry after completion of a vocational program. A vocational program represents the organization of subject matter and interrelated learning experiences designed to lead students to achieve pre-specified goals and objectives in a systematic way. One of the major goals of vocational education programs is to prepare students for gainful employment and employment advancement. Upon completion of a vocational education program, a student must be able to perform, apply, or use skills on a job." Having defined CBE in this way, Michigan State University, continues in the publication, Competency Based Vocational Education Workshop Facilitators Guide, to state that a competency based vocational education program has these attributes:

1) Course content is based upon a job analysis of worker tasks

2) Student performance objectives (an activity that can be observed and measured) are known by students in advance of instruction

3) Learning time is flexible

4) Instructional methodology is geared to the individual student

5) Student achievement and evaluation is based upon the performance standards needed on the job.

Competency based education is a model of education that lends itself to the inclusion of academic and technical skills in the same curricula and incorporates the concepts of teaching workplace skills along with the technical content of a given occupation. The premise is vocational training that is designed with industry needs in mind to develop student skills to perform at the entry level of the occupation. The utilization of job analysis information as the beginning point of instructional design synchronizes with the ACT Work Keys occupational profile as the beginning point of workplace skills infusion into the technical curricula--the focus of this project. Therefore, the CBE model of education would necessarily be the focus of a workshop design for select faculty at North Lake College. This model could be disseminated and used elsewhere in other applications like the recent initiative by University of North Texas to conduct "Personnel Development in SCANS skills integration" initiatives and training statewide.

North Lake College would propose that eight to ten faculty be selected on the basis of their track record for innovative curriculum development and outstanding instructional qualities to participate in a workshop. A mix of full and part-time faculty (adjunct faculty) would be invited to participate and offered compensation for their participation in the workshop. The idea would be to develop these faculty leaders as supporters of the concept of CBE and workplace skills integration and as knowledgeable resources to their faculty colleagues.

Using the model inservice program developed by Dr. Carl A. Woloszyk, Associate Professor, Western Michigan University (as described in ERIC document #357 220) which trains faculty in competency based vocational education, the North Lake Skills Standards Project proposes that the model be adopted with some additional adaptations to be used for professional development purposes of this Project. The following competencies have been identified for the workshops and provide the key areas for workshop content:

Explaining Competency Based Vocational Education (CBVE)

1. identify terminology used in CBVE
2. explain characteristics of CBVE

Organizing Content for a CBVE Program

1. recognize a job task
2. identify methods used to collect job tasks
3. define job task detailing

Organizing Classroom/Laboratory Instruction for CBVE

1. explain the benefits of job task detailing
2. prepare a job task detailing worksheet
3. apply various teaching methods for instruction on a given job task

Developing Written and Performance Evaluation Instruments

1. identify types of performance evaluation instruments
2. List the instructional purposes for criterion reference measures
3. explain the difference between norm and criterion reference measures
4. classify informal and formal evaluation instruments
5. construct written and performance evaluation instruments

Using Student Competency Profiles

1. identify uses for student competency profiles
2. explain the nature of the student competency profile for your program
3. use a student competency profile in your program

Identifying Learning Styles and Teaching Strategies

1. identify effective teaching factors in vocational education
2. identify teaching/learning activities to implement CBVE in a vocational Program
3. identify an individual student's learning style
4. use teaching/learning strategies to implement CBVE in a vocational Program

The ERIC document which describes the workshop design, provides individual lesson plans addressing each competency. Lesson plans are provided that contain: required time, learning concepts, objectives, materials, terminology, evaluation and other information. Session handouts and transparencies for overhead projection are included.

A mix of learning activities would be incorporated into the workshops like case studies, instructional design critiques, video tape viewing, lecture-discussion, small group exercises, readings, task analysis exercises, and expertise sharing sessions.

Methods of collecting job information and job task detailing would be presented along with resources for identifying occupations and related jobs through questionnaire (survey), interview, observation and dacum information.

Other workshop instruction would cover the effective use of teaching techniques: lecture, demonstration, questioning, laboratory, discussion, inquiry, assignments, resource persons, role-playing, learning packages, independent study, structure observations, case method, programmed instruction, panel, debate, field trip, brainstorming, and use of instructional aids.

Adaptation of skill standards into the present curriculum design would be addressed with methods for curriculum analysis and enhancement.

Evaluation instruments used in CBE would be addressed that are criterion referenced--

written assessments for cognitive measurement of task performance and performance evaluation for psychomotor measurement of task mastery. Performance objectives that describe the testing or evaluation situation with the conditions and criteria components are the criterion-referenced measures that would be presented which faculty would need to develop for their own curricula. The assessment topic would include items on the uses of criterion-referenced measures as formal and informal measures to determine learner performance. Informal measures like assignments, study sheets, and oral questioning would be dealt with as examples of ways to provide learner feedback on cognitive objectives. Formal assessments like written tests, product and performance checklists would also be presented to evaluate learner mastery.

The use of a competency profile would be presented, how it applies to a particular technical program and possible industry applications would be addressed. How a profile can assist in the job placement process by identifying competencies the job candidate possesses would be discussed including the documentation of workplace skills attainment. How the Profile serves as a tool for student accountability, public relations, and academic reporting systems would be described.

Learning styles and teaching strategies would form another area of workshop content and would address items like the criteria for selecting learning activities and how these are dependent on teaching methods, instructional materials and instructional technology and media. Types of teaching methods paired with group/individual learning situations would be addressed. Methods for determining learning styles would be presented with associated learning activities. Three main areas of learning styles would be addressed: information gathering/receiving, social work conditions, and expressive preference along with the appropriate learning activity for each style.

A half-day followup workshop session would be scheduled six weeks later to assess faculty usage and provide technical assistance to faculty implementing CBE and workplace skills infusion into their curricula.

Workshop presenters would be recruited from various sources: experts in CBE and content experts in workplace skills instruction/infusion.

The workshop would be scheduled to accommodate part-time faculty schedules so they could attend without interference with their other job roles.

Additional adaptations would focus on the ways to infuse workplace skills into the existing curriculum and assess for those skills with written performance objectives. The "Faculty Content Expert Guide" could be provided as handout material that instructors could reference during the workshop and perhaps try out and report their successes/shortcomings with the results of these efforts.

Step 5: Determine Institutional Support Factors

Institutional Support Factors refers to the kind of organizational support that is essential to the implementation of effective faculty development programs. While it is beyond the scope of this Project to address these, they are mentioned here because they should be considered in developing any faculty development design. Types of institutional support that enables faculty development includes, but is not limited to:

Curriculum Specialist/Instructional Design Expertise

Policies for Compensation for Faculty Development Participation

Compensation for Curriculum Development/Modification

Growth Contracting

A curriculum specialist/instructional design expert provides technical support to faculty to enable curriculum revisions and development. Full and part-time faculty would benefit from the assistance and leadership a person with these skills could provide to faculty development activities. Expertise in CBE and inclusion of workplace skills on-site is essential if an institution is going to move in the direction of adopting CBE as the means of providing instruction.

Compensation for faculty participation in curriculum development activities and in faculty development is essential to provide incentives to motivate and sustain time-intensive efforts that lead to curricular change. Extra service contracts, class load reductions and release time, and other forms of compensation are incentives that enable faculty to engage in faculty development activities that lead to instructional improvement.

Growth contracting is the means by which faculty and the College join together in a "binding agreement" which "allows for quick and efficient action which can increase the productivity and satisfaction of the faculty member" and "compels the institution to regard the faculty member as an individual." It is the mechanism for promoting faculty development on the individual level in a voluntary manner where the faculty member retains control over their own faculty development plan. Simpson and Oggel in "Growth Contracting for Faculty Development" state "the uniqueness of human and professional growth demands an individualized approach to faculty development."

In addition, growth contracting allows for faculty and institutional representatives to mutually specify goals which "is a contribution both to the faculty member's growth and to the institution's development." Austin College in Austin, Texas has used growth contracting for instructional improvement.

It may be important to note; however, growth contracting has limitations in terms of flexibility for mid-course corrections or changes since the process of contracting is a formal one. Also, some faculty feel growth contracting may be skewed in favor of the institution and sometimes favors the "goal-oriented" faculty.

To utilize a program of growth contracting faculty must see some benefit in terms of:

- opportunity to better themselves
- revitalized pedagogical or research interest
- opportunity to move to the forefront of a burgeoning area of study
- higher peer evaluations
- raised self-esteem
- special experiences such as tutorials, self-directed intensive study programs
- internships/externships
- post-doctorates

The authors state, "It is financially advantageous and academically responsible to facilitate faculty growth, to promote revitalization, and to help faculty continue to be productive as the institution itself grows and changes." Further, they identify the need for faculty development due to fewer opportunities for growth while growth is demanded from societal change. Information explosion, technological change, a pluralistic society and changing cultural norms, and more demanding and discerning consumers of education all place demands on colleges to be institutionally more responsive and develop faculty.

Step 6: Determine Evaluation Methods

Evaluation of the recommended activities for faculty development of workplace skills infusion is depicted in the matrix pairing objectives with activities and modes of delivery. Evaluation methods are determined by the learning objectives. Selection of evaluation methods is based also on the feasibility, practicality and cost of the evaluation. Workshop evaluation, for instance, will include formative and summative evaluations. Informal assessments in terms of assignment mastery, instructor observation and faculty feedback provide useful measures of program success.

Step 7: Establish Timeline

The **timeline** for faculty development activities is described in this section. Full consideration must be given to adequate planning time for all activities. Time to elicit interest and participation of key faculty, the "innovators" in the college for proper diffusion of change to fully-implement competency based educational delivery with workplace and SCANS skills infusion into the technical curriculum is critical. Even when incorporating activities into existing institutional activities that are a regular part of faculty development offerings, a certain level of planning must be accommodated in the schedule.

Other considerations that bear upon timeline construction include the appropriate identification and sequencing of activities and what activities should be selected first in order to engage faculty.

Being able to offer faculty compensation may take time to develop within the College; yet is a key factor for program success.

It was our decision to allow six months for the planning of the CBE workshop and identifying key faculty to invite to the program. The implementation of the initial workshop, followup workshop and evaluation would comprise the second six months of activity.

For multi-media communications (video-tapes, email newsletter and fact sheets), it was proposed that the first six months be used to develop video scripts and develop or research for purchase applicable video tapes on key workplace skill areas. A system for dissemination and usage (including maintenance) would need to be developed for implementation and evaluation the second six months. For e-mail, part-time instructors would need to be surveyed to find out their ability to access e-mail from remote stations and identification/development of the content for the newsletter would need to be accomplished in the first six months. Implementation, technical support and evaluation would need to be a part of the latter six months activities. Fact sheets would need to be researched, written and published and a plan for dissemination developed in the initial six months with dissemination and evaluation accomplished the latter six months.

The Faculty Content Experts Learning Activity Guide would need to be formatted for publication and published in the first six months along with a plan for dissemination. The latter six months the Guide would be disseminated and evaluated.

Concurrent with these activities would be efforts at acquiring more funding to support and sustain faculty development efforts.

Step 8: Secure Funding

Carl Perkins funds are intended by law, and available to all Texas community colleges, by formula, to fund faculty development especially as it relates to integration of academic and vocational education. These funds provide a likely source for financial support of faculty development activities related to this Plan.

The Carl D. Perkins Vocational and Applied Technology Education Act of 1990 states that Colleges may use their basic grants received from the State by formula for this purpose. Specifically, Section 235 Uses of Funds states:

(C) Requirements for Uses of Funds

(1) Funds made available under a grant under this part shall be used to provide vocational education in programs that--

(b) integrate academic and vocational education in such programs through coherent sequences of courses so that students achieve both academic and occupational competencies;

(2) In carrying out the provisions of paragraph (1), grant funds may be used for activities such as--

(c) inservice training of both vocational instructors and academic instructors working with vocational education students for integrating academic and vocational education.

Further, it is stated:

> It is the purpose of this Act to make the United States more competitive in the world economy by developing more fully the academic and occupational skill of all segments of the population.

Certainly, within the stated purposes of the Act and appropriate application of funds, the kinds of faculty development activities proposed with this Plan could be eligible for consideration of Carl Perkins funds.

The Budget for faculty development activities would reflect major expense categories for staffing (curriculum development and workshop facilitators), purchase of/production costs for video taping, printing/publication costs associated with fact sheets and the Faculty Content Experts Learning Guide, minor software purchases for part-time faculty, and lease of computer equipment to link into the e-mail system, for desk top publishing and for writing the print materials.

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SECTION E

TESTING AND CERTIFICATION

Skill Standards and Certification Project
Testing and Certification Document: North Lake College
Electrical Technology Program

Introduction

The purpose of addressing testing and certification strategies as a component of this project as stated in the RFP are to "suggest recommended approaches and strategies for how the project might promote criterion-referenced, skill-based testing to certify that students have attained the levels of SCANS and technical competency levels necessary for successful entry-level employment."

What is criterion-referenced, skill-based testing?

According to Roger Peddie, author of Beyond the Norm? An Introduction to Standards-based Assessment. Developing a Qualification Framework for New Zealand, in standards-based assessment, the outcome is analyzed against some fixed criterion or level of achievement. In his publication he describes subtypes of standards-based assessments. One subtype, competency-based or criterion referenced assessment, sets a particular standard of competence that must be reached to receive credit. In another subtype, achievement-based assessment, a number of progressively more demanding standards are used and learner achievement is reported in the form of a grade. He identifies five critical issues in standards-based assessment: (1) theory versus practice; (2) how many and what type of assessments are needed; (3) awarding merit; (4) test difficulty; and (5) test bias.

In technical and occupational training, *technical* competencies are routinely assessed - and as long as critical issues are addressed such as those listed on the previous page - test makers have achieved success in the development of valid instruments of measurement. However, the assessment of SC^NS and ACT Work Keys workplace skills present new and challenging problems.

Proposed Assessment Strategies Activities

The following activities were proposed to develop assessment strategies:

- Research Assessment Strategies
- Analyze Current Assessments
- Study Work Keys Job Profile
- Identify Assessment Strategies
- Propose Assessment Strategies
- Submit Draft Assessment Strategies
- Submit Final Assessment Strategies

Assessment Analysis and Strategies Steps and Outcomes

The only variance between the proposed activities of this portion of the project and the actual activities performed was the addition of an analysis of related licensure. While licensure is not a requirement of the North Lake Program, preparing for it is an objective of the Program and a requirement of the City of Dallas and surrounding municipalities for employment in several related electrical occupations. In the act of attaining licensure, the candidate is becoming "certified" in the electrical occupation. This licensure is a prerequisite to become a journeyman or master electrician, the career path for the apprentice electrician.

Step 1: Research Assessment Strategies

These activities provided sources of research materials:

- An ERIC search was conducted on skills assessment
- The SCANS reports were reviewed
- ACT assessment information was obtained and reviewed

The information generated from the **ERIC search** was limited, but useful in the area of workplace skills assessment and strategies. The paucity of citations is an indicator that this is a new and emerging area of research.

The **SCANS reports** substantiated the need for workplace skills assessments and included articles on the difficulty of measuring these skills while not specifically giving guidance on "how" to measure them. In his paper, "Assessment of the SCANS Competencies - Some Examples", John Wirt states: "One potential difficulty is determining the level of students' general competency when their prior knowledge of the specific context of assessment exercises may vary significantly. Several of the competencies also involve social skills, and some assessment experts doubt that social skills can be reliably and validly assessed on a large scale. A third potential problem is that the thinking inherent in many of the competencies, such as improving systems and allocating resources, is much more complex and open-ended than generally can be assessed using conventional testing methods." He goes on to say the examples of how the SCANS competencies can be assessed, "do not yield general conclusions about feasibility of assessing the SCANS competencies or about the best approaches to take." In summary, the examples are as follows:

Hay/McBer example to measure job competency generally: In 90-minute to two-hour job interviews, individuals are asked to describe what they did, said, thought, and felt in several critical workplace situations they faced in their own work experience. These descriptions are then coded by degree of competency reflected in interviewee responses and reported in a profile form.

Educational Testing Service example to measure interpersonal skills: This example is based on the use of video technology. Situations are projected onto a video screen attached to a hand-held computer. Portrayal of each situation is followed by portrayal options for dealing with the situation. The exam taker chooses one option that he/she feels is the best response to the situation.

Maryland Education Department example to measure allocation of resources: This example simulates the real world situation of planning a restaurant. The simulation involves both individual and group activities. Students take on the role of "developer" and have to work within realistic restraints: the restaurant must be a rectangular, one-story building of 6,000 square feet, with parking for 30 cars, and there must be some landscaping to make the restaurant attractive.

Wilson Learning Corporation example to measure interpersonal skills: This assessment requires candidates to view a videotape that contains a series of vignettes featuring four different main characters. Each character represents one of the four types of job families targeted by the program. Participants see the characters responding to a wide variety of situations like those they might experience if they were actually in the job. During the course of the video, the action is interrupted at various points and the participants are asked multiple-choice questions about how they would respond.

American College Testing example to measure using information - acquiring and evaluating data skills: This example provides an assessment that includes questions requiring examinees to evaluate data in the context of a specific decision to be made.

Information provided directly by ACT included test descriptions used in the Work Keys profile process. This process was conducted for the Electrical Worker the first quarter of this Project. Current Work Keys assessments include Reading for Information, Applied Mathematics, Listening, Writing, Teamwork, Locating Information, and Applied Technology. A brief description of each assessment as described in the Work Keys Test Descriptions booklet follows:

The Reading for Information assessment measures the examinee's skill in reading and understanding work-related reading materials. The reading passages and questions are based on the actual demands of the workplace. Passages take the form of memos, bulletins, notices, letters, policy manuals, and government regulations. The test contains reading materials and related multiple-choice questions at five levels of complexity. (p 1:0)

The Listening assessment measures the examinee's skill at listening to and understanding work-related messages. The assessment is administered via an audiotape which contains all directions and messages. Examinees are asked to listen to the audiotaped messages and then compose written messages based on the messages they have heard. Scoring is based on the accuracy and completeness of the information in the examinee's written message. It is not based on mechanics or writing style. Two raters read each message and assign it a level score from 0 to 5. (p 2:1)

The Writing assessment measures the examinee's skill at writing work-related messages. The assessment is administered via an audiotape which contains all directions and messages. Examinees are asked to listen to the audiotaped messages and then compose written messages based on the messages they heard. Scoring is based on the writing mechanics (such as sentence structure and grammar) and writing style used in the examinee's written message. It is not based on the accuracy and completeness of the information, but examinees must try to respond to the stimulus. Two raters read each passage and assign it a level score from 0 to 5. (p 3:1)

The Applied Mathematics assessment measures the examinee's skill in applying mathematical reasoning to work-related problems. This test is designed to be taken with a calculator. A formula sheet that includes all formulas required for the assessment is provided. The assessment contains questions at five levels of complexity. (p 4:1)

The Locating Information assessment measures the examinee's skill in using information taken from workplace graphics such as diagrams, blueprints, floor plans, tables, forms, graphs, charts, and instrument gauges. Examinees are asked to locate, insert, compare, and summarize information contained in one graphic or in a group of related graphics. The assessment contains graphics and questions at four levels of complexity. (p 5:1)

The Teamwork assessment measures the examinee's skill in choosing behaviors and/or actions that simultaneously support team interrelationships and lead toward the accomplishment of work tasks. Examinees must recognize the goals of a team and identify ways to accomplish those goals in increasingly complex situations, such as those where the resources needed to accomplish a given task are not readily available. The assessment contains questions at four levels of complexity. (p 6:1)

The Applied Technology assessment measures the examinee's skill in solving problems of a technological nature. The content covers the basic principles of mechanics, electricity, fluid dynamics, and thermodynamics as they apply to machines and equipment found in the workplace. The assessment contains questions at four levels of complexity. (p 7:1)

Step 2: Analyze Current Assessments

Project staff collected and organized assessment materials in three areas: licensure, testing, and certification. Interviews were scheduled and conducted with Larry Blevins, coordinator of the North Lake Electrical Technology Program; A.C. McAfee, director of the DJATC Program; and Olen Rich, City of Dallas to discuss current assessments in the three areas. Project objectives and goals were reviewed. Follow-up meetings were scheduled as needed.

A barrier was identified when it became evident that actual testing instruments would not be provided for analysis of the inclusion of workplace skills. To maintain integrity the licensure and certification exams are protected. A partial solution was reached by pursuing the availability of sample questions, test descriptions, course projects and assignments, and field supervisor evaluations. An analysis of the three areas follow:

Licensure

On January 27, 1994, the North Central Texas Council of Governments (NCTCOG) Executive Board endorsed the implementation of a cooperative regional program for the competency testing at various grade levels of electricians desiring to perform electrical work in the North Central Texas region. Charles Clawson, chairman, NCTCOG's Regional Codes Coordinating Committee, reported the Executive Board authorized the engagement of Southern Building Code Congress International, Inc. (SBCCI), to prepare, administer, and grade the electrical examinations.

Exams for the electrician grade levels of Master Electrician, Journeyman Electrician, Master Sign Electrician, and Maintenance Electrician are offered at three locations per month. Exams for Residential Wireman, Journeyman Sign Electrician, and Elevator Electrician are currently under development. Municipalities wishing to take part in this testing program must agree to accept the exam results issued by the program. Acceptance of these test results serve as the applicant's fulfillment of the competency testing component of the municipality's electrician licensing requirements. With the exception of the competency exam, municipalities retain all other electrician licensing authority and responsibility they currently possess. Prerequisites for licensure in the City of Dallas are listed on the following pages under each occupation heading.

A 30 day waiting period is required between the first and second time an examinee tests in a particular exam category. After the second testing in a particular exam category, a 90 day waiting period is required between testing dates.

All exams are multiple choice and require a minimum score of 75%. If an examination has two parts, examinees must score 75% on both parts at a single administration in order to pass. Failing examinees receive their actual score along with a diagnostic letter designed to help them determine the areas where they need more study. Passing examinees receive only an indication that they have passed the exam.

SBCCI does not endorse any particular study references for the exams. It is recommended examinees consult the examination outlines provided in the Exam Information Booklet. They are provided by SBCCI and listed below. The job definitions and prerequisites for each licensed occupation are taken from CHAPTER 56, "DALLAS ELECTRICAL CODE," of the Dallas City Code, 5/25/93, draft.

Master Electrician

An individual who possesses the necessary qualifications, training, and technical knowledge to plan, layout, and supervise the installation, maintenance, and extension of electrical equipment.

Prerequisites for Master Electrician:

(a) A new applicant for a certificate as a master electrician or a master sign electrician shall be at least 21 years of age and:

  (1) have been registered for at least one year as a journeyman electrician or journeyman sign electrician with the city;

  (2) file with the application affidavits from past or present employers showing no less than five years experience in the installation, alteration, or maintenance of electrical equipment or electrical sign equipment; or

  (3) show evidence of holding a bachelor of science degree in electrical engineering with either:

    (A) affidavits from past or present employers showing not less than three years experience in the installation, alteration, or maintenance of electrical conductors and equipment or electrical sign equipment; or

    (B) proof of registration with the State of Texas as a professional engineer.

(b) Evidence required in Subsections (a), (2) and (a), (3), (A) may be waived by a vote of the Board. One half of the time spent in attendance at an electrical technical school or college may be considered toward satisfaction of the required five years experience.

Examination Outline - Part I - Closed Book
Time Limit 1 Hour
A score of 75% is required to pass.

Category	**Percent**
Terms and Definitions	15%
Electrical Theory and Principles	18%
Electrical Calculations	22%
Meters and Safety	6%
Transformers	4%
General Code Knowledge	35%

Examination Outline - Part II - Open Book
Time Limit 3 Hours
A score of 75% is required to pass.

Category	**Percent**
Branch Circuit and Service Calculations	10%
Overcurrent Protection	8%
Services	9%
Grounding	5%
General Wiring	22%
Equipment, Motors, and Appliances	10%
Special Requirements	16%
Plan Reading & Analysis	20%

Journeyman Electrician

An individual who possesses the necessary qualifications, training, and technical knowledge to install, maintain, and extend electrical equipment and who is capable of doing this work in accordance with plans and specifications furnished to the individual and in accordance with applicable laws and ordinances governing the work.

Prerequisites of Journeyman Electrician:

(a) An applicant for a certificate as a journeyman electrician or journeyman sign electrician shall be at least 20 years of age and:

(1) have been registered with the city as an electrician in any classification for at least four years;

(2) file with the application, affidavits for past or present employers showing not less than four years experience in the installation, alteration, or maintenance of electrical equipment; or

(3) show evidence of holding a bachelor of science degree in electrical engineering with either:

(A) affidavits from past or present employers showing not less than two years experience in the installation, alteration, or maintenance of electrical conductors or equipment; or

(B) proof of registration with the State of Texas as a professional engineer.

(b) Evidence required in Subsections (a), (2) and (a), (3), (A) may be waived by a vote of the Board. One half of the time spent in attendance at an electrical technical school or college may be considered toward satisfaction of the required four years experience.

Examination Outline - Part I - Closed Book
Time Limit 1 Hour
A score of 75% is required to pass.

Category	**Percent**
Terms & Definitions	20%
Electrical Theory	30%
Wiring Methods	30%
Plan Reading	20%

Examination Outline - Part II - Open Book
Time Limit 3 Hours
A score of 75% is required to pass.

Category	**Percent**
General Requirements & Fundamentals	15%

Wiring Methods - Code Related	25%
Electrical Services	10%
Voltage Drop	5%
Motor Loads	10%
Overcurrent Protection	10%
Calculations	20%
Clearance	5%

Maintenance Electrician

An individual who possesses the necessary qualifications, training, and technical knowledge to repair, operate, and replace electrical equipment in a specific building or premise.

note: A maintenance electrician's certificate or a temporary maintenance electrician's certificate shall entitle the holder to be employed by any person holding an electrical building maintenance operator's certificate under the provisions of the Dallas Electrical Code.

Examination Outline - Open Book
Time Limit 3 Hours
A score of 75% is required to pass.

Category	**Percent**
Terms & Definitions	10%
Electrical Theory	10%
General Requirements & Fundamentals	10%
Wiring Methods	25%
Voltage Drop	5%
Motor Loads	10%
Overcurrent Protection	10%
Calculations	15%
Clearances	5%

Master Sign Electrician

An individual who possesses the necessary qualifications, training, and technical knowledge to plan, layout, and supervise the installation, maintenance, and extension of electrical signs, luminous gas or electrical discharge signs, and luminous gas or electrical discharge outline lighting.

Prerequisites of Master Sign Electrician: See prerequisites of Master Electrician above.

Examination Outline - Open Book
Time Limit 3 Hours
A score of 75% is required to pass.

Category	**Percent**
Basic Electricity & Wiring	24%
Electrical Materials & Installation	20%
Motors & Transformers	10%
Outside Branch Circuits & Feeders	20%
Electrical Signs & Outline Lighting	26%

Licensure Under Development:

Journeyman Sign Electrician

An individual who possesses the necessary qualifications, training, and technical knowledge to install, maintain, and extend electrical signs, luminous gas or electrical discharge outline lighting and who is capable of doing this work in accordance with plans and specifications furnished to the individual and in accordance with applicable laws and ordinances governing the work.

Prerequisites for Journeyman Sign Electrician: See prerequisites for Journey Electrician above.

Examination Outline - Open Book
Time Limit 3 Hours
A score of 75% is required to pass.

Category	**Percent**
Basic Electricity and Wiring	25%
Electrical Materials and Installation	30%
Motors and Transformers	5%
Outside Branch Circuits and Feeders	10%
Electrical Signs and Outline Lighting	30%

Residential Wireman

This occupation/licensure title falls under the category definition of "Special Electrician" and represents an individual who possesses the necessary qualifications to construct, repair, install, or maintain specific electrical equipment under the specific classification of electrical work for which the specialist is qualified.

note: Each applicant applying for this licensure **not** holding a master or journeyman electrician's registration certificate shall be required to answer a reasonable number of questions, in writing, to show that the applicant has sufficient knowledge and training to perform the work for the class of electrical specialist applied for.

Examination Outline - Open Book
Time Limit 3 Hours
A score of 75% is required to pass.

Category	Percent
Electrical Layout	10%
Branch Circuits Rough-In Wiring	14%
Branch Circuits and Appliances	16%
Services	14%
Grounding	16%
Panel Wiring and Overcurrent Protection	16%
Final Wiring and Trim Out	14%

Elevator Electrician

This occupation/licensure title falls under the category definition of "Special Electrician" and presents an individual who possesses the necessary qualifications to construct, repair, install, or maintain specific electrical equipment under the specific classification of electrical work for which the specialist is qualified.

note: Each applicant applying for this licensure **not** holding a master or journeyman electrician's registration certificate shall be required to answer a reasonable number of questions, in writing, to show that the applicant has sufficient knowledge and training to perform the work for the class of electrical specialist applied for.

Examination Outline - Open Book
Time Limit 3 Hours
A score of 75% is required to pass.

Category	Percent
Basic Load Computations	10%
Electrical Materials and Installation	40%

Motors and Transformers	8%
Overcurrent Protection and Grounding	8%
Elevator Wiring	34%

A close look at the categories included in the licensure exams reveals that examinees are being tested in the most critical areas identified by industry in the ACT Work Keys profile process. For example, the Journeyman examination tests in the categories of calculations and clearance which require applied math skills; plan reading and code-related wiring methods which require locating information skills, and voltage drop and motor loads which require applied technology skills.

Recommendations:

A valuable resource for the City of Dallas, surrounding municipalities, and SBCCI, the authorized administrator of the electrical exams required for licensure, would be the review and incorporation of pertinent, up-to-date information. National Skill Standard and Job Task Analysis studies for the electrical industry are scheduled to be released later this fall. It is recommended they be disseminated to the North Central Texas Council of Governments and the appropriate City of Dallas officials responsible for the certification of electrical workers for possible inclusion of examination items that test for SCANS/workplace development.

Testing

Current Assessment Analysis:

Work was conducted with Larry Blevins, coordinator of the North Lake College Electrical Technology Program and A.C. McAfee, director of the Dallas Joint Apprenticeship and Training Program to review current assessments. Both Programs demonstrated that criterion-referenced, skill-based testing is currently in practice in their programs to attain the levels of *technical* competency necessary for successful entry-level employment. Additionally, formal assessment of some of the SCANS or ACT Work Keys workplace skills is currently in practice. The curriculum review and analysis conducted the second and third quarters of this project yielded data documenting that workplace skills were taught to varying levels in the curriculum. Since testing is conducted over the current curriculum, it is implicit that these skills are currently tested. Other identified workplace skills were reported as being assessed informally through instructor or on-the-job supervisor observation in apprenticeship and cooperative work experience settings.

<ins>North Lake College Electrical Technology Program:</ins>

Pre-program assessments/requirements: North Lake College has an assessment and advisement program for entering students which is a required part of the enrollment process. The assessment program includes the completion of a questionnaire which documents information on career and work plans, previous academic achievement and other relevant information. Assessment also includes an examination of individual skill levels in reading, writing and mathematics. Information on skills may come from ACT, SAT, previous college-level work or from scores on the standardized tests administered free of charge by the College. Students who have taken TASP also need their TASP scores.

The Texas Academic Skills Program (TASP) is required by state law to insure that students enrolled in Texas public colleges possess the academic skills needed to perform effectively in college-level course work. Students who entered the Dallas County Community College District Fall, 1989, or thereafter, must take the TASP test prior to accumulating, or during the semester of enrollment in 9 hours of college credit, and must report TASP scores prior to their next DCCCD enrollment. Students who have had at least 3 hours of college-level credit prior to Fall, 1989 are exempt from the TASP requirement. Students enrolled in certain DCCCD Certificate programs may be waived from the TASP requirement. Deaf and blind students are TASP-exempt, as are students whose composite Enhanced ACT is 29 or higher with individual math and English scores of at least 27; or whose SAT composite score is at least 1200 with verbal and math scores each of at least 550; or with TAAS scores of at least 1800 on each of the three sections. (Test scores must meet all DCCCD criteria to be considered valid.)

Current Electrical Technology program assessments: Formal indicators of achievement for students currently enrolled in the North Lake College Electrical Technology Program include class/homework assignments, project assignments, and assessments via chapter quizzes, mid-terms, final exams, and cooperative work experience evaluations. Informal assessments include instructor and peer observation and feedback during demonstrations and other in-class and laboratory exercises.

Class/homework assignments: These assignments are completed individually. They consist of assigned reading and chapter questions, locating and reporting information found in the National Electrical Code, calculations, and viewing video tapes and answering questions.

Project assignments: These assignments are completed individually or in teams. They consist of workbook assignments, observation and return demonstration, and hands-on lab tests. These assignments are evaluated on set criteria with the student receiving a pass or no-pass grade for each project.

Chapter quizzes: These assessments may be announced or unannounced. They consist of multiple choice questions, true and false questions, and calculations.

Mid-terms and final exams: These assessments consist of multiple choice questions, true and false questions, lab assignments, calculations, and fill-in-the-blank.

Instructor observation: Instructors evaluate both individual and team assignments using checksheets and by taking notes.

Cooperative work experience feedback: Instructors evaluate the classroom portion of these courses. Students are assessed in the areas of class participation, class assignments, and completion of objectives. Objectives vary and are developed cooperatively by the student, the instructor, and the on-the-job field supervisor. Additionally, students are evaluated by their field supervisors and scored (outstanding, good, average, needs improvement, does not meet standard) in the following areas:

Work attitude
Work attendance
Punctuality

Personal appearance
Work quality
Work quantity
Compliance with policies
Observance of safety rules
Accepting responsibility
Personal initiative
Willingness to learn
Co-worker cooperation
Management cooperation
Technical knowledge
Meeting the public
Problem solving skills
Operation of equipment
Following instructions

The above list of attributes in which cooperative work experience students are being evaluated and assessed very closely matches the workplace skills or competencies identified by SCANS as necessary for successful entry-level employment. It is important to note that SCANS foundation skills are often a prerequisite to successful performance of the SCANS competencies.

DJATC Apprenticeship Program:

Pre-program assessment/requirements: Students wishing to enter the Apprenticeship Program are required to follow an application process. This includes the completion of a questionnaire and proof of age, high school graduation or GED, one year of high school algebra or equivalent with a passing grade, and official high school transcript. Additionally, applicants must undergo a drug test and verify physical ability to perform electrical construction work. DJATC only accepts as many students as estimated can be employed in the Program; therefore, the enrollment process is competitive. Students wishing to enter the program that meet the application criteria are assessed and scored on their educational background, the extent of their mathematics background, and a personal, job-type interview process.

Current DJATC program assessments: Formal program indicators of achievement for students currently enrolled in the DJATC Apprenticeship Program include homework assignments, chapter tests, a comprehensive final exam, and employer evaluation. Informal assessments include instructor observation and feedback.

Homework assignments: These assignments are completed individually or in teams. They consist of workbook lessons, written lessons, the completion of handouts, etc. A passing score of 90% is required.

Chapter tests: These assessments are completed individually. They are written tests and include fill-in-the-blank, short answer, true and false, and essay questions based on the required course competencies. A passing score of 75% is required.

Final comprehensive test: This assessment is administered at the end of the five-year apprenticeship program. It is a written test containing multiple choice, true and false questions, electrical formulas, calculations, and schematic drawings. It measures student competence in all areas identified by the National Joint Apprenticeship Training Committee as being necessary for successful industry employment at the journeyman level. A passing score of 75% is required.

Instructor Observation: This is a continuous, informal assessment where through observation instructors "monitor" student behavior, class contributions, abilities, and difficulties providing feedback for corrective action.

Employer Feedback: This assessment of the student's performance on-the-job from the employer's point of view occurs in three ways. First, the employers provide verbal feedback to the apprentice on a very frequent, if not daily basis. Second, the employer provides verbal feedback to the Apprenticeship Committee on apprentice's performance.

And third, written evaluations are completed by the employer, foreman, and electricians familiar with the apprentice's work on an as-needed basis and each time an apprentice qualifies for a pay raise.

Recommendations:

Suggested approaches and strategies for how North Lake College and DJATC might enhance current testing procedures:

1. The current testing instruments will need to be reviewed for possible revision of technical and workplace skills assessment when the National Skill Standards and Job Task Analysis become available.
2. The current testing procedures need to be reviewed for possible consideration and incorporation of ACT test instruments in selected skill areas.
3. New assessments need to be developed to measure workplace skills. In the curriculum enhancement section of this project, prototype learning activities and performance objectives were developed for the seven identified ACT Work Keys skill areas. Assessments need to be developed to accompany each new learning activity.

Certification

Existing Certifications:

North Lake College Electrical Technology Certificate

The North Lake College Electrical Technology Certificate program consists primarily of electrical courses for the student who wishes to move directly into an electrical career. Completion of the required ten courses with a passing grade qualifies a student for a Certificate in Electrical Technology. A minimum of 30 credit hours is required.

College credit may be granted to students for prior work experience and credit may also be given to students who pass written exams covering academic and technical skills and knowledge previously acquired. Cooperative education is also available for Electrical Technology students, providing on-the-job training that permits the student to experience a real work situation, receive a salary, and develop/hone workplace skills.

North Lake College Associate Degree

The North Lake College Electrical Technology Associate Degree program prepares a student for career opportunities by developing technical knowledge and practical skills necessary to enter or advance in the electrical technology field. Completion of the required courses with a passing grade qualifies a student for an Associate in Applied Art and Science with a major in Electrical Technology. A minimum of 68 credit hours is required. A graduate of this program should be capable of passing a journeyman's or master's licensing examination.

College credit may be granted to students for prior work experience and credit may also be given to students who pass written exams covering skills and knowledge previously acquired. Cooperative education is also available for Electrical Technology students, providing on-the-job training that permits the student to experience a real work situation and receive a salary while satisfying college credit requirements.

Students completing the Associate in Applied Arts and Sciences degree program may wish to continue their education at a four-year college or university. North Lake College's Electrical Technology course credit may be applied toward earning a bachelor's degrees at many institutions.

DJATC Apprenticeship Associate Degree

This Degree is offered to students enrolled in the DJATC Apprenticeship Program who complete the requirements of both the Apprenticeship Program and the North Lake College Associate Degree in Electrical Construction. The North Lake requirements include:

MTH	195	Technical Mathematics	3 Credit Hours
PSY	131	Human Relations	3 Credit Hours
SC	101	Intro to Speech Communications	3 Credit Hours
COM	131	Applied Composition & Speech	3 Credit Hours
CIS	105	Intro to Computer Info. Systems	3 Credit Hours
Elective*			3 Credit Hours

*Elective must be selected from the following: ART 104, HUM 101, ENG 201, ENG 202, ENG 203, ENG 204, ENG 205, ENG 206, MUS 104, PHI 101, THE 101, Foreign Language

NJATC Certificate of Completion of Apprenticeship

Apprenticeship is a structured system of training which combines on-the-job training, under the supervision of experienced journey workers, with related classroom instruction. Upon completion of the Electrical Apprenticeship individuals start their careers as Journey electricians. The NJATC Certificate of Completion of Apprenticeship is awarded by the National Joint Apprenticeship Training Committee to students who complete an affiliated apprenticeship program with a score of 75%, complete 8,000 hours of on-the-job training, and pass the journeyman electrician licensure exam. With this credential students are ready to begin a career as an International Brotherhood of Electrical Workers (IBEW) - National Electrical Contractors Association (NECA) trained electrical worker qualified to work for any union electrical employer.

United States Department of Labor Certificate of Completion of Apprenticeship

There are approximately 800 apprenticeable occupations currently recognized by the Bureau of Apprenticeship and Training, U.S. Department of Labor. The electrician occupation is among them. The United States Department of Labor Certificate of Completion is awarded to students meeting the requirements of the NJATC Certificate of Completion of Apprenticeship.

Recommendations:

A suggested approach for how North Lake College and DJATC might enhance current certification instruments and methods follow:

The adoption of an INITIAL MASTERY COMPETENCY PROFILE that is endorsed by both the North Lake College Electrical Technology Program and the DJATC Apprentice Program is suggested. The PROFILE would represent the knowledge, skills, and attitudes that a student has demonstrated at a given time under given conditions. An example appears in Appendix Q. A COMPETENCY PROFILE would include the following:

- On-the-job training and work experience
- Employability competencies including personal characteristics, job seeking techniques, and entrepreneurship awareness.
- Basic skills degree of competency
- Technical skills degree of competency

Step 3: Study Work Keys Job Profile

Project staff met to review the occupational tasks and skill levels that comprise the ACT Work Keys job profile and related/compared them to the assessments currently used in the North Lake and DJATC Programs. This meeting led to the formulation of the recommended strategies for how the project might promote criterion-referenced, skill-based testing to document that students have attained the levels of workplace and technical competency levels necessary for successful entry-level employment.

Project staff in consultation with the Coordinator of the North Lake College Electrical Technology Program and the Director of the DJATC Apprenticeship Program proposed that prime skill areas be the focus of a sample testing procedure. Suggested areas to target for testing include: Reading for Information, Applied Math, Locating Information, and Applied Technology. It was the consensus that if Locating Information incorporated reading for information skills as a foundation in the performance of that skill, then Locating Information would be selected as the third area for testing. A sampling of the skill areas is recommended by staff because of two factors: (1) the cost of purchasing the test instruments and test processing is prohibitive for testing all students in every skill area, and (2) the fact that inferences can be made from a sample of students tested in selected skill areas.

Step 4: Identify Assessment Strategies

Five recommendations are proposed as assessment strategies for how the project might promote criterion-referenced, skill-based testing to certify that students have attained the levels of SCANS skills and technical competency levels necessary for successful entry-level employment.

- Disseminate the National Skill Standards and Job Task Analysis reports for the electrical industry to: (1) the North Central Texas Council of Governments, (2) City of Dallas officials responsible for certification of electrical workers, and (3) SBCCI, the authorized administrator of the electrical exams, for possible inclusion of additional examination items that test specifically for SCANS/workplace skills development.

- Review current North Lake College Electrical Technology Program and DJATC Apprenticeship Program testing instruments for possible revision of technical and workplace skills assessment when the National Skill Standards and Job Task Analysis reports become available.

- Implement pre- and post testing in Spring semester, 1995 of a sample of NLC Electrical Technology Program students in the skill areas of Applied Mathematics, Applied Technology, and Locating Information using the ACT Work Keys assessments.

- Implement assessments for the prototype learning activities and performance objectives that were developed for the seven identified ACT Work Keys skill areas in the enhanced curriculum. In the matrix that follows, assessments are identified in bold type. These have been developed to accompany each learning activity.

SKILL AREA	NEW ENHANCEMENTS		EXISTING ENHANCEMENTS	
	Learning Activity and Assessment	**Performance Objective**	*Learning Activity and Assessment*	**Performance Objective**
Reading For Information	*ELE 105* *Read a basic job function provided by the instructor and list the steps to accomplish the tasks on the job function handout.* ***Assessment: Completed job function handout graded for correct sequence.***	Using the provided document, the student will read, identify, and list the steps required to accomplish a general wiring task. Performance will be satisfactory if the sequence of steps is correct.	*ELE 105/6* *Read the safety booklet and complete the written safety test.* ***Assessment: Completed multiple choice test.***	Using the Safety booklet, the student will read information and identify critical information. Performance will be satisfactory with a minimum score of 100% on the written safety test.
Applied Mathematics	*ELE 205* *Use a computer estimating program to perform construction cost calculations.* ***Assessment: Computer print out graded for calculations and final estimation.***	Using a computer estimating program, the student will calculate construction costs for an estimation. Performance will be satisfactory if the estimate is within 20% of the actual costs.	*ELE 106* *In the Electrical Technology Lab students will complete a Series Circuit project and worksheet.* ***Assessment: Completed Series Circuit Worksheet graded for calculated values.***	Using Series Circuit Project materials, the student will construct basic circuits and measure and calculate values for voltage, amperage, resistance, and power. Performance will be satisfactory if a score of 70% is achieved.

SKILL AREA	NEW ENHANCEMENTS		EXISTING ENHANCEMENTS	
	Learning Activity and Assessment	**Performance Objective**	***Learning Activity and Assessment***	**Performance Objective**
Listening	*ELE 108* *In a role play students will alternately act as a supervisor giving instructions and a worker receiving instructions. (You may wish to video tape this activity)* ***Assessment: Checklist completed by instructor during role play.***	Given verbal instructions, the student will paraphrase the instructions correctly. Performance will be satisfactory if all critical information is present in the communication.	*ELE 116* *Using the medium of video tape students will listen to, view, and take notes on key concepts.* ***Assessment: Multiple choice test.***	Using notes as a reference, the student will report key lighting concepts from a video tape presentation. Performance will be satisfactory with a minimum score of 70% on a written test.

SKILL AREA	NEW ENHANCEMENTS		EXISTING ENHANCEMENTS	
	Learning Activity and Assessment	**Performance Objective**	***Learning Activity and Assessment***	**Performance Objective**
Writing	*ELE 205* *Read the safety problem handout, discuss safety solutions in small groups, and write a memo.* ***Assessment: Written memo graded for critical information and mechanical errors.***	Presented with a problem related to safety the student will write a memo to a supervisor detailing proposed solutions to problems. Performance will be satisfactory if critical information is communicated in a clear and concise manner with a minimum of three mechanical errors.	*ELE 218* *Read chapter on "Single Family Dwellings" and write set of specifications.* ***Assessment: Three-to-four page, written, short-answer test graded for inclusion of basic elements and mechanical errors.***	Given a lecture and assigned reading the student will write a set of specifications for a single family dwelling. Performance will be satisfactory if all basic elements are present and are communicated in a clear and concise manner with two mechanical errors.

SKILL AREA	NEW ENHANCEMENTS		EXISTING ENHANCEMENTS	
	Learning Activity and Assessment	**Performance Objective**	***Learning Activity and Assessment***	**Performance Objective**
Locating Information	*ELE 108* *Use National Electrical Code software as a research tool.* ***Assessment: Informal instructor observation and feedback.***	Using a computer based National Electrical Code software program, the student will search the software using key words to locate essential information to research a stated problem. Performance will be satisfactory if essential information is located.	*ELE 116* *Study building plans to locate specifications.* ***Assessment: Multiple choice test.***	Using a set of building plans, the student will identify key specifications. Performance will be satisfactory if seven out of ten specifications are identified.

SKILL AREA	NEW ENHANCEMENTS		EXISTING ENHANCEMENTS	
	Learning Activity and Assessment	**Performance Objective**	*Learning Activity and Assessment*	**Performance Objective**
Teamwork	*ELE 116* *Apply the "Project Critique Checklist" in a team project evaluation.* ***Assessment: Checklist completed by the instructor during the evaluations and feedback provided by the instructor after the evaluations.***	Provided with complete class projects, student teams will evaluate other student's blueprints, papers or projects and provide feedback to the student. Performance will be satisfactory if students complete the assignment within the class period and identify two strengths and weaknesses of the Projects and work in teams to conduct the critique.	*ELE 116* *Convene in teams in the lab and complete the team installation of electrical service project following the checklist.* ***Assessment: Return demonstration using testing devices (volt meters, etc.) Checklist completed by the instructor during demonstration.***	Using training booths in labs and working in teams, students will connect a single-phase service entrance, panelboard, protective devices, switches, outlets and other related material. Performance will be satisfactory if the electrical service is installed and operates properly and students demonstrate teamwork skills identified on a teamwork checklist.

SKILL AREA	NEW ENHANCEMENTS		EXISTING ENHANCEMENTS	
	Learning Activity and Assessment	**Performance Objective**	***Learning Activity and Assessment***	**Performance Objective**
Applied Technology	*ELE 115* *In the lab environment students will practice with trainers and complete the checklists.* ***Assessment: Instructor observation and feedback.***	Using a fire and burglar alarm trainer the student will perform trouble-shooting techniques used to isolate selected problems. Performance will be satisfactory if the problem is isolated within the allotted time utilizing all safety procedures.	*ELE 106* *In the lab environment, students will use volt meters to measure electrical values.* ***Assessment: Completed fill-in-the-blank project sheet graded for values. In addition, instructor observation and feedback that students are following the correct steps and procedures to take the measurements.***	Using a multi-meter the student will measure voltage, current, and resistance in a series-parallel circuit. Performance will be satisfactory if values are properly measured and recorded.

- Create an INITIAL MASTERY COMPETENCY PROFILE that is endorsed by the North Lake College Electrical Technology Program. The PROFILE would represent the knowledge, skills, and attitudes that a student has demonstrated at a given time under given conditions. An example appears in Appendix Q.

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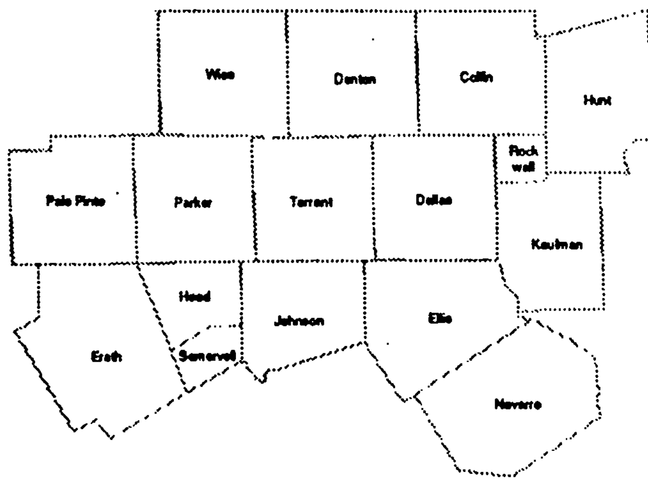
SECTION F

APPENDIX

APPENDIX A

NOTE

This brochure should be used as a guide for occupational demand but should not be considered an absolute because unexpected changes in the work place such as plant closings and company downsizing could impact the occupational demand very quickly.



North Central Texas *InterLink*, Inc.
8445 Freeport Parkway, Suite 640
Irving, Texas 75063
P.O. Box 610246
DFW Airport, TX 75261-0246
(214) 621-0400 (Metro)

North Central Texas

InterLink, inc.

1993-2000

Demand Occupations

Introduction

This brochure is intended to assist parents, students, and school counselors in career counseling and planning by identifying high demand career opportunities that are expected to be available in the North Central Texas labor market between now and the year 2000.

The demands of today's labor market make it absolutely necessary that students begin to think in terms of the types of occupations they may want to have as early as their 7th and 8th grade years. Increasingly, today's jobs require a firm foundation in science, mathematics, and communication skills. These courses are progressive, meaning that each succeeding course builds upon the previous one. A failure to enroll in the proper courses during middle school and the early years of high school practically ensures that students making late career decisions will lack the necessary education and will find job opportunities severely limited.

Students and parents are encouraged to see their school counselors for further information regarding this information and other potential career opportunities.

InterLink is the quality work force planning region for North Central Texas that was formed in 1987 in conjunction with the Texas Department of Commerce, The Texas Education Agency, and the Texas Higher Education Coordinating Board. Its mission is to increase the efficiency and cost effectiveness of matching education and training in the region with the job requirements of today and the future. *InterLink's* labor market database consists of information gathered from and in conjunction with state and local government and education agencies with assistance from the business community.

This list includes occupations that will be in high demand and will require formal education beyond high school, generally in the form of technical certificates, associate degrees, or college degrees.

Average annual openings from 1990-1995 reflect both newly created jobs and replacement jobs due to employees leaving.

InterLink "Top 40" Targeted Occupations for 1993-2000

Occupational Category	Average Annual Openings	Training Time
Managerial and Administrative:		
Food Service Managers	1560	2 yrs to 4 yrs
Managers, N. E. C.	3480	2 yrs to 4 yrs
Supervisor/ Manager, Clerical	3230	2 yrs to 4 yrs

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"Top 40" continued...

Professional and Technical:		
Civil Engineer	395	4 yrs to 10 yrs
Computer Programmers	1860	2 yrs to 4 yrs
Computer Systems Analyst	1485	2 yrs to 4 yrs
CAD Drafters	1105	1 yr to 2 yrs
Electrical Engineer Technicians	1310	2 yrs to 4 yrs
Electrical Engineer	1345	4 yrs to 10 yrs
Laboratory Analyst/Environmental	500	2 yrs to 4 yrs
Licensed Practical Nurses	2840	1 yr to 2 yrs
Medical Lab Technicians	355	6 mos to 1 yr
Physical Therapists	335	2 yrs to 4 yrs
Radiologic Technologists	270	1 yr to 2 yrs
Registered Nurses	4870	2 yrs to 4 yrs
Sales Representatives/Wholesale	3810	2 yrs to 4 yrs
Preschool Teachers	850	2 yrs to 4 yrs
Elementary Teachers	3820	2 yrs to 4 yrs
Secondary Teachers	4750	4 yrs to 10 yrs
Clerical and Administrative Support:		
Info. Technology Support Specialists	795	2 yrs to 4 yrs
Medical Secretaries	700	2 yrs to 4 yrs
Secretaries, N. E. C.	8045	1 yr to 2 yrs
Service:		
Business Services Agents	565	6 mos to 1 yr
Cooks, Restaurant	2025	1 yr to 2 yrs
Correction Officers	615	3 mos to 6 mo
Dental Assistants	590	3 mos to 6 mos
Home Health Aides	2640	1 yr to 2 yrs
Medical Assistants	615	1 yr to 2 yrs
Police Patrol Officers	1170	2 yrs to 4 yrs
Production/Construction/Operators/Maintenance/Materials:		
Aircraft Mechanics	425	2 yrs to 4 yrs
Auto Mechanics	2115	1 yr to 2 yrs
Computer Maintenance Technicians	500	1 yr to 2 yrs
Diesel/Bus/Truck Mechanics	825	2 yrs to 4 yrs
Electricians	1355	4 yrs to 10 yrs
Excavating/Loading Machine Operator	170	6 mos to 1 yr
Gardeners/Groundskeepers	1670	3 mos to 6 mos
Heat /Refrigeration Mechanics	455	2 yrs to 4 yrs
Maintenance Repairers, General Utility	3120	2 yrs to 4 yrs
Plumbers/Pipefitters	1115	6 mos to 1 yr
Truck Drivers, All	5800	3 mos to 6 mos

APPENDIX B

Business

The Dallas Morning News

Thursday, June 23, 1994

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SPECIAL REPORT

Qualified workers for entry-level jobs difficult to find

By Jennifer Files
Staff Writer of The Dallas Morning News

Help wanted: Futon Co. is searching for a new salesperson. Besides having minimal sales experience, applicants should listen well, get along with customers and co-workers, have basic reading, writing and math skills and be familiar enough with computers not to crash the system.

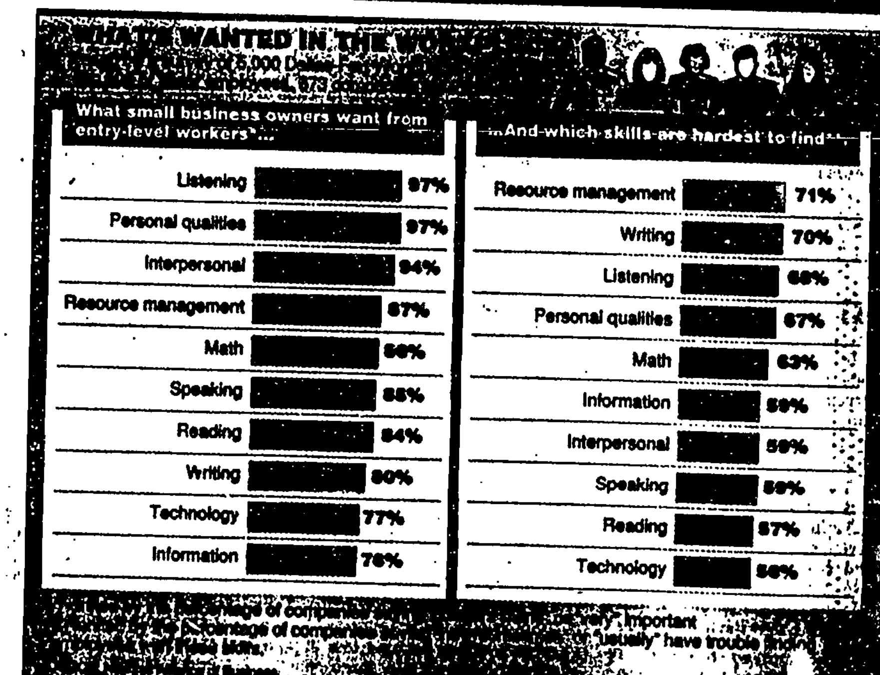
Those are pretty typical qualifications for an entry-level job. But Futon district manager Flint Fyke says applicants who meet that description aren't so common.

"I don't know what it is," Mr. Fyke said Wednesday afternoon, after hearing from 10 to 20 applicants. "I have a hard time finding good, competent people. They lock up on the computer; they're not willing to really stick with it and do the job."

So it didn't surprise Mr. Fyke to hear that a new survey found that most Dallas-Fort Worth small businesses have trouble finding qualified entry-level workers.

The survey — released Wednesday by the National Alliance of Business — asked 5,000 local companies with 500 or fewer employees to rate the importance of 10 basic skills and to say how often

Please see APPLICANTS on Page 2D.



Applicants for entry-level jobs lack skills, survey finds

Continued from Page 1D.

finding qualified workers is a problem.

More than half of the 673 respondents said they "sometimes" or "usually" have trouble finding applicants who possessed the abilities. Ranked in order of importance to the companies, the skills included: listening, personal qualities, interpersonal relations, resource management, math, speaking, reading, writing, technology and information.

Dallas Independent School District superintendent Chad Woolery called the results "very realistic" and said they mirror the anecdotal evidence he has heard from Dallas-area employers.

They are also similar to the alliance's findings from previous surveys in Los Angeles and Miami — and a 1990 survey of the nation's 1,200 largest public and private corporations. Almost two-thirds of the corporations said they were dissatisfied with the competency of job applicants, and 84 percent said new employees weren't sufficiently educated.

But while the problems may be universal, they may have a bigger impact on small companies, which are less able to lure highly paid top-notch workers or provide on-the-job-training.

"Small businesses can't afford a training department," said alliance president William H. Kolberg, who will be in Dallas Thursday for a seminar the alliance is sponsoring on improving the workforce. "They probably can't even afford a personnel department. They are often in a very difficult competitive mode."

The 3,200-member alliance, which focuses on education reform to improve the workforce, chose Dallas for its survey because the city will host its annual conference this fall, Mr. Kolberg said.

Of the 673 respondents, 52 p... ...t said they were manufacturing companies, 44 percent were service companies and 4 percent said they were in other types of business.

Managing resources — including time, money and materials — was the scarcest skill they reported: 30 percent of companies said it is "usually a problem." The right mix of personal qualities is also elusive, with 27 percent of respondents reporting frequent problems in that area.

But fundamental abilities also present problems. One quarter of companies said finding workers who can write is usually difficult, and 21 percent reported applicants often can't do basic math. Reading is usually a problem for 15 percent of the companies.

Providing better training for Texas workers is a major economic development priority, said Mike Wegner, who directed a wide-ranging study by the Texas Comptroller of Public Accounts to determine how competitive the state will be in the future.

"There are still going to be some jobs for people with little education, but they're not going to pay worth a darn," Mr. Wegner said. "More and more if you want to get above those kinds of jobs, you need technical training (or) community college."

Current enrollment figures in the Dallas County Community College District indicate students are already paying attention. Nearly 40 percent of students take some remedial classes, and 38 percent sign up for technical programs.

And Mr. Woolery said he has recently put together a committee of businesspeople, representing both small and large businesses, to recommend ways to prepare students more adequately for the workforce.

APPENDIX C

National Joint Apprenticeship and Training Committee for the Electrical Industry
A. J. Pearson, Executive Director • 16201 Trade Zone Ave., Suite 105 • Upper Marlboro, MD 20772
Phone 301 249-2042 FAX 301 249-4961

October 12, 1993

SUBJECT: Job Analysis - Your role, objective and responsibility

Dear IBEW Business Manager (Inside and Outside Locals), NECA Chapter Manager, JATC Training Director or Secretary of the JATC:

As noted in numerous NJATC Bulletins; we, the IBEW and NECA through the auspices of our NJATC are investing substantial funds to conduct a most complete job analysis. The analysis being conducted by the American Institutes for Research (AIR) will provide a complete, up-to-date job description for the Inside Wireman, Outside Lineman and Residential Wireman.

Current legislation, rules and regulations including the Americans with Disabilities Act makes it essential for every JATC, local union and electrical contractor to have a job description. A current job description will provide unmeasurable support for our industry. To provide complete and accurate data necessary for this study, thousands of active members in our industry will be called on to provide valuable input and information. This input will be collected from surveys completed by individual journeymen and apprentices. Approximately one hundred and seventy-five (175) local areas will be randomly selected to participate in the survey. The Training Director or the Secretary of the JATC will receive the survey forms directly from the AIR with clear instructions from the NJATC on how to randomly select journeymen and apprentice to participate in the study. A predetermined number of journeymen and apprentices from each of the participating JATCs are to be given the surveys along with its cover letter. The individuals need to be encouraged to complete the form in a timely manner. The Training Director or Secretary of the JATC will need the assistance of the Local Union Business Manager, Chapter Manager, and employer in encouraging journeymen to complete the survey forms.

The Training Director or the Secretary of the JATC (or person designated to distribute and collect the survey forms) will need a copy of every employers' Monthly Payroll Report (MPR) for September, 1993. The forms will be used to randomly select the predetermined number of journeymen that will participate in the study. This random selection is absolutely essential to insure the integrity of the study. It is most important that instructions from the NJATC and the AIR be carefully followed and adhered to. The Local Union Business Manager and the NECA Chapter Manager should work with the Training Director or the JATC Secretary in establishing the list from the MPRs, to use for the random selection of participants.

Instructions will be mailed with the surveys to those areas selected to help with this important research. If your area is selected to help with this study, please do so with the awareness that this is a most important endeavor. Its outcome will depend on your full, cooperative participation.

We thank you for your cooperation in this effort to help better serve all local needs in these critical areas.

Sincerely,

John M. Grau
Executive Vice President
NECA

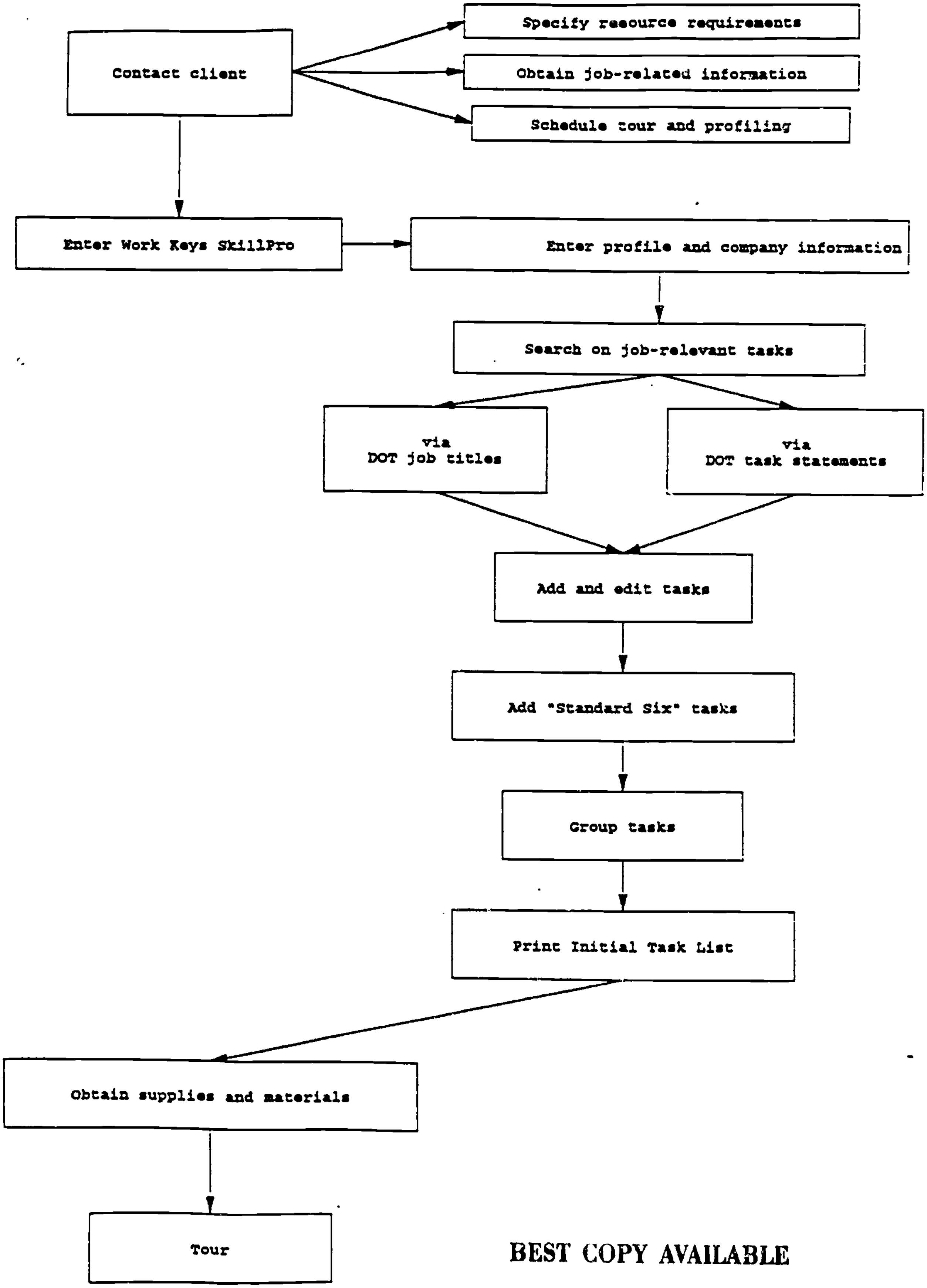
Fraternally,

J. J. Barry
International President
IBEW

AJP/bp

APPENDIX D

Preparing for A Job Profiling Session Before Meeting with SMEs



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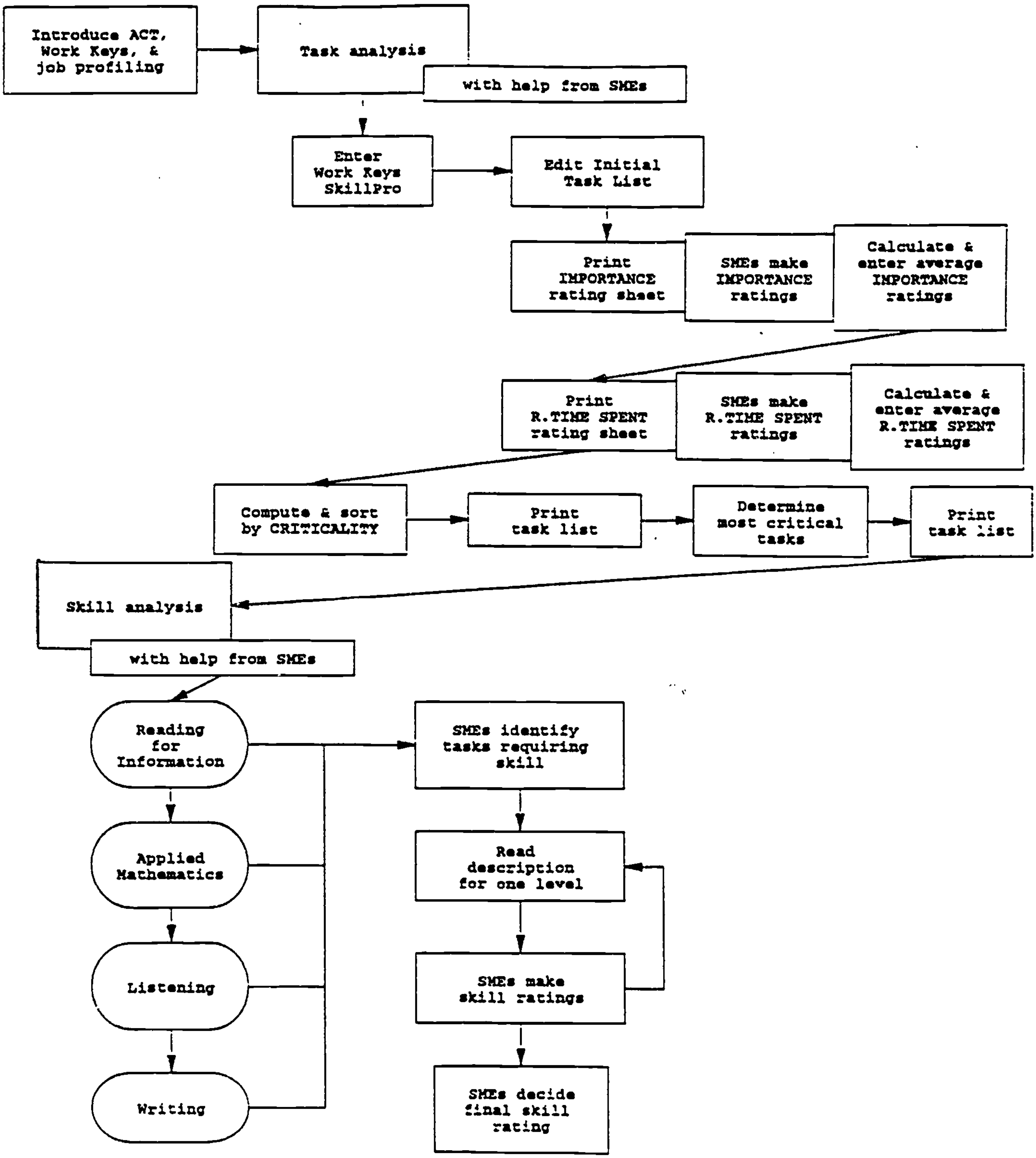
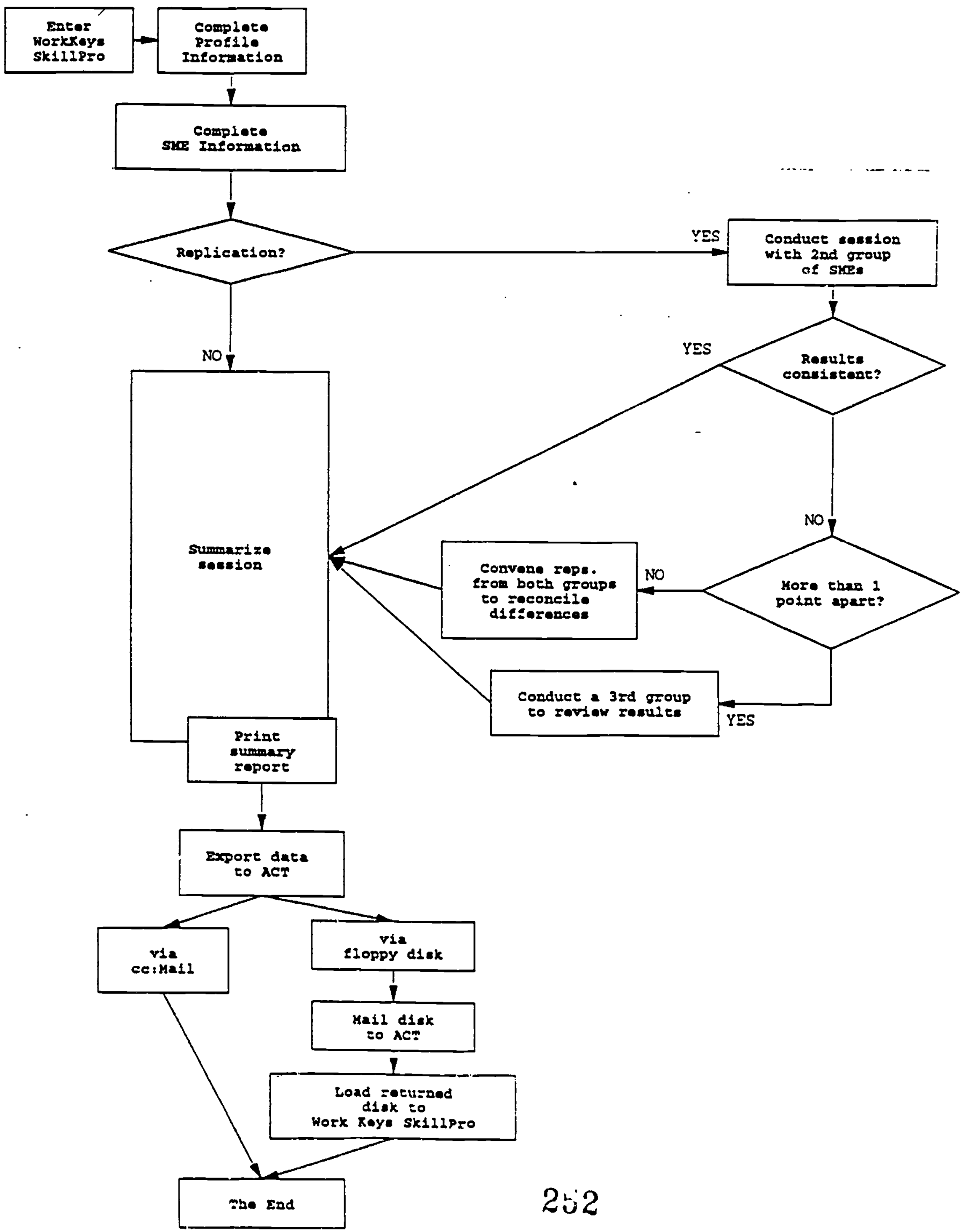
Conducting A Job Profiling Session During Meeting with SMEs



Completing A Job Profiling Session After Meeting with SMEs



APPENDIX E

Reading for Information

Level 3

Questions at Level 3 measuring the examinee's skill in reading short, uncomplicated passages which use elementary vocabulary. The reading materials include basic company policies, procedures, and announcements. All of the information needed to answer the questions is stated clearly in the reading materials and the questions focus on the main points of the passages.

At this level, the wording of the questions and answers is similar to identical to the wording used in the reading materials.

Questions at Level 3 require the examinee to

* identify uncomplicated key concepts and simple details.
* recognize the proper placement of a step in a sequence of events, or the proper time to perform a task.
* identify the meaning of words that are defined within the passage.
* identify the meaning of simple words that are not defined within the passage.
* recognize the application of instructions from the passage to situations that are described in the passage.

Level 4

At level 4, the reading passages are slightly more complex than those at Level 3. They contain more detail and describe procedures which involve a greater number of steps. Many passages describe policies and procedures where, depending on various factors, appropriate behavior changes.

At this level, the questions and answers are paraphrased from the passage rather than taken verbatim. The vocabulary, while elementary, contains words that are more difficult than those at Level 3. For example, the word "reposition" may be used at this level, whereas at Level 3 the phrase "put back" would be used.

In addition to the skills tested at the preceding level, questions at Level 4 require the examinee to

* identify details that are more subtle than those in Level 3.

* recognize the application of more complex instructions, some of which involve several steps, to described situations.

* recognize cause-effect relationships.

Level 5

Passages at Level 5 or more detailed, more complicated, and cover broader topics than those at Level 4. The vocabulary used includes words and phrases that may be specialized (jargon and technical language) and words with multiple meanings.

Questions at this level typically call for applying information given in the passage to a situation that is not specifically described in the passage. All of the information needed to answer the questions is stated clearly in the passages, but the examinee may need to take several considerations into account in order to choose the correct responses.

In addition to the skills tested at the preceding levels, questions at Level 5 require the examinee to

* identify the paraphrased definition of jargon or technical terms that are defined in the passage and recognize the application of jargon or technical terms to stated situations.

* recognize the definition of acronyms that are defined in the passage.

* identify the appropriate definition of words with multiply meanings.

* recognize the application of instructions from the passage to new situations that are similar to the situations described in the reading materials.

* recognize the application of more complex instructions to described situations, including conditionals and procedures with multiple steps.

Level 6

Passages at Level 6 are significantly more difficult than those at the previous level. The presentation of the information is more complex; passages may include excerpts from regulatory and legal documents. The procedures and concepts described are more elaborate. Advanced vocabulary, jargon, and technical terms are used Most of the information needed to answer the questions correctly is not clearly stated in the passages.

The questions at this level require examinees to generalize beyond the stated situation, to recognize implied details, and to recognize the probable rationale behind policies and procedures.

In addition to the skills tested at the preceding levels, questions at Level 6 require the examinee to

* recognize the application of jargon or technical terms to new situations.

* recognize the application of complex instructions to new situations.

* recognize the less common meaning of a word with multiple meanings from context.

* generalize from the passage to situations not described in the passage.

* identify implied details.

* explain the rationale behind a procedure, policy, or communication.

* generalize from the passage to a somewhat similar situation.

Level 7

The questions at Level 7 are similar to those at Level 6 in that they require the examinee to generalize beyond the stated situation, to recognize implied details, and to recognize the probable rationale behind policies and procedures. However, the passages are more difficult: the density of information is higher, the concepts are more complex, and the vocabulary is more difficult. Passages include jargon and technical terms whose definitions must be derived from context.

In addition to the skills tested at the preceding levels, questions at Level 7 require the examinee to

* recognize the definitions of difficult, uncommon jargon or technical terms from context.

* generalize from the passage to situations neither described in nor completely similar to those in the passage.

Applied Mathematics

Level 3

Problems at Level 3 measure the examinee's skill in performing basic mathematical operations (addition, subtracting, multiplication, and division) and conversions from one form to another, using whole numbers, fractions, decimals, or percentages. Solutions to problems at Level 3 are straightforward, involving a single type of mathematical operation. For example, the examinee might be required to add several numbers or to calculate the correct change in a simple financial transaction.

Problems at this level translate easily from a verbal setup to a mathematical equation. All the information needed to solve the problems is provided in logical order and no unrelated information is included. Problem setups may include units of measurement. However, with the exception of dollars and cents, these units function solely as labels and are not involved in actual calculations.

Level 4

Problems at Level 4 measure the examinee's skill in performing one or two mathematical operations, such as addition, subtraction, or multiplication, on several positive or negative numbers. (Division or negative numbers is not covered until Level 5.) Problems may require adding commonly known fractions, decimals, or percentages (e.g., 1/2, .75, 25%), or adding three fractions that share a common denominator. At this level, the examinee is also required to calculate averages, simple ratios, proportions, and rates, using whole numbers and decimals.

Problems at this level require the examinee to reorder verbal information before performing calculations. The examinee must read the entire problem carefully to determine which operation (s) to perform and in what order. In some problems, examinees must read a simple chart or graph to obtain the information needed to solve the problem.

Level 5

Problems at Level 5 require the examinee to look up and calculate single-step conversions within English or non-English systems of measurement (e.g., converting from ounces to pounds or from centimeters to meters) or between systems of measurement (e.g., converting from centimeters to inches). These problems also require calculations using mixed units (e.g., hours and minutes).

Problems at this level contain several steps of logic and calculation. The examine must determine what information, calculations, and unit conversions are needed to find a solution. For example, the examinee might be asked to calculate perimeter and areas of basic shapes, to calculate percent discounts or markups, or to complete a balance sheet or order form.

Level 6

Problems at Level 6 measure the examinee's skill in calculating using negative numbers, fractions, rations, percentages, and mixed numbers. For example, the examinee might be required to calculate multiple rates to find areas of rectangles or circles and volumes of rectangular solids or to solve problems that compare production rates and pricing schemes. The examinee might need to transpose a formula before calculating or to look up and use two formulae in conversions within a system of measurement. Level 6 problems may also involve identifying and correcting errors in calculations.

Problems at Level 6 may require considerable translation from verbal form to mathematical expression. They generally require considerable set up and involve multiple-stop calculations or conversions.

Level 7

Problems at Level 7 require multiple steps of logic and calculation. For example, the examinee may be required to convert between systems of measurement that involve fractions, mixed numbers, decimals, or percentages; to calculate multiple areas and volumes of spheres, cylinders, and cones; to set up and manipulate complex rations and proportions; or to determine the better economic value of several alternatives. Problems may involve more than one unknown, nonlinear functions (e.g., rate of change), and applications of basic statistical concepts (e.g., error of measurement). The examinee may be required to locate errors in multiple-step calculations.

At this level, problem content or format may be unusual, and the information presented may be incomplete or implicit, requiring the examinee to derive from the setup the information needed to solve the problem.

Listening

Listening Scoring Criteria

<u>Levels</u>

0 No meaningful information, or totally inaccurate information.

1 Minimal pertinent information; enough context to provide clues as to gist of situation <u>OR</u> source of further information.

2 Some pertinent information; may have incorrect critical information, but sketch of the situation is correct.

3 Response substantially correct; all the critical information that is present is correct; may be missing a few pieces of critical information.

4 Response correct in that all critical information is given and is correct; may be missing subtle details or tone; may have incorrect noncritical information that does not interfered with central meaning.

5 All information correct; all critical information present and correct; response conveys insight into situating through tone and/or subtle details.

Writing

Writing Scoring Criteria

Levels

0 An attempt is made at the message, but the message is completely garbled with no recognizable sentence structure.

1 Message conveyed inadequately; overall lack of proper sentence structure.

2 Message conveyed adequately; weak sentence structure; large number of mechanical errors.

3 Message conveyed clearly; most sentences complete; some mechanical errors.

4 Message conveyed clearly; all sentences are complete; may have a few minor mechanical errors; may have a choppy style.

5 Message conveyed clearly; good sentence structures; no mechanical errors; highly appropriate for business setting and situation; smooth, logical style.

Locating Information:

Using Tables, Forms, Graphs and Diagrams

Level 3

Questions at Level 3 are based on elementary workplace graphics such as simple order forms, bar graphs, tables, flowcharts, and floor plans.

Questions at Level 3 require the examinee to

* find one or two pieces of information in these types of graphics.
* fill in one or two pieces of information that are missing from these types of graphics.

Level 4

Questions at Level 4 are based on straightforward workplace graphics, such as basic order forms, line graphs, tables, instrument gauges, maps, flowcharts, and diagrams.

In addition to the skills tested at the preceding level, questions at Level 4 require the examinee to

* find several pieces of information in these types of graphics.
* summarize and/or compare information and trends in a single graphic.
* summarize and/or compare information and trends among more than one workplace graphic, such as a bar chart and a data table showing related information.

Level 5

Questions at Level 5 are based on complicated workplace graphics, such as detailed form, tables, graphs, maps, instrument gauges, and diagrams.

In addition to the skills tested at the preceding level, questions at Level 5 require the examinee to

* summarize and/or compare information and trends in a single graphic.
* summarize and/or compare information and trends among more than one workplace graphic, such as a bar chart and a data table showing related information.

Level 6

Questions at Level 6 are based on complex workplace graphics which are difficult because of the great amount of information they contain and/or their challenging presentations. These graphics include very detailed graphs, charts, tables, forms, maps, blueprints and diagrams.

In addition to the skills tested at the preceding level, questions at Level 6 examinee to

* make decisions, draw conclusions, and/or apply information to new situation using several related graphics.

Teamwork

Level 3

Questions at Level 3 are based on recognizing the behaviors or actions which would best support a team and contribute to work performance when faced with simple work situations involving one problem or source of difficulty. In these work situations, team goals and consequences are clear, all the information needed to respond correctly is given, and the team members get along well.

Questions at Level 3 require the examinee to

* identify team goals and ways to work with other team member to accomplish those goals.
* Choose actions that support the ideas of other team members to accomplish team goals.
* recognize that a team is having problems finishing a task and identify the cause of those problems.

Level 4

Questions at Level 4 are based on recognizing the behaviors or actions which would best support a team and contribute to work performance when faced with work situations involving several problems or sources of difficulty. In these work situations, the goals and consequences are not altogether clear, some of the information needed to respond correctly is implied rather than stated, and/or the team members have competing concerns or needs.

In addition to the skills tested at the preceding level, questions at Level 4 require the examinee to

* identify the organization of tasks and the time schedule that would help accomplish team goals efficiently and effectively.
* select approaches that accept direction from other team members in order to accomplish tasks and to build and keep up good team relations.
* identify behaviors that show appreciation for the personal and professional qualities of other team members and respect for their diversity.

Level 5

Questions at Level 5 are based on recognizing the behaviors or actions which would best support a team and contribute to work performance when faced with work situations involving many subtle and competing problems and sources of difficulty. In these work situations, team goals, and consequences are unclear, much of the information needed to respond correctly must be inferred, and the team members have completing concerns and needs.

In addition to the skills tested at the preceding level, questions, at Level 5 require the examinee to

- * identify courses of action that give direction to other team members effectively. Considering the team goals,the examinee must determine the best use of team talents to accomplish those goals.
- * choose approaches that encourage and support the efforts of other team members to further team relationships an/or task accomplish.
- * consider the possible effects of alternative behaviors on both team relationships and team accomplishments and select the one which would best help the team meet its goals.

Level 6

Questions at Level 6 are based on recognizing the behaviors or actions which would best support a team and contribute to work performance when faced with work situations involving complex problems and sources of difficulty. In these work situations, team goals and consequences are unclear and often conflicting, much of the information needed to respond correctly must be inferred, and the team members frequently disagree and argue.

In addition to the skills tested at the preceding level, questions at Level 6 require the examinee to

- * identify the focus of team activity and select a new focus if that would help the team meet its goals more effectively.
- * select approaches that show the willingness to give and take direction as needed to further team goals (e.g., recognize the organization of team members' tasks that would best serve the larger goals of the team.).
- * choose approaches that encourage a team to act as a unit and reach agreement when discussing specific issues.

* identify actions that would help manage differences of opinion among team members, moving the team toward its goals while valuing and supporting individual diversity.

Applied Technology

Level 3

Questions at Level 3 are based on problems involving one uncomplicated system. In solving these problems, the examinee must apply elementary physical principles, such as the use of heat to expand and loosen a metal nut stuck to a bolt.

Questions at Level 3 require the examinee to

* understand the operation of tools, machine components, and uncomplicated systems, such as piping systems, simple electrical heaters, or other equipment found in the home, school, or workplace.

* apply elementary principles underlying the operation of physical systems, such as the workings of plumbing components or uncomplicated electrical circuits.

Level 4

Questions at Level 4 are based on problems involving a moderately complex system or more than one uncomplicated system. In solving these problems, the examinee must apply elementary physical principles, such as heat transfer or the flow of fluids through pipes.

In addition to the skills tested at the preceding level, questions at Level 4 require the examinee to

* understand the operation of moderately complex tools, machines, and systems, such as appliances, pulley-driven equipment, or piping systems that carry more than one fluid.

* apply elementary principles underlying the operation of physical systems, such as an air conditioning unit or an automobile jack.

Level 5

Questions at Level 5 are based on problems involving one complex system, or one or more uncomplicated tools or systems. In solving some of these problems, the examinee must apply difficult physical principles, such as phase change or pressure equilibrium in a system.

In addition to the skills tested at the preceding level, questions at Level 5 require the examinee to

* understand moderate and advanced principles of mechanics, electricity, thermodynamics, and fluid dynamics.

* understand complex machines and systems, such as the operation of gasoline engines, complex appliances, or electrical systems in a building.

Level 6

Problems at Level 6 do not contain all of the information needed to solve them, and that which is provided may be out of logical order. Extraneous information is generally included in problems at Level 6. These problems involve one or more tools or systems having a wide range of complexity. In solving some of these problems, examinees must apply difficult physical principles. Other problems require examinees to understand and correctly interpret the interaction of several complex systems.

In addition to the skills tested at the preceding level, questions at Level 6 require the examinee to

* understand advanced principles and mechanics, electricity, thermodynamics, and fluid dynamics.

* understand complex machines and systems, such as the operation of gasoline engines, complex appliances, or electric systems in a building.

Source: The American College Testing Program, Work Keys Test Descriptions. Iowa City, Iowa, 1994.

APPENDIX F

ACT
Work Keys Profile

Occupation Title: **Electrician (construction)**
Total Number of Subject Matter Experts: 8
Number of Employers Represented: 8
Number of SME Groups: 1
March 10, 1994

Reading for Information	*Applied Mathematics*	*Listening*	*Writing*	*Locating Information*	*Teamwork*	*Applied Technology*
5 or 6	6 or 7	4	3 or 4	5	3	5

Briefly, profiling involved the following four steps:

1. Developing a list of the most critical tasks to the occupation;
2. Sorting the tasks into categories associated with each *Work Keys* skill;
3. Identifying on-the-job behaviors associated with each skill as it is used in the occupation;
4. Determining the *Work Keys* skill levels of the occupation.

As the initial step, subject matter experts (SMEs), consisting of employees identified as having firsthand knowledge of the requirements of the occupation, reviewed a task list taken from the *Dictionary of Occupational Titles* for relevance and comprehensiveness. They deleted any tasks they considered unimportant, revised some task statements, and added tasks that they considered important to the occupation. The SMEs rated each task on both IMPORTANCE, the significance of the task to overall occupational performance, and RELATIVE TIME SPENT, the amount of time spent performing this task compared to other tasks. The CRITICALITY of each task to the occupation (the multiplication of IMPORTANCE and RELATIVE TIME SPENT) was then calculated. The SMEs reviewed the list of tasks and their CRITICALITY ratings and revised the list so that only the most critical tasks remained.

Using this list of most critical tasks, the SMEs discussed how the *Work Keys* skills (i.e., *Applied Mathematics*, *Reading for Information*, etc.) were required for effective performance of each task, and then sorted the tasks into categories associated with each skill (tasks could be sorted into more than one category). Guided by these new lists, the SMEs identified on-the-job behaviors and activities that required the skill, such as reading manuals, calculating the sum of a list of numbers, etc. Finally, the SMEs reviewed the descriptions of the *Work Keys* skills to determine the levels of *Reading for Information*, *Applied Mathematics*, *Listening*, *Writing*, *Locating Information*, *Teamwork* and *Applied Technology* needed to perform the tasks of the occupation.

The resulting profile determined by the SMEs is presented in the table at the top of this page. The most critical tasks and a description of the *Work Keys* skills levels for this occupation are presented on the following pages.

ACT

Profile Comments

The purpose of conducting a profile for the Electrician (construction) occupation was to use the resulting information for curriculum development. For this reason, the SMEs were instructed to think of the skill levels needed for an individual entering the occupation (i.e., at the apprentice level). The task list, however, represents tasks performed by journeyman electricians (the designation for an individual who has completed the five year apprenticeship program). This approach was taken to the task list because apprentices are not expected to be able to perform any electrician tasks when they enter the apprenticeship program so a task list for apprentices does not exist. The discussion among the SMEs regarding appropriate skill levels resulted in a number of interesting observations which are summarized below.

Reading for Information: Six members of the group said individuals need to enter the apprenticeship program at Level 6 of this skill. The remaining two members of the group felt that setting the level at Level 6 would exclude too many people from the occupation and felt Level 5 of this skill would be appropriate for entry-level. The training coordinator, who participated in the meeting, mentioned that most applicants for the program are not at Level 6. He went on to note that the dropout rate is 30% to 40% for Year 1. The implication was that the dropout rate may decline if individuals enter the occupation with higher skill levels.

Applied Mathematics: Six members of the group felt entry-level people should be at Level 6 of this skill and that they would move up to Level 7 during the apprenticeship program. Two group members said basic algebra is needed in the occupation and felt Level 7 was more appropriate. The training coordinator noted that the apprenticeship program does include a refresher course in mathematics.

Listening: The group members agreed that a great deal of an apprentice's job is to listen either during classroom instruction or while working on the job with a journeyman electrician. There was clear agreement among the group that Level 4 is the appropriate level of this skill to require at entry-level.

Writing: Six members of the group felt individuals could start the apprenticeship program at Level 3 of this skill, while the remaining group members felt Level 4 was more appropriate. The group noted that, in their opinion, most of the current workforce is at Level 3.

Locating Information: The group was in clear agreement that Level 5 was the appropriate level of this skill to require at entry-level.

Teamwork: After some discussion, the group decided that Level 3 was the appropriate level of this skill to require at entry-level. The discussion focused around conflict that can occur in work groups and the SMEs decided that problems were handled in a speedy manner prior to getting out of control.

Applied Technology: The group was in clear agreement that Level 5 was the appropriate level of this skill to require at entry-level.

ACT

Final Task List

1. Measures, cuts, bends, threads, assembles, and installs electrical conduit, using tools such as hacksaws, pipe threaders, and conduit benders.
2. Works and coordinates with others (including people practicing other crafts) to complete assigned projects.
3. Cuts wires, cables, conduit, and raceway, threading and reaming conduit, boring and cutting chases under the direction of the foreman.
4. Provides prompt and efficient service to customers by responding quickly to customer work orders.
5. Connects wiring to accessories, such as relays, circuit breakers, plugs, condensers, switches, and solenoids; and installs accessory assemblies in electrical or electronic units using soldering gun and handtools.
6. Uses the proper rigging to pull wire and communication cable of all sizes through conduit, cable trays, and all other raceways using proper hand tools and power tools.
7. Works safely to prevent on the job injuries by using appropriate safety equipment, such as rubber gloves and sleeves, and methods such as. grounding line equipment and jumpers.
8. Connects conductors to switches, receptacles, or appliances with proper methods of splicing, or soldering and taping.
9. Connects wiring to lighting fixtures and power equipment using handtools.
10. Installs control, distribution, and electronic apparatus, such as switches, relays, and circuit-breaker panels, programmable controllers; using hand tool and power tools to fasten in place with screws or bolts.
11. Lays out the various outlets, switches, receptacles, and other details of the job from blueprints or by direction of the superintendent of construction.
12. Plans new or modified installations to minimize waste of materials, provide access for future maintenance, and avoid unsightly, hazardous, and unreliable wiring, consistent with specifications and local electrical codes.
13. Plans, lays outs, installs, and repairs wiring, electrical fixtures, apparatus, and control equipment using hand tools and power tools.
14. Splices wires by stripping insulation from terminal leads (using a knife or wire strippers), twisting or soldering wires together, and applying tape or terminal caps or necessary lugs.
15. Uses measuring instruments, such as rulers, plumb-bobs, levels, and wire gauges.
16. Reads and understands construction standards manual and is familiar with electrical codes.
17. Uses measuring instruments such as volt meters, ohm meters, and amp meters.
18. Interprets maintenance manuals, schematics, and wiring diagrams, and repairs equipment, utilizing knowledge of electronics and using standard test instruments using handtools and power tools.
19. Reads work order to determine installation procedures specified by supervisor/technician.
20. Studies and understands electrical theory (Ohm's Law; single-phase and three-phase circuits; and vectors, voltage drops, series and parallel circuits).
21. Tests circuits and electric components to locate grounded wires, broken connections, or defective current-control mechanisms using electrical testing instruments.
22. Installs and connects single-phase and three-phase bank transformer connections and capacitor banks/voltage regulators.

Final Task List (continued)

23. Attends regular safety meetings and reads distributed material regarding new safety procedures.
24. Completes company paperwork such as truck inspection forms, time sheets, panel and transformer cards, accident reports, work orders, and oil spill sheets.
25. Performs and understands switching procedures of the distribution and transmissions system and fills out appropriate paperwork.
26. Prepares sketches or as-built drawings showing location of wiring and equipment, or follows diagrams or blueprints, ensuring that concealed wiring is installed before completion of future walls, ceilings, and flooring.
27. Suggests improvements in work methods by reviewing current procedures and using on-the-job experience to make tasks more efficient.
28. Troubleshoots, repairs, and maintains, in accordance with diagrams, sketches, operation manuals, and manufacturer's specifications, machinery and equipment, such as transformers, tools, regulators, reclosers, capacitors, switches, fuses, and cut-outs.
29. Takes measurements, such as street and building dimensions, distances to be spanned by wire and cable, or space available in existing buildings and underground vaults, which affect installation and arrangement of equipment.
30. Operates radio to communicate with coworkers and dispatchers.
31. Recognizes and identifies the wide variety of conductors, such as underground and overhead.
32. Assesses work environment for proper wiring methods and materials in hazardous locations.
33. Digs trench and lays underground cable and conduit to connect source of power to customer's building, setup outdoor lighting as well as laying underground cable and conduit for data and communications (commercial, industrial, and residential).
34. Drives and operates vehicles and equipment, such as trucks (may be required to have commercial driver's license), trenchers, and tractors.
35. Installs and replaces duct systems and underground cable (works in underground vaults where cables are located).
36. Installs, maintains, and repairs pedestals, equipment pads, switching cabinets, padmounted transformers, and other underground equipment.
37. Locates cable and faults using fault and/or cable locating equipment.
38. Observes functioning of installed equipment or system to detect hazards and need for adjustments, relocation, or replacement.
39. Removes obstructions (steel structures, manhole covers, substation enclosures) and material in inorder to gain access to and remove defective parts or perform maintenance, using hoists, personnel lifts, cranes, handtools and power tools.
40. Replaces defective components and parts, such as transistors, coils, and integrated circuits, using soldering iron, wire cutters, hand tools, and power tools.
41. Works on energized lines with rubber gloves, mats and blankets and/or live line tools.
42. Terminates, splices, and tests cable according to manufacturer specifications.
43. Uses transit and tripod to establish grade and elevation.
44. Cuts and welds steel structural members using flame cutting and welding equipment.

ACT

Skill Level Descriptions

Electrician (construction) Occupation

Reading for Information Levels: 5 or 6

(Levels range from 3 to 7, "X" indicates skill is not applicable or is below Level 3)

Level 5

Employees must read moderately detailed and complicated company policies, procedures, and announcements. These reading materials contain words and phrases that may be specialized (jargon and technical language) or words that have several meanings. All of the information employees need is stated clearly in the reading materials, but the employees must consider several factors in order to identify the course of action that will accomplish their goals.

Employees are required to

- understand the paraphrased definition of specialized words or phrases (jargon or technical terms) defined in these reading materials.
- use jargon or technical terms appropriately in describing situations stated in these reading materials.
- understand the meaning of acronyms defined in these reading materials (an acronym is a word or collection of letters which stands for a longer phrase, such as HMO to mean Health Maintenance Organization).
- figure out which definition of a word with multiple meanings is appropriate in the context of these reading materials.
- apply information given in these reading materials to situations that are not directly described, but similar.
- apply instructions or procedures with a number of steps to described situations. These instructions may include conditionals (if X happens, then you should do Y).

Level 6

Employees must read difficult company policies, procedures, and announcements. These reading materials present complicated information: for example, they may include excerpts from regulatory and legal documents. These reading materials use advanced vocabulary, jargon, and technical terms to describe elaborate procedures and concepts. Most of the information employees need in order to identify an appropriate course of action is not clearly stated in the reading material. Thus, employees may need to determine the principles underlying the described situation and apply those principles to new situations not depicted in the reading material.

Employees are required to

- understand specialized words or phrases (jargon or technical terms) when used in an unfamiliar context.
- apply complicated information to new situations.
- figure out from context the less common meaning of a word with multiple meanings.

ACT

Skill Level Descriptions (continued)

Reading for Information Level 7 (continued)

- figure out the general principles underlying situations described in these reading materials and apply those principles to related situations.
- understand implied details.
- figure out the reasoning behind a procedure, policy, or communication.

Applied Mathematics Levels: 6 or 7

(Levels range from 3 to 7. "X" indicates skill is not applicable or is below Level 3)

Level 6

Employees are required to

- set up problems and do several steps of calculations or conversions.
- calculate using negative numbers, fractions, ratios, percentages, or mixed numbers (e.g., 12⅛).
- transpose a formula before calculating (e.g., $v = ir \Rightarrow r = \frac{v}{i}$), or look up and use two formulas to change from one unit to another unit within the same system of measurement (e.g., 1 cup = 8 fl oz and 1 quart = 4 cups).
- find mistakes in calculations, such as those required in lower levels.

For example, employees might be required to calculate multiple rates, to find areas of rectangles and volumes of rectangular solids, or to solve problems that compare production rates and pricing schemes.

Level 7

Employees are required to

- do several steps of reasoning and calculations.
- solve problems involving more than one unknown and nonlinear functions (e.g., rate of change).
- find mistakes in multiple-step calculations.
- figure out the information needed to solve a problem when the information presented is incomplete or implicit.

For example, employees might be required to convert between systems of measurement that involve fractions, mixed numbers, decimals, or percentages; to calculate multiple areas and volumes of spheres, cylinders, or cones; or to set up and manipulate complex ratios or proportions.

ACT

Skill Level Descriptions (continued)

Listening Level: 4
(Levels range from 0 to 5)

Employees must understand all the important information from the spoken material. They may miss subtle details or tone or may have incorrect noncritical information that does not interfere with the main idea.

Writing Levels: 3 or 4
(Levels range from 0 to 5)

Level 3

Employees' writing must convey information clearly. Most of the sentences in the messages are complete. There are some mechanical errors which do not interfere with understanding the meaning. Writing does not contain slang.

Level 4

Employees' writing conveys information clearly. All of the sentences in the writing are complete, though they may be choppy. Writing does not contain any slang. There may be a few minor mechanical errors, but these errors do not interfere with understanding the meaning.

Locating Information Level: 5
(Levels range from 3 to 6. "X" indicates skill is not applicable or is below Level 3)

Employees must read complicated workplace graphics, such as detailed forms, tables, graphs, diagrams, instrument gauges, and maps.

Employees are required to

- summarize and/or compare information and trends in a single graphic.
- summarize and/or compare information and trends among more than one workplace graphic, such as a bar chart and a table showing related information.

ACT

Skill Level Descriptions (continued)

Teamwork Level: 3

(Levels range from 3 to 6. "X" indicates skill is not applicable or is below Level 3)

Employees are required to recognize the behaviors or actions which would best support the team and contribute to work performance when faced with simple work situations involving one problem or one issue that needs to be handled. In these work situations, the team goals and consequences are clear, all the resources needed to deal with the problems are available, and the relationship among team members is good.

Employees may be required to

- understand the goal that the team is trying to accomplish and how to work with other team members to accomplish that goal.
- choose actions that support the ideas of other team members and try to use their suggestions to accomplish team goals.
- determine if the team is having problems finishing a task and figure out what is causing these problems.

Applied Technology Level: 5

(Levels range from 3 to 6. "X" indicates skill is not applicable or is below Level 3)

Employees are required to solve problems involving one complex system, or one or more uncomplicated tools or systems. In solving some of these problems, employees must apply difficult physical principles, such as phase change or pressure equilibrium in a system.

Employees are required to

- understand moderate and advanced principles of mechanics, electricity, thermodynamics, and fluid dynamics.
- understand the operation of complex machines and systems, such as gasoline engines, complex appliances, and building electrical systems.

APPENDIX G

FIVE COMPETENCIES

Resources: Identifies, organizes, plans, and allocates resources

A. Time - Selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules

B. Money - Uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives

C. Material and Facilities - Acquires, stores, allocates, and uses materials or space efficiently

D. Human Resources - Assesses skills and distributes work accordingly, evaluates performance and provides feedback

Interpersonal: Works with others

A. Participates as Member of a Team - contributes to group effort

B. Teaches Others New Skills

C. Serves Clients/Customers - works to satisfy customers' expectations

D. Exercises Leadership - communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies

E. Negotiates - works toward agreements involving exchange of resources, resolves divergent interests

F. Works with Diversity - works well with men and women from diverse backgrounds

Information: Acquires and uses information

A. Acquires and Evaluates Information

B. Organizes and Maintains Information

C. Interprets and Communicates Information

D. Uses Computers to Process Information

Systems: Understands complex interrelationships

A. Understands Systems - knows how social, organizational, and technological systems work and operates effectively with them

B. Monitors and Corrects Performance - distinguishes trends, predicts impacts on system operations, diagnoses systems' performance and corrects malfunctions

C. Improves or Designs Systems - suggests modifications to existing systems and develops new or alternative systems to improve performance

Technology: Works with a variety of technologies

A. Selects Technology - chooses procedures, tools or equipment including computers and related technologies

B. Applies Technology to Task - Understands overall intent and proper procedures for setup and operation of equipment

C. Maintains and Troubleshoots Equipment - Prevents, identifies, or solves problems with equipment, including computers and other technologies

A THREE-PART FOUNDATION

Basic Skills: Reads, writes, performs arithmetic and mathematical operations, listens and speaks

A. Reading - locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules

B. Writing - communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts

C. Arithmetic/Mathematics - performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques

D. Listening - receives, attends to, interprets, and responds to verbal messages and other cues

E. Speaking - organizes ideas and communicates orally

Thinking Skills: Thinks creatively, makes decisions, solves problems, visualizes, knows how to learn, and reasons

A. Creative Thinking - generates new ideas

B. Decision Making - specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative

C. Problem Solving - recognizes problems and devises and implements plan of action

D. Seeing Things in the Mind's Eye - organizes, and processes symbols, pictures, graphs, objects, and other information

E. Knowing How to Learn - uses efficient learning techniques to acquire and apply new knowledge and skills

F. Reasoning - discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem

Personal Qualities: Displays responsibility, self-esteem, sociability, self-management, and integrity and honesty

A. Responsibility-exerts a high level of effort and perseveres towards goal attainment

B. Self-Esteem believes in own self-worth and maintains a positive view of self

C. Sociability - demonstrates understanding, friendliness, adaptability, empathy, and politeness in group settings

D. Self-Management-assesses self accurately, sets personal goals, monitors progress, and exhibits self-control

E. Integrity/Honesty - chooses ethical courses of action

Source: U.S. Department of Labor Secretary's Commission on Achieving Necessary Skills, What Work Requires of Schools. Washington, D.C., 1991.

APPENDIX H

Electrician (Based on Five Interviews)

Electricians install, operate, troubleshoot, maintain and repair various types of electrical equipment. They determine or design the correct materials needed for a job, usually by reading a blueprint. They install wiring, conduit, circuits, electrical panels, transformers and power distribution equipment and ensure that they are installed correctly. Electricians troubleshoot equipment that fails to function properly. They coordinate installation requirements with other electricians and contractors.

Functional Skills	Mean	Std. Dev.
F21 Uses Machines to Monitor/Perform Tasks	4.40	.55
F20 Selects Appropriate Technologies	4.40	.55
F05 Identifies Information	4.40	.89
F01 Manages Time	4.20	.84
F17 Understands How Systems Work	4.20	.45
F11 Teaches Others New Skills	4.20	.45
F22 Maintains and Troubleshoots Technologies	4.20	.84
F07 Converts Information	4.00	1.22
F08 Interprets Information	3.80	1.10
F12 Serves Clients and Customers	3.60	1.67
F03 Manages Material and Facility Resources	3.40	1.67
F10 Participates as a Member of a Team	3.40	1.14
F06 Prepares Information	3.20	1.10
F18 Anticipates and Identifies Consequences	3.00	1.41
F15 Works with Cultural Diversity	3.00	1.58
F19 Monitors and Corrects Performance	3.00	1.41
F02 Manages Financial Resources	2.80	1.48
F04 Manages Human Resources	2.80	1.64
F13 Influences an Individual or Group	2.80	1.48
F09 Employs Computers	2.40	.89
F14 Negotiates to Arrive at a Decision	2.40	1.34
F16 Questions the Status Quo	1.80	1.30

(Results for Enabling Skills on following page)

Enabling Skills	Mean	Std. Dev.
E03 Reading Skills	4.80	.45
E16 Conscientiousness	4.60	.55
E09 Problem Solving	4.40	.55
E11 Ability to Learn	4.40	.55
E08 Decision Making	4.40	.89
E15 Cooperation	4.40	.55
E12 Work Orientation	4.20	.84
E06 Reasoning Skills	4.20	1.10
E13 Self Confidence	4.20	.84
E05 Listening Skills	4.00	.71
E10 Representing Information	4.00	.71
E01 Mathematical Skills	4.00	1.22
E07 Creative Thinking	3.60	.89
E04 Speaking Skills	3.20	.45
E14 Social	3.20	.84
E02 Writing Skills	2.40	1.14

Job: Electrician

Manages Time (F01)

Budget the time needed to install equipment in a computer room. In order to perform this task, the electrician views blueprints and a contractor order to determine the pieces of equipment to be connected. Further, a determination is made concerning the time needed for equipment installation, based upon blueprints, measures, manufacturer's installation instructions, and the equipment itself. Next, an equipment list is developed, and the materials to be used are ordered with a purchase order or material requisition form. Calculations are made in order to determine the amount of time it will take to connect each item. Finally, these time requirements are coordinated with the general contractor. Task ID#: 010461

Provide the supervisor with input on how to prioritize different job tasks. To perform the task, the electrician evaluates which repairs are needed by asking the equipment operator. The electrician also uses testing devices to troubleshoot the equipment and to determine the problems on a variety of jobs. Along with this, the electrician evaluates the amount of time necessary to repair each piece of equipment. This evaluation includes consideration of the repairs needed, the availability of replacement parts, and the criticality of the equipment to operations. The electrician informs the supervisor of the time needed to perform each job and of the job's criticality. The supervisor then takes this information and makes a decision as to the order of repair jobs. Task ID#: 010541

Design and install a customized electrical system in a building under construction. To perform this task, the electrician determines where to order specific material for a job, obtains the equipment that is needed immediately and makes up a schedule for installation of the system. The electrician meets with other contractors and the customer to coordinate when to start work, orders the material for the job, and schedules labor for the job (e.g., gives the contractor a list of the specific skills needed in the job's performance and of when they will be needed). The electrician then organizes a work schedule and briefs other electricians on it. The electrician makes periodic checks on work progress and coordinates with other contractor personnel on time and construction requirements. Finally, the electrician inspects the completed work. Task ID: 010321

Manages Material and Facility Resources (F03)

Project material requests for a construction site. To perform the task, the electrician reviews the two-week and long-term construction schedules and projects material requirements for the following month. The electrician next reviews the current material and compares it with the material requested; from this comparison a list of required material is developed. The electrician then reviews lists of assigned stock, develops a purchase list of additional material required, reviews projected manpower, reviews support material requests, and orders additional support equipment. Task ID#: 030471

Arrange for delivery and storage of electrical components. To perform this task, the electrician analyzes the job to determine when equipment is required, and evaluates available storage facility requirements. Then, the electrician coordinates arrangements for the storage site with the contractor, and coordinates transportation of the equipment with the vendor and internally. The electrician schedules personnel to deliver the equipment and supervises its delivery, to include inspecting and testing the delivered equipment, and coordinating with delivery personnel the return of damaged equipment. Finally, the electrician secures the accepted equipment. Task ID#: 030321

Forecast labor and material needed for a job in order to estimate cost. To perform the task, the electrician looks at the job requirements and conveys his or her comments to the general contractor's office. Upon receipt of a reply, the electrician incorporates changes into the construction schedule, developing a list of any materials needed. Finally, the electrician identifies and orders the long lead items (those that have a longer acquisition period). Task ID#: 020471

Manages Human Resources (F04)

Schedule work assignments for other electricians. To perform this task, the electrician reviews all installation tasks to determine personnel scheduling. He or she then lists tasks in order of priority, matches tasks with personnel for given periods of time, and assigns tasks to individuals. The electrician then supervises workers' performance and provides feedback. Finally, the electrician coordinates with subcontractors for follow-on work. Task ID#: 040321

Identifies Information (F05)

Identify the information required to repair a malfunctioning breaker in a power panel. In order to perform this task, the electrician must review the manufacturer specifications which describe how the breaker functions. Next, the electrician must gather any appropriate test instruments and tools which were identified from the initial information search. Task ID#: 050461

Identify and locate drawings/schematics for reference and for circuit identification when a piece of equipment breaks down. To perform the task, the electrician realizes that an input is missing in a test cell for jet engines. He or she researches the technical manuals, obtains the schematic diagram for the specific circuit, and uses this diagram to make a check throughout the circuit and isolate the faulty component. Task ID#: 050541

Install power-factor correction unit, using details provided by both the electrical coder and the manufacturer. To perform this task, the electrician obtains technical specifications from the manufacturer, visits the installation site to check for physical requirements, coordinates the installation with the site supervisor, and inspects the physical site. Finally, the electrician compares the requirements against local codes. Task ID#: 050321

Prepares Information (F06)

Prepare a two-week activity report for the main office. To perform the task, the electrician lists all personnel, projects manpower requirements, and reviews the current budget to develop a proposed budget for the next two weeks. Task ID#: 060471

Converts Information (F07)

Take the information found in an Request For Information (RFI) response and convert the data into a form which is usable for other electricians. To perform the task, the senior electrician reads an RFI response and decides on the appropriate format in which to present the data. The electrician converts the written information into a drawing, presents the drawing to the other electricians, and briefs them on the meaning. Task ID#: 070471

Convert the two-dimensional information found on a blueprint to the three-dimensional requirements for installing lighting into a false ceiling. To perform the task, the electrician reads the electrical blueprint for the overall layout of the project. He or she checks the actual drawings for the actual finish (details of the ceiling and fixtures). The electrician then checks the mechanical drawing for the air conditioning duct, roof diameter, and any other components which will affect the layout. He or she then gathers the needed tools and material, strikes up the center line for the fixture, fastens the hangers to the ceiling, prefabricates a conduit, and installs the fixture. Task ID#: 070481

Interprets Information (F08)

Explain to other electricians the procedures for installing newly received equipment. To perform this task, the electrician must read the manufacturer's installation instructions, request from the manufacturer any needed clarifications, and develop installation diagrams. Finally, the senior electrician must use the information obtained to instruct other electricians on equipment installation. Task ID#: 080461

Brief the project manager on changes in electrical requirements. To perform the task, the senior electrician develops additional materials and personnel requirements based on a Request for Information response. He or she sends the appropriate purchase order to a company and meets with the project manager to explain the new requirements. Task ID#: 080471

Interpret information indicating location of an air conditioning duct found when wire was being run into an electrical closet. To perform the task, the electrician finds an air conditioning duct in the electrical closet, checks the mechanical drawings for accuracy, and communicates the conflict to the air conditioning contractor. The contractor and the electrician then meet with mechanical and electrical engineers to explore the problem and determine another location for the air conditioning ducts. Finally, the ducts are moved to the new location. Task ID#: 080481

Participates as a Member of a Team (F10)

Work as a team to install overhead fixtures. To perform the task, the foreman divides the electricians into two groups and briefs the teams on their responsibilities with regard to the project. Team A works to unload the needed materials while team B prepares to install the fixture. Team B then installs the electrical components to the fixture while team A provides materials to team B, as needed. Task ID#: 100471

Work with others to pull an electrical cable. To perform the task, the electricians work together to identify the correct materials for the job and to move a cable to the correct spot on the construction site. They gather the appropriate tools and run fish tape through the conduit. A rope is attached to the fish tape and pulled through the conduit. A cable is attached to the rope and lubricants are applied to the cable. Next, the cable is run through the conduit and then cut. Task ID#: 100481

Work together to install wire into a conduit. To perform this task, the electrician verifies that the components (wire, conduit) are correct for the job requirements. He or she then establishes coordination at both ends of the conduit (i.e., reaches agreement on the use of common technical terms). The electrician then installs pulling apparatus into the conduit, secures wire to fish tape, and adds lubricant to the wire. The electrician uses radio signals to coordinates the start of wire pulling. The wire is then pulled, and is cut at the end when pulling is completed. Task ID#: 100321

Teaches Others New Skills (F11)

Teach apprentices how to properly bend pipe. To perform the task, the journeyman (an electrician who is certified) first uses general terms to explain to the apprentices the task of pipe bending. He or she then explains in detail the equipment used for the task and the math involved in calculating the proper bend. Next, the electrician demonstrates to the apprentices how to bend pipe. After the demonstration, he or she watches the apprentices develop a pipe-bending formula and then bend pipe themselves. Task ID#: 110471

Teach apprentices how to move a switch gear. To perform the task, the electrician explains to the apprentices the safety precautions that should be taken. He or she then identifies the tools and equipment to be used to move the switch, and shows the apprentices how to apply the straps needed to secure the switch gear and how to clean the area for movement. Next, the electrician works with the apprentices to place rollers on the switch gear, and demonstrates how to set up the wrench. Further, the electrician attaches the cable to straps on the switch gear, and then installs the wrench while the apprentices move the roller and keep the route clean. Task ID#: 110481

Explain to a trainee how to troubleshoot a motor. To perform the task, the electrician verbally goes through the electrical troubleshooting procedure. He or she explains what to do and why for each step in the process. The electrician starts the repair, explains the procedure, and answers any questions. The trainee does the next applicable repair while the trainer watches and reviews each procedure. Task ID#: 110541

Work with an apprentice to install motor starter controlling equipment. To perform this task, the electrician assesses the knowledge level of the apprentice. He or she shows the apprentice the equipment and explains the relationship between the blueprints, specifications, and physical equipment. The electrician demonstrates the installation of wiring to start/stop switches and details (marks) the blueprint as the wires are connected. The electrician then has the apprentice install the wire, and supervises the apprentice's work and provides feedback. Task ID#: 110321

Identify new methods for installing computer-operated lighting. To perform the task, the senior electrician observes that an electrician is reluctant to work with a computer, and talks to the electrician about learning new technology. The senior electrician then demonstrates the new computer system and relates its functions to everyday topics. Finally, the senior electrician helps the electrician to understand the equipment as it is installed. Task ID#: 130471

Serves Clients/Customers (F12)

Explain to a potential customer the different options for a certain electrical work job. To perform the task, the electrician obtains information about the customer's needs—for example, that he or she wants fluorescent lights that dim. The electrician analyzes possible methods for achieving this goal, selects the best approaches, and presents them to the customer. Task ID#: 120471

Install an uninterrupted power supply for a business computer. To perform the task, the electrician arrives at the business site, receives the request from the customer, and examines the physical site and the circuit boards. The electrician then gathers materials and tools and coordinates with helper(s) the pulling of the cable. The electrician explains to both the customer and the assistant(s) information about the wiring segments, and then installs all cable, fuses and connectors. Next, the electrician informs the customer that the system is ready to be tested, and explains the options and warranties to the customer. Task ID#: 120481

Check copy machine circuits while on a service call. To perform this task, the electrician talks to the client (e.g., the secretary) about the nature of the problem. He or she troubleshoots the circuit by connecting the voltmeter to the circuit, turning on different appliances in the office, observing the effect on the circuit, and identifying the overload to the circuit. The electrician draws a schematic of the electrical system and identifies the problem with the circuit. Finally, he or she explains the problem to the client and suggests solutions. Task ID#: 120321

Works with Cultural Diversity (F15)

Deal with personal hygiene issues resulting from the cultural habits of a new group of employees. To perform the task, the electrician understands that the behaviors (i.e., infrequent showers) of foreign-born workers may be different from the behavior of the majority of the employees because of cultural differences. The senior electrician then explains to the rest of the crew the nature and origin of the differences. Task ID#: 150471

Understands How Systems Work (F17)

Troubleshoot the electrical portion of the environmental control system in order to deal with a cold room. To perform this task, the electrician inspects the thermostat in the cold room to see if the system is on and to check for power at the heating unit. The electrician then troubleshoots the heating unit, reading the electrical schematic for the unit. Task ID#: 170461

Install an energy management system in a building. To perform the task, the electrician reviews the mechanical specifications and drawings, and consults with a mechanical contractor to determine the type of equipment to be installed. The electrician then determines any additional equipment needed and coordinates with others to obtain a work station time. Task ID#: 170481

Know who to talk to in order to get needed information on equipment. To perform this task, the electrician receives a job order requesting the installation of a large cable system. The electrician contacts the requestor to get specific information on the job needs and, if necessary, contacts engineering to gather additional information. Finally, the electrician may go to an "out-of-chain" person for a specific tool that is not normally available but is necessary to perform the job. Task ID#: 170541

Anticipates and Identifies Consequences (F18)

Install fans in closet in a way which minimizes the possibility of electrical failure. To perform this task, the electrician must assemble the needed materials, install the basket for the fan, and then install the fan—taking care to avoid actions which would cause electrical failure. Task ID#: 180461

Prepare to install a fire prevention system in a building. To perform the task, the electrician reviews the job specifications for the fire prevention system and develops a Request for Information for the system. The electrician gives the Request for Information to the general contractor for a response and then gathers the appropriate materials. After receiving a response from the general contractor, the electrician compares it with the work specifications and drawings, and then makes a final plan for installation of the fire prevention system. Task ID#: 180481

Monitors and Corrects Performance (F19)

Install a voltage monitor to monitor the power coming into the facility. To perform this task, the electrician is first notified about a power problem by the owner of the facility, and then determines that the power system needs to be monitored for fluctuations. The electrician installs an amp monitor onto the external power system, then reviews the taped data coming from the monitor and notifies the owner of specific problems and possible options. Task ID#: 190461

Monitor and correct the energy management system in a new building. To perform the task, the electrician identifies a problem area in the system (e.g., erratic temperature). He or she disconnects the controls for the affected area and attaches measurement controls to the circuit. Next, the problem area is identified and problematic equipment is disassembled. Finally, the electrician troubleshoots and replaces it and retests the system. Task ID#: 190481

Selects Appropriate Technologies (F20)

Decide upon the specific lighting system to be installed based on the owner's goals. To perform this task, the electrician researches manufacturers' catalogs for the range of lighting systems offered, checks the availability of the items and decides which items are appropriate to the owner's needs. From this information, electrician develops a list of recommended systems and presents the options to the owner. Task ID#: 200461

Determine the appropriate fire-alarm sensor for a job. To perform the task, the electrician reviews the work specifications and blueprints to see if sensor and alarm match the actual requirements. The electrician generates a Request for Information on problem areas and talks to the electrical engineer and the general contractor before recommending an appropriate alarm and sensor. Task ID#: 200481

Select the appropriate piece of test equipment to solve a problem. To perform the task, the electrician identifies the problem (e.g., the motor will not run) and realizes that a power fuse has blown, indicating a possible short circuit. The electrician chooses either an ohmmeter (resistance to ground) or a mogger (generator of higher voltage to determine short circuits) to use in testing. Task ID#: 200541

Determine the correct type of metering equipment to install at a substation on an army facility (i.e., determine if metering equipment will be installed above or below the ground). To perform this task, the electrician inspects the physical site for installation parameters (i.e., how big a hole will be needed if the meter is installed underground). Then he or she performs a cost benefit analysis (i.e., determines the costs of installing the meter underground versus building a structure to insulate the meter above ground). The electrician the selects the installation type and site (i.e., fixed underground cable). Task ID#: 200321

Uses Machines to Monitor/Perform Tasks (F21)

Use the core drilling machine to drill through concrete. To perform the task, the electrician lays out the location for drilling with the use of blueprints, measures, and paint, and then coordinates the drilling with the other tradespeople involved. Next, electrician sets up the core driller and drills the needed holes. Task ID#: 210461

Monitor mainframe circuit breaker's short circuit sensors. To perform the task, the electrician identifies a circuit board to be tested and monitored. He or she reviews the circuit board requirements and sets up test equipment. Next, the electrician tests and monitors all aspects of the circuit and then recalibrates it. Task ID#: 210481

Use analog, digital, or recording voltmeter to monitor the power supply of computers going from a central computer facility to branch schools. To perform this task, the electrician interviews a computer systems operator for the exact details of the problem, and conducts a physical inspection of the problem-causing equipment. The electrician then connects a voltmeter to the problem equipment and connects recording equipment to the circuits. The electrician analyzes the recorded data and inspects the circuit that is causing the problem. Finally, the electrician corrects the physical problem with the circuit. Task ID#: 210321

Maintains and Troubleshoots Technologies (F22)

Troubleshoot the functioning of telemetry control systems in a water treatment plant. To perform this task, the electrician checks the maintenance schedule for specific maintenance requirements. The electrician identifies the tools required and gathers tools and parts (e.g., transmitters, pressure gauges, and wrenches). When on site, the electrician records data from the transmitter. The electrician installs the test set and runs an initial test of the transmitter equipment to determine if the electrical input is consistent with the signal generated by the transmitter. Then, using simulated signals that the transmitter would normally send, the electrician re-evaluates the transmitter. After assessing the transmitter's ability to transmit signals, the transmitter is retested. Once it is determined that the transmitter is functional, the equipment is disconnected. Task ID#: 220321

APPENDIX I

OCCUPATION TITLE: ELECTRICIAN
WORK KEYS IDENTIFIED TASKS
AND SCANS MATRIX

Instructions: Please mark each SCANS skill that is necessary for successful performance of each task.

R = Reading for Information
AM = Applied Mathematics
L = Listening
W = Writing
LI = Locating Information
T = Teamwork
AT = Applied Technology

This survey completed by:
A. C. McAfee
Dallas Electrical J.A.T.C.
6/16/94

SCANS SKILLS

	ACT Work Keys Final Task List	R	AM	L	W	LI	T	AT
1.	Measures, cuts, bends, threads, assembles, and installs electrical conduit, using tools such as hacksaws, pipe threaders, and conduit benders.	X	X	X	X	X	X	X
2.	Works and coordinates with others (including people practicing other crafts) to complete assigned projects.	X	X	X	X	X	X	X
3.	Cuts wires, cables, conduit, and raceway, threading and reaming conduit, boring and cutting chases under the direction of the foreman.	X		X	X	X	X	X
4.	Provides prompt and efficient service to customers by responding quickly to customer work orders.	X	X	X	X	X	X	X
5.	Connects wiring to accessories, such as relays, circuit breakers, plugs, condensers, switches, and solenoids; and installs accessory assemblies in electrical or electronic units using soldering gun and hand tools.	X		X	X	X		X
6.	Uses the proper rigging to pull wire and communication cable of all sizes through conduit, cable trays, and all other raceways using proper hand tools and power tools.	X	X	X	X	X	X	X
7.	Works safely to prevent on the job injuries by using appropriate safety equipment, such as rubber gloves and sleeves, and methods such as, grounding line equipment and jumpers.	X		X	X	X	X	X
8.	Connects conductors to switches, receptacles, or appliances with proper methods of splicing, or soldering and taping.	X		X	X	X		X
9.	Connects wiring to lighting fixtures and power equipment using hand tools.	X		X	X	X		X

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ACT Work Keys Final Task List	R	AM	L	W	LI	T	AT
10. Installs control, distribution, and electronic apparatus, such as switches, relays, and circuit breaker panels, programmable controllers; using hand tool and power tools to fasten in place with screws or bolts.	X	X	X	X	X	X	X
11. Lays out the various outlets, switches, receptacles, and other details of the job from blueprints or by direction of the superintendent of construction.	X	X	X	X	X	X	X
12. Plans new or modified installations to minimize waste of materials, provide access for future maintenance, and avoid unsightly, hazardous, and unreliable wiring, consistent with specifications and local electrical codes.	X	X	X	X	X	X	X
13. Plans, lays out, installs, and repairs wiring, electrical fixtures, apparatus, and control equipment using hand tools and power tools.	X	X	X	X	X	X	X
14. Splices wires by stripping insulation from terminal leads (using a knife or wire strippers), twisting or soldering wire together, and applying tape or terminal caps or necessary lugs.	X			X	X		X
15. Using measuring instruments, such as rulers, plumb-bobs, levels, and wire gauges.	X		X	X	X		X
16. Reads and understands construction standards manual and is familiar with electrical codes.	X	X	X	X	X		X
17. Uses measuring instruments such as volt meters, ohm meters, and amp meters.	X	X	X	X	X		X
18. Interprets maintenance manuals, schematics, and wiring diagrams, and repairs equipment, utilizing knowledge of electronics and using standard test instruments using hand tools and power tools.	X	X	X	X	X		X
19. Reads work order to determine installation procedures specified by supervisor/technician.	X		X	X	X	X	X
20. Studies and understands electrical theory (Ohm's Law; single-phase and three-phase circuits; and vectors, voltage drops, series and parallel circuits).	X	X	X	X	X		

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ACT Work Keys Final Task List	R	AM	L	W	LI	T	AT
21. Tests circuits and electric components to locate grounded wires, broken connections, or defective current-control mechanisms using electrical testing instruments.	X	X	X	X	X	X	X
22. Installs and connects single-phase and three-phase bank transformer connections and capacitor banks/voltage regulators.	X	X	X		X	X	X
23. Attends regular safety meetings and reads distributed material regarding new safety procedures.	X		X	X	X	X	X
24. Completes company paperwork such as truck inspection forms, time sheets, panel and transformer cards, accident reports, work orders, and oil spill sheets.	X	X	X	X	X	X	X
25. Performs and understands switching procedures of the distribution and transmissions system and fills out appropriate paperwork.	X	X	X	X	X		X
26. Prepares sketches or as-built drawings showing location of wiring and equipment, or follows diagrams or blueprints, ensuring that concealed wiring is installed before completion of future walls ceilings, and flooring.	X	X	X	X	X	X	X
27. Suggests improvements in work methods by reviewing current procedures and using on-the-job experience to make tasks more efficient.	X	X	X	X	X	X	X
28. Troubleshoots, repairs, and maintains, in accordance with diagrams, sketches, operation manuals, and manufacture's specifications, machinery and equipment, such as transformers, tools, regulators, reclosers, capacitors, switches, fuses, and cut-outs.	X	X	X	X	X	X	X
29. Takes measurements, such as street and building dimensions, distances to be spanned by wire and cable, or space available in existing buildings and underground vaults, which affect installation and arrangement of equipment.	X	X	X	X	X	X	X
30. Operate radio to communicate with co-workers and dispatchers.	X		X		X	X	X

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ACT Work Keys Final Task List	R	AM	L	W	LI	T	AT
31. Recognizes and identifies the wide variety of conductors, such as underground and overhead.	X		X		X		X
32. Assesses work environment for proper wiring methods and materials and hazardous locations.	X	X	X		X		X
33. Digs trench and lays underground cable and conduit to connect source of power to customer's building, setup outdoor lighting as well as laying underground cable and conduit for data and communications (commercial, industrial, and residential).	X		X		X		X
34. Drives and operates vehicles and equipment, such as trucks (may be required to have commercial driver's license) trenchers, and tractors.	X		X		X		X
35. Installs and replaces duct systems and underground cable (works in underground vaults where cables are located).	X		X		X	X	X
36. Installs, maintains, and repairs pedestals, equipment pads, switching cabinets, pad-mounted transformers, and other underground equipment.	X		X		X	X	X
37. Locates cable and faults using fault and/or cable locating equipment.	X		X		X	X	X
38. Observes functioning of installed equipment or system to detect hazards and need for adjustments, relocation, or replacement.	X		X		X	X	X
39. Removes obstructions (steel structures, manhole covers, substation enclosures) and material in order to gain access to and remove defective parts or perform maintenance, using hoists, personnel lifts, cranes, hand tools and power tools.	X		X		X	X	X
40. Replaces defective components and parts, such as transistors, coils, and integrated circuits, using soldering iron, wire cutters, hand tools, and power tools.	X		X	X	X		X
41. Works on energized lines with rubber gloves, mats, and blankets and/or live line tools.	X		X		X	X	X

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ACT Work Keys Final Task List	R	AM	L	W	LI	T	AT
42. Terminates, splices, and tests cable according to manufacturing specifications.	X	X	X		X	X	X
43. Uses transit and tripod to establish grade and elevation.	X	X	X	X	X	X	X
44. Cuts and welds steel structural members using flame cutting and welding equipment.	X		X				X

OCCUPATION TITLE: ELECTRICIAN
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This survey completed by:
Ronald P. O'Riley
Innovative Education, Inc.
6/13/94

SCANS SKILLS

ACT Work Keys Final Task List	R	AM	L	W	LI	T	AT
1. Measures, cuts, bends, threads, assembles, and installs electrical conduit, using tools such as hacksaws, pipe threaders, and conduit benders.	X	X	X	X	X	X	X
2. Works and coordinates with others (including people practicing other crafts) to complete assigned projects.	X		X		X	X	X
3. Cuts wires, cables, conduit, and raceway, threading and reaming conduit, boring and cutting chases under the direction of the foreman.	X	X	X	X	X	X	X
4. Provides prompt and efficient service to customers by responding quickly to customer work orders.	X	X	X	X	X	X	X
5. Connects wiring to accessories, such as relays, circuit breakers, plugs, condensers, switches, and solenoids; and installs accessory assemblies in electrical or electronic units using soldering gun and hand tools.	X	X	X	X	X	X	X
6. Uses the proper rigging to pull wire and communication cable of all sizes through conduit, cable trays, and all other raceways using proper hand tools and power tools.	X	X	X	X	X	X	X
7. Works safely to prevent on the job injuries by using appropriate safety equipment, such as rubber gloves and sleeves, and methods such as, grounding line equipment and jumpers.	X		X		X	X	X
8. Connects conductors to switches, receptacles, or appliances with proper methods of splicing, or soldering and taping.	X	X	X	X	X	X	X
9. Connects wiring to lighting fixtures and power equipment using hand tools.	X	X	X	X	X	X	X

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10. Installs control, distribution, and electronic apparatus, such as switches, relays, and circuit breaker panels, programmable controllers; using hand tool and power tools to fasten in place with screws or bolts.	X	X	X	X	X	X	X
11. Lays out the various outlets, switches, receptacles, and other details of the job from blueprints or by direction of the superintendent of construction.	X	X	X	X	X	X	X
12. Plans new or modified installations to minimize waste of materials, provide access for future maintenance, and avoid unsightly, hazardous, and unreliable wiring, consistent with specifications and local electrical codes.	X	X	X	X	X	X	X
13. Plans, lays out, installs, and repairs wiring, electrical fixtures, apparatus, and control equipment using hand tools and power tools.	X	X	X	X	X	X	X
14. Splices wires by stripping insulation from terminal leads (using a knife or wire strippers), twisting or soldering wire together, and applying tape or terminal caps or necessary lugs.	X	X	X	X	X	X	X
15. Using measuring instruments, such as rulers, plumb-bobs, levels, and wire gauges.	X	X	X	X	X	X	X
16. Reads and understands construction standards manual and is familiar with electrical codes.	X	X	X	X	X	X	X
17. Uses measuring instruments such as volt meters, ohm meters, and amp meters.	X	X	X	X	X	X	X
18. Interprets maintenance manuals, schematics, and wiring diagrams, and repairs equipment, utilizing knowledge of electronics and using standard test instruments using hand tools and power tools.	X	X	X	X	X	X	X
19. Reads work order to determine installation procedures specified by supervisor/technician.	X	X	X	X	X	X	X
20. Studies and understands electrical theory (Ohm's Law; single-phase and three-phase circuits; and vectors, voltage drops, series and parallel circuits).	X	X	X	X	X	X	X

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ACT Work Keys Final Task List	R	AM	L	W	LI	T	AT
21. Tests circuits and electric components to locate grounded wires, broken connections, or defective current-control mechanisms using electrical testing instruments.	X	X	X	X	X	X	X
22. Installs and connects single-phase and three-phase bank transformer connections and capacitor banks/voltage regulators.	X	X	X	X	X	X	X
23. Attends regular safety meetings and reads distributed material regarding new safety procedures.	X	X	X		X	X	X
24. Completes company paperwork such as truck inspection forms, time sheets, panel and transformer cards, accident reports, work orders, and oil spill sheets.	X	X	X	X	X	X	X
25. Performs and understands switching procedures of the distribution and transmissions system and fills out appropriate paperwork.	X		X	X	X	X	X
26. Prepares sketches or as-built drawings showing location of wiring and equipment, or follows diagrams or blueprints, ensuring that concealed wiring is installed before completion of future walls ceilings, and flooring.	X	X	X	X	X	X	X
27. Suggests improvements in work methods by reviewing current procedures and using on-the-job experience to make tasks more efficient.	X	X	X	X	X		X
28. Troubleshoots, repairs, and maintains, in accordance with diagrams, sketches, operation manuals, and manufacture's specifications, machinery and equipment, such as transformers, tools, regulators, reclosers, capacitors, switches, fuses, and cut-outs.	X	X	X	X	X	X	X
29. Takes measurements, such as street and building dimensions, distances to be spanned by wire and cable, or space available in existing buildings and underground vaults, which affect installation and arrangement of equipment.	X	X	X	X	X	X	X
30. Operate radio to communicate with co-workers and dispatchers.	X		X			X	X

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ACT Work Keys Final Task List	R	AM	L	W	LI	T	AT
31. Recognizes and identifies the wide variety of conductors, such as underground and overhead.	X	X	X	X	X		X
32. Assesses work environment for proper wiring methods and materials and hazardous locations.	X	X	X	X	X		X
33. Digs trench and lays underground cable and conduit to connect source of power to customer's building, setup outdoor lighting as well as laying underground cable and conduit for data and communications (commercial, industrial, and residential).	X		X		X	X	X
34. Drives and operates vehicles and equipment, such as trucks (may be required to have commercial driver's license) trenchers, and tractors.	X		X			X	X
35. Installs and replaces duct systems and underground cable (works in underground vaults where cables are located).	X	X	X		X	X	X
36. Installs, maintains, and repairs pedestals, equipment pads, switching cabinets, pad-mounted transformers, and other underground equipment.	X	X	X	X	X	X	X
37. Locates cable and faults using fault and/or cable locating equipment.	X	X	X	X	X	X	X
38. Observes functioning of installed equipment or system to detect hazards and need for adjustments, relocation, or replacement.	X	X	X	X	X		X
39. Removes obstructions (steel structures, manhole covers, substation enclosures) and material in order to gain access to and remove defective parts or perform maintenance, using hoists, personnel lifts, cranes, hand tools and power tools.	X		X			X	X
40. Replaces defective components and parts, such as transistors, coils, and integrated circuits, using soldering iron, wire cutters, hand tools, and power tools.	X	X	X	X	X	X	X
41. Works on energized lines with rubber gloves, mats, and blankets and/or live line tools.	X		X		X	X	X

R = Reading for Information
AM = Applied Math
L = Listening
W = Writing
LI = Locating Information
T = Teamwork
AT = Applied Technology

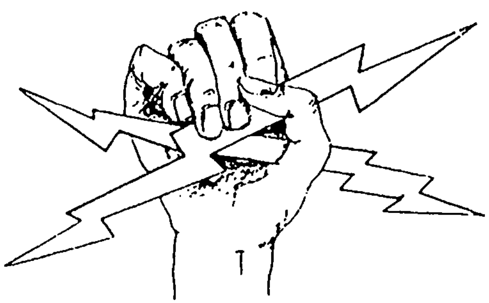
ACT Work Keys Final Task List	R	AM	L	W	LI	T	AT
42. Terminates, splices, and tests cable according to manufacturing specifications.	X	X	X	X	X	X	X
43. Uses transit and tripod to establish grade and elevation.	X	X	X	X	X	X	X
44. Cuts and welds steel structural members using flame cutting and welding equipment.	X	X	X	X	X	X	X

APPENDIX J

North Lake College

Technology Division

5001 N. MacArthur Blvd.
Irving, Texas 75038-3899



ELECTRICAL TECHNOLOGY

1 and 2 year programs

WHAT ARE MY CAREER OPPORTUNITIES?

The Electrical Technology program at North Lake College prepares men and women for outstanding career opportunities as engineering technicians, master electricians, journeymen and electrical contractors by developing the technical knowledge and practical skills necessary to enter or advance in the electrical career field.

These careers offer both good pay and benefits, as the career field constantly expands to offer new job opportunities. Emphasis in this program is placed on developing practical lab skills and technical information, which allows the student to select a career from a variety of electrical specialties.

WHAT DEGREE OPTIONS DO I HAVE?

Electrical Technology students may earn a Certificate or an Associate in Applied Arts and Sciences degree. A Certificate program consists primarily of electrical courses for the student who wishes to move directly into an electrical career. Students who wish to enroll in a wide variety of electrical courses, as well as additional academic courses, may enroll in the Associate in Applied Arts and Sciences degree program. These students may wish to continue their education at a four-year college or university. North Lake's Electrical Technology courses may be applied toward bachelor's degrees at many institutions.

Graduates of both programs should be capable of passing a journeyman's or master's examination. Although a guarantee of successful completion of a license exam cannot be given to each graduate, North Lake's record of student success is evident.

HOW DOES THE ELECTRICAL TECHNOLOGY PROGRAM WORK?

A student may enter a certificate or degree program, or may enroll any semester and complete only those courses which teach the skills he desires. Program content provides training in basic electronics; power transformers; residential wiring; commercial-industrial wiring; motor theory and wiring methods; electromagnetic and solid state electronic controls; maintenance techniques; burglar and fire alarm systems and electrical design.

Non-traditional college credit may be granted to students with prior work experience and credit may also be given to students who pass written exams covering skills and knowledge previously acquired.

Cooperative education is also available for Electrical Technology students, providing on-the-job training that permits the student to experience a real work situation and receive a salary while satisfying college credit requirements.

WHERE CAN I GET MORE INFORMATION?

For more information, please contact the Electrical Technology Department through the Technology Division Office, 214-659-5233, or the North Lake College Counseling Center at 659-5210. For information about grants and scholarships for veterans and non-veterans, call the Financial Aid/Veteran's Affairs Office, 659-5117.

Associate of Applied Arts & Sciences Degree

Must complete all of the courses listed below. Students planning to transfer to a 4-year institution should consult a counselor or advisor regarding transferability of these courses.

SEMESTER I		16 Hours
ELE 106	Fundamentals of Electricity	4
ELE 107	Electrical Transformers	4
ELE 108	General Electrical Codes	2
MTH 195	Technical Mathematics	3
SC 101	Introduction to Speech Communication	3

SEMESTER II		15 Hours
ELE 115	Low Voltage Circuits	3
ELE 116	General Electrical Wiring	3
ELE 117	General Electrical Planning	4
ELE 118	Commercial Codes	2
COM 131	Applied Communications	3

SEMESTER III		17-18 Hours
ELE 205	Commercial Wiring	3
ELE 206	Commercial Planning	4
ELE 207	Industrial Planning	2
ELE 208	Industrial Codes	2
ELE 703	Cooperative Work Experience OR	3
ELE 704	Cooperative Work Experience	(4)
CIS 103	Introduction to Computer Information Systems	3

SEMESTER IV		17-18 hours
ELE 213	Electrical Motor Fundamentals	2
ELE 214	Solid State Controls	3
ELE 216	Motor Controls	3
ELE 218	Electrical Design	3
PSY 131	Applied Psychology & Human Relations	3
ELE 803	Cooperative Work Experience OR	
ELE 804	Cooperative Work Experience OR	4
Elective		3-4
MINIMUM HOURS REQUIRED		65

Certificate in Electrical Technology

This programprepares the student to e enter or advance in the electrical field by developing technical knowledge and necessary practical skills. Courses may be taken in any order after consultation with the instructor.

SEMESTER I		15 Hours
ELE 105	Introduction to Electrical Technology	2
ELE 106	Fundamentals of Electricity	4
ELE 107	Electrical Transformers	4
ELE 108	General Electrical Codes	2
MTH 195	Technical Mathematics I	3

SEMESTER II 15 Hours
Same as Semester II for Associate degree above
MINIMUM HOURS REQUIRED 30

COURSE DESCRIPTIONS

(ELE) 105 Introduction to Electrical Technology (2)
This course focuses on the nature of the electrical technology industry and employment opportunities. Safety, materials, and the proper use of tools and common test devices are covered. Laboratory fee. (2 Lec., 1 Lab.)

(ELE) 106 Fundamental of Electricity (4)
Electrical theory and basic DC and AC circuits are covered. Voltage, current, resistance, reactance, impedance, phase angle, and power factors are calculated and measured in series, parallel and combination circuits. Laboratory fee. (3 Lec., 3 Lab.)

(ELE) 107 Electrical Transformers (4)
This course focuses upon the fundamentals, types and testing procedures of electrical transformers. Power generation, transmission, and distribution systems are presented utilizing both single-phase and three-phase transformers. Laboratory fee. (4 Lec., 2 Lab.)

(ELE) 108 General Electrical Codes (2)
General wiring principles as identified in the current National Electric Code are presented. General codes concepts and residential applications are stressed. (2 Lec.)

(ELE) 115 Low Voltage Circuits (3)
This course focuses on types of low voltage electrical circuits. The theory, installation, and testing of low voltage circuits such as bells, chimes, and alarm systems will be presented. Laboratory fee. (2 Lec., 2 Lab.)

(ELE) 116 General Electrical Wiring (3)
This course covers general wiring practices with emphasis on safety and procedures. Topics include materials selection, splicing, switches, receptacles, and lighting circuits for both residential and selected commercial applications. Laboratory fee. (2 Lec., 4 Lab.)

(ELE) 117 General Electrical Planning (4)
This course presents service, feeders, and branch circuit load calculations. Student activities include calculating load requirements and determining circuit locations using blueprints, construction drawings and specifications. Laboratory fee. (4 Lec., 2 Lab)

(ELE) 118 Commercial Codes (2)
This course is an extension of the Basic Electrical Codes to application frequently encountered in commercial electrical wiring. Information presented is based upon the current National Electric Code. (2 Lec.)

(ELE) 205 Commercial Wiring (3)
Topics in this course are centered upon accepted procedures and practices in wiring for commercial applications. Materials, conduit, and circuit layouts are included. Laboratory fee. (2 Lec., 4 Lab.)

(ELE) 206 Commercial Planning (4)
This course stresses application for service, feeders and branch circuits for commercial loads. Topics covered include blueprint reading, load calculations, overload protection, and planning for selected commercial environments. Laboratory fee. (4 Lec., 2 Lab.)

(ELE) 207 Industrial Planning (2)
This course covers power applications for industrial locations. Topics include high voltage wiring, feeder bus systems, switching, and system protection. Laboratory fee. (2 Lec., 1 Lab.)

(ELE) 208 Industrial Codes (2)
This course presents those areas of the current National Electric Code dealing with transformer and welder feeder circuits, motor and branch circuit overload protection. (2 Lec.)

(ELE) 213 Electrical Motor Fundamentals (2)
Theory and fundamentals of AC, DC and three-phase electrical motors are presented. Emphasis is placed on the characteristics, connection, and testing of these machines. Laboratory fee. (2 Lec., 1 Lab.)

(ELE) 214 Solid State Controls (3)
Solid state digital logic concepts and applications for motor controls are presented. System diagnostic procedures are covered. Laboratory fee. (2 Lec., 2 Lab.)

(ELE) 216 Motor Controls (3)
This course focuses upon the connection and testing of electrical systems used to control single and multiple-motor operations. Topics included are control circuit diagrams, magnetic starting, overload protecting, jogging, reversing, and sequencing. Laboratory fee. (3 Lec., 2 Lab.)

(ELE) 218 Electrical Design (3)
This course presents topics pertaining to designing and planning residential and commercial projects. Topics include construction drawings, specifications, load calculations, electrical layout and schedules, materials selection, and cost estimating. Activities are centered upon major student projects. Laboratory fee. (2 Lec., 4 Lab.)

(ELE) 703, 713, 803, 813
Cooperative Work Experience (3): 1 Lec., 15 Lab

(ELE) 704, 714, 804, 814
Cooperative Work Experience (4): 1 Lec., 20 Lab.

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APPENDIX K

Electrical Technology Program
Curriculum Analysis
Larry G. Blevins

COURSE NAME: Introduction to Electricial Technology

COURSE #: ELE 105

Reading for Information: 6

Note 1a: National Electrical Code

Note 1b: Housewiring Simplified

Note 1c: Illustriated Dictionary for Electrical Workers

Note 1d: Exams covering chapter reading assignments

Note 1e: Project assignment sheets

Note 1f: Use of trade catalog

Note 1g: Material/Tool Request, brief discription

Applied Mathematics: 6

Note 2a: Worksheet for Ohm's Law equations (basic electrical formulas)

Note 2b: Single family dwelling (conversions/multiple calculations)

Note 2c: Housewiring Simplified (provides guidance in using formulas)

Note 2d: Reading the folding rule (calculate using fractions)

Note 2e:

Note 2f:

Listening: 4

Note 3a: Electricity Can Kill - main details for safety (video tape)

Note 3b: Safety discussion, (feedback on critical information (quiz))

Note 3c: Textbook/electrical course content discussion (student query)

Note 3d: General orientation (tour of facilities and equipment)

Note 3e:

Writing: 4

Note 4a: Written discription of material on display board using catalogs

Note 4b: Student write multiple choice questions from safety booklet

Note 4c: Students write questions from quiz/test critique

Note 4d:

Note 4e:

Note 4f:

Locating Information: 6

Note 5a: National Electrical Code (Table and graphs)

Note 5b: Electrical meters (voltmeter, ammeter - Read & interpret)

Note 5c: Cable layouts, wiring diagrams & schematics (read & interpret)

Note 5d: Electrical trade catalog, (researching description/pricing)

Note 5e:

Note 5f:

Teamwork: 4

Note 6a: Wiring circuit boards (team problem solving using meters)

Note 6b: Clean-up teams for work area (identify/accomplish team goals)

Note 6c: Identify display on wall in work groups

Note 6d:

Electrical Technology Program
Curriculum Analysis
Larry G. Blevins

Applied Technology: 6

Note 7a: Ohms law applied to lab projects.

Note 7b: Determine electrical services for single family dwelling

Note 7c: Inventory of standard electrical tools

Note 7d: Applications of wiring procedures (single & three-way switches)

Note 7e:

Note 7f:

Electrical Technology Program
Curriculum Analysis
Larry G. Blevins

COURSE NAME: Fundamentals of Electricity

COURSE #: ELE 106

Reading for Information: 7

Note 1a: Standard Textbook of Electricity, (textbook)

Note 1b: Quik-Lab II for DC Circuits, (computer program)

Note 1c: Quik-Lab II for AC Circuits, (computer program)

Note 1d: Electronic Workbench, (computer lab program)

Note 1e:

Note 1f:

Note 1g:

Applied Mathematics: 7

Note 2a: Conversion of metric values

Note 2b: Solve complex problems using Kirchoff's Law containing RCL

Note 2c:

Note 2d:

Note 2e:

Note 2f:

Listening: 4

Note 3a: Magnetism, (video tape)

Note 3b: Safety discussion, (feedback on critical information (quiz))

Note 3c: Textbook/electrical course content discussion (student query)

Note 3d:

Note 3e:

Writing: 4

Note 4a: Student write multiple choice questions from safety booklet

Note 4b: Students write questions from quiz/text critique

Note 4c:

Note 4d:

Note 4e:

Note 4f:

Locating Information: 6

Note 5a: Student summarizes circuit problem by developing a matrix

Note 5b: Electrical meters (voltmeter, ammeter - read & interpret)

Note 5c: Wiring diagrams & schematics (read & interpret)

Note 5d:

Note 5e:

Note 5f:

Teamwork: 4

Note 6a: Wiring circuit boards (team problem solving using meters)

Note 6b: Clean-up teams for work area (identify/accomplish team goals)

Note 6c:

Note 6d:

Applied Technology: 6

Note 7a: Ohms Law applied to lab projects

Note 7b: Connect circuit boards using patch cords

Note 7c: Compare circuit test results to calculated values

Note 7d:

Note 7e:

Note 7f:

Electrical Technology Program
Curriculum Analysis
Larry G. Blevins

COURSE NAME: Electrical Transformers

COURSE #: ELE 107

Reading for Information: 6

Note 1a: Electrical Transformers (Text)

Note 1b: Electrical Transformers (Workbook), includes self paced study

Note 1c: Transformers (Projects)

Note 1d: National Electrical Code

Note 1e:

Note 1f:

Note 1g:

Applied Mathematics: 7

Note 2a: Load balancing, calculating system values using the NEC

Note 2b: Tap changer calculations problems (use of ratio/percentages)

Note 2c:

Note 2d:

Note 2e:

Note 2f:

Listening: 4

Note 3a: Video tape, Brownouts, Blackouts, & Burnouts

Note 3b: Safety discussion, (feedback on critical information (quiz))

Note 3c: Textbook/electrical course content discussion (student query)

Note 3d:

Note 3e:

Writing: 4

Note 4a: Student write multiple choice questions from safety booklet

Note 4b: Students write questions from quiz/test critique

Note 4c:

Note 4d:

Note 4e:

Note 4f:

Locating Information: 6

Note 5a: National Electrical Code

Note 5b: Wiring system identification

Note 5c:

Note 5d:

Note 5e:

Note 5f:

Teamwork: 4

Note 6a: Wiring transformer trainers (team problem solving using meters)

Note 6b: Clean-up teams for work area (identify/accomplish team goals)

Note 6c:

Note 6d:

Applied Technology: 6

Note 7a: Test & repair transformer trainers

Note 7b: Determining overcurrent protection for transformers

Note 7c:

Note 7d:

Note 7e:

Note 7f:

Electrical Technology Program
Curriculum Analysis
Larry G. Blevins

COURSE NAME: General Electrical Codes

COURSE #: ELE 108

Reading for Information: 6

Note 1a: Interpreting the National Electrical Code (text)

Note 1b: National Electrical Code

Note 1c: Instructor handout, voltage drop

Note 1d: Instructor handout, Steps for finding articles in the NEC

Note 1e: National Electrical Code (computer version)

Note 1f:

Note 1g:

Applied Mathematics: 7

Note 2a: Single family Dwelling load calculation

Note 2b: Determining wall box size

Note 2c:

Note 2d:

Note 2e:

Note 2f:

Listening: 4

Note 3a: Textbook/electrical course content discussion (student query)

Note 3b: Safety discussion

Note 3c:

Note 3d:

Note 3e:

Writing: 4

Note 4a: Students write questions from quiz/test critique

Note 4b: Students write multiple choice questions from text

Note 4c: Students answer text questions using complete sentences

Note 4d:

Note 4e:

Note 4f:

Locating Information: 6

Note 5a: National Electrical Code

Note 5b: National Electrical Code (Computer version)

Note 5c: Interpreting the NEC (text)

Note 5d:

Note 5e:

Note 5f:

Teamwork: NA

Note 6a: Exchange quiz, (student grading)

Note 6b:

Note 6c:

Note 6d:

Applied Technology: 5

Note 7a: Determine proper size and type conductors for circuits

Note 7b:

Note 7c:

Note 7d:

Note 7e:

Note 7f:

Electrical Technology Program
Curriculum Analysis
Larry G. Blevins

COURSE NAME: Low Voltage Circuits

COURSE #: ELE 115

Reading for Information: 6

Note 1a: Understanding and Servicing Alarm Systems

Note 1b: National Electrical Code

Note 1c: Instructor handout, Installation manual EN1550

Note 1d:

Note 1e:

Note 1f:

Note 1g:

Applied Mathematics: 6

Note 2a: Determine relay drop-out voltage, (Ohms/Kirchoff's Laws)

Note 2b: Calculate the square foot area of protection for heat detectors

Note 2c: Calculate the amount of Cathodic protection for a given problem

Note 2d: Conversion of Units/Resistor Color Coding (metric)

Note 2e:

Note 2f:

Listening: 4

Note 3a: Textbook/electrical course content discussion (student query)

Note 3b: Determine proper component selection for specific applications

Note 3c: Smart House, (video tape)

Note 3d: Smoke & Fire Detectors (video tape)

Note 3e: Safety discussion

Writing: 4

Note 4a: Students write questions from quiz/test critique

Note 4b: Students develop alarm system proposal

Note 4c: Students answer text questions using complete sentences

Note 4d:

Note 4e:

Note 4f:

Locating Information: 6

Note 5a: National Electrical Code

Note 5b: National Electrical Code (Computer version)

Note 5c: Installation Manual, Bugular alarm

Note 5d: Low Voltage Circuits (Projects)

Note 5e:

Note 5f:

Teamwork: 4

Note 6a: Wiring circuit boards (team problem solving using meters)

Note 6b: Clean-up teams for work area (identify/accomplish team goals)

Note 6c:

Note 6d:

Applied Technology: 6

Note 7a: Determine proper components and install alarm system

Note 7b: Demonstrate troubleshooting techniques for alarm systems

Note 7c:

Note 7d:

Note 7e:

Note 7f:

Electrical Technology Program
Curriculum Analysis
Larry G. Blevins

COURSE NAME: General Electrical Wiring

COURSE #: ELE 116

Reading for Information: 6

Note 1a Residential Wiring (text)

Note 1b: General Wiring Projects (project book)

Note 1c: National Electrical Code

Note 1d:

Note 1e:

Note 1f:

Note 1g:

Applied Mathematics: 7

Note 2a: Load calculation forms, single family, multi-family dwellings

Note 2b: Project assignments calculations, voltage drop etc.

Note 2c:

Note 2d:

Note 2e:

Note 2f:

Listening: 4

Note 3a: Video tape series (Bergwall, Residential), notes & test on each

Note 3b: Lecture/discussion

Note 3c: Safety discussion

Note 3d:

Note 3e:

Writing: 4

Note 4a: Specification details, material identification/discription

Note 4b: Use catalog to identify material/write discription for

Note 4c:

Note 4d:

Note 4e:

Note 4f:

Locating Information: 6

Note 5a: National Electrical Code Book requirements for projects

Note 5b: Video tape series students locate notes from

Note 5c: Blueprint set (find information on by answering test)

Note 5d:

Note 5e:

Note 5f:

Teamwork: 4

Note 6a: Clean-up

Note 6b: Hands on projects from Project Book, drilling etc.

Note 6c:

Note 6d:

Applied Technology: 6

Note 7a: Project book wiring projects, hands on

Note 7b: Take-off material identification

Note 7c:

Note 7d:

Note 7e:

Note 7f:

Electrical Technology Program
Curriculum Analysis
Larry G. Blevins

COURSE NAME: General Electrical Planning

COURSE #: ELE 117

Reading for Information: 7

Note 1a: Electrical Wiring Residential (text)

Note 1b: Project Book, (design individual project using instructions)

Note 1c: National Electrical Code

Note 1d:

Note 1e:

Note 1f:

Note 1g:

Applied Mathematics: 7

Note 2a: Calculating square footage for a dwelling (Project Book)

Note 2b: Load balancing using, Ohms Law, Power formulas (Project Book)

Note 2c: Transformer fault interruption (Text)

Note 2d:

Note 2e:

Note 2f:

Listening: 4

Note 3a: Lecture/discussion

Note 3b: Load summary examples observed from overhead/student takes note

Note 3c:

Note 3d:

Note 3e:

Writing: 4

Note 4a: Answer chapter questions fill in blanks, (text)

Note 4b: Test critique

Note 4c:

Note 4d:

Note 4e:

Note 4f:

Locating Information: 6

Note 5a: National Electrical Code Book

Note 5b: Underwriters Books (UL)

Note 5c: Building blueprints (Text/Project Book)

Note 5d:

Note 5e:

Note 5f:

Teamwork: 3

Note 6a: Discussion on projects during time allocated for projects.

Note 6b:

Note 6c:

Note 6d:

Applied Technology: 6

Note 7a: Dwelling design project (Project Book)

Note 7b: Branch circuit design, (Project Book)

Note 7c:

Note 7d:

Note 7e:

Note 7f:

Electrical Technology Program
Curriculum Analysis
Larry G. Blevins

COURSE NAME: Commercial Codes

COURSE #: ELE 118

Reading for Information: 6

Note 1a: Interpreting the National Electrical Code (text)

Note 1b: National Electrical Code

Note 1c: Handout, Hazardous (Classified Locations)

Note 1d:

Note 1e:

Note 1f:

Note 1g:

Applied Mathematics: 6

Note 2a: Calculations such as, conductor derating, box sizing,etc.(Text)

Note 2b:

Note 2c:

Note 2d:

Note 2e:

Note 2f:

Listening: 4

Note 3a: Video tape (Hazardous Materials)

Note 3b: Lecture/discussion

Note 3c:

Note 3d:

Note 3e:

Writing: 4

Note 4a: Short answers to fill in chapter test.

Note 4b: Handout Hazardous (Classified) Locations short answers

Note 4c:

Note 4d:

Note 4e:

Note 4f:

Locating Information: 6

Note 5a: National Electrical Code Book

Note 5b: Handout Hazardous (Classified) Locations

Note 5c:

Note 5d:

Note 5e:

Note 5f:

Teamwork: NA

Note 6a: Students interaction with code problems (problem solving)

Note 6b:

Note 6c:

Note 6d:

Applied Technology: 5

Note 7a: Selecting proper component size based on NEC

Note 7b:

Note 7c:

Note 7d:

Note 7e:

Note 7f:

Electrical Technology Program
Curriculum Analysis
Larry G. Blevins

COURSE NAME: Commercial Wiring

COURSE #: ELE 205

Reading for Information: 6

Note 1a: Commercial Wiring (text)

Note 1b: Commercial Wiring Project (workbook)

Note 1c: Benfield Conduit Bending Manual

Note 1d: Electrical trade catalog (material)

Note 1e: Handout, Panelboard protection (UL)

Note 1f:

Note 1g:

Applied Mathematics: 7

Note 2a: Calculation for commercial devices (text)

Note 2b: Service load calculation (special problems)

Note 2c: Calculations based on NEC

Note 2d:

Note 2e:

Note 2f:

Listening: 4

Note 3a: Video tapes (Commercial Load Calculations)

Note 3b: Lecture/discussion

Note 3c: Safety discussion

Note 3d:

Note 3e:

Writing: 4

Note 4a: Catalog material identification/description

Note 4b: Estimating Form (handout)

Note 4c:

Note 4d:

Note 4e:

Note 4f:

Locating Information: 6

Note 5a: National Electrical Code Book

Note 5b: Electrical catalogs

Note 5c: Benfield Conduit Manual

Note 5d: Selecting Wiring Systems (discussion/quiz)

Note 5e: Electrical Trade Catalog

Note 5f:

Teamwork: 4

Note 6a: Clean-up projects

Note 6b: Sharing tools

Note 6c: Projects

Note 6d:

Applied Technology: 6

Note 7a: Wiring projects (Project Book)

Note 7b: Lab test

Note 7c: Develop Cable Layout/Wiring Diagram

Note 7d:

Note 7e:

Note 7f:

COURSE NAME: Commercial Planning

COURSE #: ELE 206

Reading for Information: 7

Note 1a: Electrical Wiring Commercial (text)

Note 1b: National Electrical Code Book

Note 1c: Planning Project

Note 1d: Handout (summary sheets)

Note 1e:

Note 1f:

Note 1g:

Applied Mathematics: 7

Note 2a: Commercial load calculations

Note 2b: Circuit load requirement

Note 2c: Fault Current Calculations

Note 2d:

Note 2e:

Note 2f:

Listening: 4

Note 3a: Lecture/discussion

Note 3b: Load summary examples using overhead/students take notes

Note 3c:

Note 3d:

Note 3e:

Writing: 4

Note 4a: Develop wiring specifications

Note 4b: Complete fill in type questions from text

Note 4c:

Note 4d:

Note 4e:

Note 4f:

Locating Information: 6

Note 5a: National Electrical Code Book

Note 5b: Underwriters books research specific problems

Note 5c: Fault Current Calculations Forms/Tables

Note 5d:

Note 5e:

Note 5f:

Teamwork: 3

Note 6a: Interaction during class work sesession

Note 6b:

Note 6c:

Note 6d:

Applied Technology: 6

Note 7a: Commercial planning projects

Note 7b:

Note 7c:

Note 7d:

Note 7e:

Note 7f:

Electrical Technology Program
Curriculum Analysis
Larry G. Blevins

COURSE NAME: Industrial Planning

COURSE #: ELE 207

Reading for Information: 7

Note 1a: Electrical Wiring Industrial (text)

Note 1b: Industrial planning projects

Note 1c: National Electrical Code

Note 1d: Projects (Motor load calculations)

Note 1e: Projects (Welder load calculations)

Note 1f:

Note 1g:

Applied Mathematics: 7

Note 2a: Industrial planning projects

Note 2b:

Note 2c:

Note 2d:

Note 2e:

Note 2f:

Listening: 4

Note 3a: Discussion/lecture

Note 3b: Load summary examples overhead projector, student takes notes

Note 3c:

Note 3d:

Note 3e:

Writing: 4

Note 4a: Answer textbook fill in blank questions, (text)

Note 4b: Specifications

Note 4c:

Note 4d:

Note 4e:

Note 4f:

Locating Information: 6

Note 5a: National Electrical Code

Note 5b: Fault Current Calculation Form/Tables

Note 5c:

Note 5d:

Note 5e:

Note 5f:

Teamwork: 3

Note 6a: Project study days

Note 6b:

Note 6c:

Note 6d:

Applied Technology: 6

Note 7a: Industrial planning projects

Note 7b:

Note 7c:

Note 7d:

Note 7e:

Note 7f:

Electrical Technology Program
Curriculum Analysis
Larry G. Blevins

COURSE NAME: Industrial Codes

COURSE #: ELE 208

Reading for Information: 6

Note 1a: Interpreting the National Electrical Code

Note 1b: National Electrical Code

Note 1c: Handout (Transformer summary sheet)

Note 1d:

Note 1e:

Note 1f:

Note 1g:

Applied Mathematics: 7

Note 2a: Calculations motor feeders, welder feeders, transformer feeders

Note 2b:

Note 2c:

Note 2d:

Note 2e:

Note 2f:

Listening: 4

Note 3a: Lecture/discussion

Note 3b: Video tapes (Motor Faults)

Note 3c:

Note 3d:

Note 3e:

Writing: 4

Note 4a: Answer questions from the text, fill in the blanks

Note 4b: Make questions multiple choice

Note 4c:

Note 4d:

Note 4e:

Note 4f:

Locating Information: 6

Note 5a: National Electrical Code Book

Note 5b: National Electrical Code (Computer version)

Note 5c:

Note 5d:

Note 5e:

Note 5f:

Teamwork: NA

Note 6a: Test evaluation, switch papers, discuss code requirements

Note 6b:

Note 6c:

Note 6d:

Applied Technology: 6

Note 7a: Determine the circuits sizes for specific problems

Note 7b: Identify common circuit components for special problems

Note 7c:

Note 7d:

Note 7e:

Note 7f:

Electrical Technology Program
Curriculum Analysis
Larry G. Blevins

COURSE NAME: Electrical Motor Fundamentals

COURSE #: ELE 213

Reading for Information: 6

Note 1a: Industrial Principles & Practices (text)

Note 1b: Principles & Practices (workbook)

Note 1c: Motor project (building project)

Note 1d:

Note 1e:

Note 1f:

Note 1g:

Applied Mathematics: 6

Note 2a: Using micrometer, metric conversions

Note 2b: Ohms Law/Power conversions

Note 2c:

Note 2d:

Note 2e:

Note 2f:

Listening: 4

Note 3a: Video series on motor winding (EASA)

Note 3b: lecture/discussion

Note 3c; Safety discussion

Note 3d:

Note 3e:

Writing: 4

Note 4a: Test critique

Note 4b: Workbook questions

Note 4c:

Note 4d:

Note 4e:

Note 4f:

Locating Information: 6

Note 5a: Motor building project (following instructions)

Note 5b: National Electrical Code Book (Selecting wire sizes)

Note 5c:

Note 5d:

Note 5e:

Note 5f:

Teamwork: 4

Note 6a: Sharing of materials/tools

Note 6b:

Note 6c:

Note 6d:

Applied Technology: 6

Note 7a: Motor building project (load test)

Note 7b: Growler test

Note 7c: Motor connections

Note 7d:

Note 7e:

Note 7f:

Electrical Technology Program
Curriculum Analysis
Larry G. Blevins

COURSE NAME: Solid State Controls

COURSE #: ELE 214

Reading for Information: 6

Note 1a: Solid State Fundamentals for Electricians (text)

Note 1b: Solid State Fundamentals for Electricians (workbook)

Note 1c: Broder solid state trainers

Note 1d:

Note 1e:

Note 1f:

Note 1g:

Applied Mathematics: 6

Note 2a: Charts and graphs for transistor cutoff values (text/wb)

Note 2b: Calculate amplification factors (Alpha/Beta) (text/wb)

Note 2c:

Note 2d:

Note 2e:

Note 2f:

Listening: 4

Note 3a: Video tape (Static Logic)

Note 3b: Lecture/discussion

Note 3c: Safety discussion

Note 3d:

Note 3e:

Writing: 4

Note 4a: Workbook completion answers from textbook

Note 4b:

Note 4c:

Note 4d:

Note 4e:

Note 4f:

Locating Information: 6

Note 5a: Solid State Fundamentals for Electricians (workbook)

Note 5b: Truth table/electromechanical equivalent circuit

Note 5c:

Note 5d:

Note 5e:

Note 5f:

Teamwork: 4

Note 6a: Hands on lab projects on digital logic trainers

Note 6b: Solid State trainer

Note 6c:

Note 6d:

Applied Technology: 5

Note 7a: Broder logic trainer

Note 7b: Solid state trainer

Note 7c: Electronic Workbench (computer based circuit construction/test)

Note 7d: Testing solid-state components

Note 7e:

Note 7f:

Electrical Technology Program
Curriculum Analysis
Larry G. Blevins

COURSE NAME: Motor Controls

COURSE #: ELE 216

Reading for Information: 7

Note 1a: Electrical Motor Controls (textbook)

Note 1b: Motor Controls Project Manual (develop ladder/wiring diagrams)

Note 1c: National Electrical Code

Note 1d:

Note 1e:

Note 1f:

Note 1g:

Applied Mathematics: 6

Note 2a: Calculating motor circuit values (text)

Note 2b:

Note 2c:

Note 2d:

Note 2e:

Note 2f:

Listening: 5

Note 3a: Video tape (motor controls)

Note 3b: Lecture/discussion

Note 3c: Examples of project using overhead projector/student takes note

Note 3d: Safety discussion

Note 3e:

Writing: 4

Note 4a: Written statement interpretation

Note 4b: Fill-in questions at the end of text chapters

Note 4c:

Note 4d:

Note 4e:

Note 4f:

Locating Information: 6

Note 5a: National Electrical Code

Note 5b: Project analysis

Note 5c:

Note 5d:

Note 5e:

Note 5f:

Teamwork: 4

Note 6a: Lab projects

Note 6b: Tools and supplies

Note 6c:

Note 6d:

Applied Technology: 6

Note 7a: Hands on lab projects (24 practical projects)

Note 7b: Trouble-shooting trainer (multiple trouble options)

Note 7c:

Note 7d:

Note 7e:

Note 7f:

Electrical Technology Program
Curriculum Analysis
Larry G. Blevins

COURSE NAME: Electrical Design

COURSE #: ELE 218

Reading for Information: 7

Note 1a: National Electrical Code

Note 1b: Specific projects of electrical design (capstone calculations)

Note 1c:

Note 1d:

Note 1e:

Note 1f:

Note 1g:

Applied Mathematics: 7

Note 2a: Service load summary calculations

Note 2b: Feeder load summary calculations

Note 2c: Branch circuit summary calculations

Note 2d: Heating/Air condition project

Note 2e: Zonal Cavity Lighting study

Note 2f:

Listening: 5

Note 3a: One on one Instructor interaction pertaining to projects

Note 3b:

Note 3c:

Note 3d:

Note 3e:

Writing: 5

Note 4a: Write project specifications

Note 4b: Research and report pertaining to electrical design

Note 4c:

Note 4d:

Note 4e:

Note 4f:

Locating Information: 6

Note 5a: National Electrical Code Book

Note 5b: Past project portifolo

Note 5c: Open book test using research material

Note 5d:

Note 5e:

Note 5f:

Teamwork: 4

Note 6a: Interaction through discussion of project components

Note 6b:

Note 6c:

Note 6d:

Applied Technology: 6

Note 7a: Electrical design projects (Residential,Commercial,Industrial)

Note 7b:

Note 7c:

Note 7d:

Note 7e:

Note 7f:

Electrical Technology Program
Curriculum Analysis
Larry G. Blevins

COURSE NAME: Cooperative Work Experience

COURSE #: ELE 703/704

Reading for Information: 6

Note 1a: Student study guide (list of useful information)

Note 1b: Projects relating to job search/interviewing/self evaluation

Note 1c:

Note 1d:

Note 1e:

Note 1f:

Note 1g:

Applied Mathematics: NA

Note 2a: not applicable

Note 2b:

Note 2c:

Note 2d:

Note 2e:

Note 2f:

Listening: 4

Note 3a: Discussion of individual project results

Note 3b:

Note 3c:

Note 3d:

Note 3e:

Writing: 5

Note 4a: Resume/job application/letter of application

Note 4b:

Note 4c:

Note 4d:

Note 4e:

Note 4f:

Locating Information: 4

Note 5a: Research job related problems (library)

Note 5b:

Note 5c:

Note 5d:

Note 5e:

Note 5f:

Teamwork: 6

Note 6a: Developing outcomes with work supervisor (Coop booklet)

Note 6b:

Note 6c:

Note 6d:

Applied Technology: 6

Note 7a: Job work experience utilizing class studies (Coop booklet)

Note 7b:

Note 7c:

Note 7d:

Note 7e:

Note 7f:

APPENDIX L

Joint Electrical Apprenticeship and Training

This is an evaluation of the First Year electrical apprentice curriculum, by lesson number, about how each lesson improves on SCAN Work Key skills.

BASED ON ACT LISTED BASIC SKILLS
Total number of lessons in First Year is 80.

Reading for Information
Applicable in 80 lessons
Lesson Nos. 1-01 through 1-73
1-JT-1 and 1-TH-1 through 1-TH-7

Applied Mathematics
Applicable in 53 lessons
Lessons Nos. 1-12, 1-13, 1-14, 1-17, 1-18,
1-20 through 1-60, 1-65 through 1-73
1-TH-1 through 1-TH-7

Listening
Applicable in 80 lessons
Lesson Nos. 1-01 through 1-73
1-JT-1 and 1-TH-1 through 1-TH-7

Writing
Applicable in 80 lessons
Lesson Nos. 1-01 Through 1-73
1-JT-1 and 1-TH-1 through 1-TH-7

Locating Information
Applicable in 80 lesson
Lesson Nos. 1-01 Through 1-73
1-JT-1 and 1-TH-1 through 1-TH-7

Teamwork
Applicable in 17 lessons
Lesson Nos. 1-01 Through 1-09, 1-11, 1-12, 1-14,
1-15, 1-16, 1-17, 1-37 and 1-JT-1

Applied Technology
Applicable in 70 lessons
Lesson Nos. 1-03, 1-09 through 73
1-TH-1 through 1-TH-7

ON-THE-JOB TRAINING

It all starts the first day on-the-job with "Reading for Information" when the apprentices will be required to read the safety rules and it progresses from there.

"Arithmetic and Mathematics" skills are so important on-the-job that it becomes a second nature. It is so built into the job that one does not stop to think - "Hey this is math I'm using."

One important ingredient for on-the-job training is "Listening" to instructions. An important parts of on-the-job "Listening" is being aware of what is going on around a person.

A picture is worth a thousand words. Electrical journeyman and apprentices use the "Draw-Writing" method of training very often on the job.

On-the-job the apprentice will "Locate Information" through the apprentice's foreman, Journeyman and instructional bulletins.

There are two types of "Teamwork" taught at the on-the-job site. The apprentice will be playing the part as a team member by contributing his or her talent to the successful completion of the job. It is like the teamwork on a football team. The second is learning to work with the variety of personalities.

While on-the-job the apprentices is surrounded with "Applied-Technology" and has the opportunity to see what is taught in the related classroom instruction become real on-the-job.

On-the-job **Speaking** up and asking questions when one does not understand is encouraged.

LISTED SCAN THINKING SKILLS

Creative Thinking
Applicable in 27 lessons
Lesson Nos. 1-15 though 1-27, 1-29, 1-56 through 1-60
1-66 through 1-73

Decision Making
Applicable in 54 lessons
Lesson Nos. 1-01, 1-13 through 1-17, 1-26 through 1-73

Problem Solving
Applicable in 49 lessons
Lesson Nos. 1-06, 1-07, 1-21 through 1-36, 1-38 through 1-54, 1-66 through 1-73, 1-TH-1 through 1-TH-3 and 1-TH-5 through 1-TH-7

Seeing Things in the Mind's Eye
Applicable in 48 lessons
Lesson Nos. 1-04, 1-28 through 1-30, 1-34 through 1-45, 1-46 through 1-73, 1-TH-1 through 1-TH-7

Knowing How to Learn
Applicable in 5 lessons
Lesson Nos. 1-01, 1-JT-1, 1-03, 1-06 and 1-07

Reasoning
Applicable in 71 lessons
Lesson Nos. 1-10 through 1-73 and 1-TH-1 through 1-TH-7

ON-THE-JOB TRAINING

Watching what electricity does on-the-job will arouse curiosity, causing "Creative Thinking."

On-the-job "Decision Making" is constantly blended into the training when the apprentice is faced with choosing the safe way to perform an assigned task.

Apprentices' first day on-the-job starts with "Problem Solving" their way around the job site. Then comes the continual problem, "This is not doing right. What am I doing wrong?"

By "Seeing Things in the Mind's Eye," the apprentice can watch the electrons of electricity travel along the highways of wire as they travel from place to place to accomplish their work.

Apprenticeship is the passing on from one generation to the next generation the tricks of the trade. Accepting what can be passed on by demonstration and word of mouth is a demonstration of "Knowing How to Learn."

The apprentice learns, it is plain "Reasoning," that a longer handle, on a bending hickey, will give more leverage. An apprentice is taught to reason out how to get the mechanical advantage when body strength is a factor.

LISTED SCAN PERSONAL QUALITIES SKILLS

Responsibility
Applicable in 16 lessons
Lesson Nos. 1-01 through 1-12, 1-14, 1-16, 1-17, 1-61

Self-Esteem
Applicable in 9 lessons
Lesson Nos. 1-01 through 1-08, and 1-JT-1

Sociability
Applicable in 6 lessons
Lesson Nos. 1-03 through 1-08
The general school atmosphere teaches sociability.

Self-Management
Applicable in 10 lessons
Lesson Nos. 1-01 through 1-09 and 1-JT-1

Integrity/Honesty
Applicable in 4 lessons
Lesson Nos. 1-02, 1-03, 1-06, 1-07

ON-THE-JOB TRAINING

The "Personal Quality Skills" are further taught through participation in Apprenticeship Committee or electrical industry sponsored activities.

An apprentices is assigned a task and is held "Responsible" for it. All apprentices are held responsible on-the-job for what they learn in the classroom.

"Self-Esteem" will be built by an apprentice's own accomplishments on-the-job, compliments received on-the-job, recognition for progress by periodic increases in salary, and through competition for performance awards.

The participation in the social functions outside the classroom sponsored by the Apprenticeship Training Committee or the Electrical industry creates an atmosphere of "Sociability." Apprentices are encouragement to participate and take part in community activities.

Time is a very important item in construction. Important time management on the job teaches "Self-Management." A big help for "Self-Management" is the Local Union's credit union offering help on money management.

The construction worker is required to have "Integrity and Honesty" because they are trusted to work in the customers home or place of business. Often times, when night work is required, the construction workers will be alone in an office or store with the customer's valuable possessions.

Evaluations made by:
Innovative Education, Inc.
Ronald P. O'Riley

APPENDIX M

LESSON OUTLINE

NATIONAL ELECTRICAL COURSE
FOR
APPRENTICE INSIDE WIREMEN

FIRST YEAR

Lesson	Test	Code	Title	Reference
1-01	1	O	How to Study This Course	Inf. Sheet
1-02		O	IBEW/NECA Apprenticeship	Inf. Sheet
1-03		O	Your Apprenticeship	Inf. Sheet, Local Inf.
1-04		O	History of the IBEW	History and Structure
1-05		O	NECA	This is NECA, Inf. Sheet
1-06		O	Your Job and Its Future	Inf. Sheet
1-07		O	Motivation and Leadership	Inf. Sheet
1-08		O	National Program	Inf. Sheet, NJATC Brochure
1-09		O	Put Safety First	Inf. Sheet
1-10	2	J	Tools	Klein, Inf. Sheet
1-11		J	The Workplace	Inf. Sheet
1-12		J	Safety With Ladders	Inf. Sheet
1-13		J	Fastening Devices	Rawl
1-14		J	Electrical Shock	Inf. Sheet
1-15		J	Knot Tying	Inf. Sheet
1-16	3	J	Working Overhead	Inf. Sheet
1-17		J	Hoisting Overload Loads	Inf. Sheet
1-18		J	Wire Connectors	Cable & Wire, Inf. Sheet
1-19		J	Wire and Insulation	Cable & Wire, Singer
1-20		J	Sizes of Building Wire	NEC, Singer
1-21	4	M	Working With Fractions	Singer
1-22		M	Introduction to Trigonometry	Singer
1-23		J	90° Stubs	Cox, Inf. Sheet
1-24		J	Kicks and Offsets	Cox
1-25		J	Saddles	Cox
1-26	5	M	Prefixes and Powers of 10	Singer, Mileaf, Inf. Sheet
1-27		M	The Metric System and Metrication	Inf. Sheet
1-28		T	Electron Theory, Sources and Effects	Mileaf, Singer
1-29		M	Solving Simple Equations	Singer
1-30		T	Electric Units and Ohm's Law*	Mileaf, Singer, Inf. Sheet
1-31		M	Square Root	Singer
1-32		T	Power*	Mileaf, Singer, Inf, Sheet
1-33		T	Electrical and Electronic Devices	Inf. Sheet
1-34	6	T	Resistance in Series Circuits*	Mileaf, Singer, Inf. Sheet
1-35		T	Current in Series Circuits*	Mileaf, Singer, Inf. Sheet
1-36		T	Voltage in Series Circuits*	Mileaf, Inf. Sheet
1-37		J	Danger-High Voltage	Inf. Sheet
1-38		M	Ratio and Proportion	Singer
1-39		T	Voltage Divider Circuits*	Mileaf
1-40		T	Power in Series Circuits*	Mileaf

FIRST SEMESTER TEST *NOTE-see page viii

Lesson	Test	Code	Title	Reference
1-41	7	T	Voltage in Parallel Circuits*	Mileaf
1-42		T	Resistance in Parallel Circuits*	Mileaf, Inf. Sheet
1-43		T	Current in Parallel Circuits*	Mileaf, Singer
1-44		T	Current Divider Circuits*	Mileaf
1-45		T	Power in Parallel Circuits*	Mileaf, Singer
1-46	8	T	Resistance in Combination Circuits*	Mileaf, Singer
1-47		T	Current in Combination Circuits*	Mileaf, Singer
1-48		T	Voltage in Combination Circuits*	Mileaf, Singer
1-49		T	Power in Combination Circuits*	Mileaf
1-50		T	Voltage Polarity and Voltage Drop*	Mileaf, Singer, NEC, Inf. Sheet
1-51	9	T	Magnetism and Electromagnetism	Mileaf, Singer
1-52		T	Principles of Generation	Mileaf, Singer
1-53		T	Superposition*	Mileaf
1-54		T	Applications of DC Theory	All Previous Lessons
1-55	10	J	Aluminum Conductors	Aluminum Manual
1-56		J	Basic Circuits	Inf. Sheet
1-57		J	Overcurrent Protection Devices	Mileaf, NEC, Elec. Prot. Hndbk.
1-58		J	Ground Fault Interrupters	Inf. Sheet
1-59		J	The Three Wire System*	Inf. Sheet, NEC
1-60		J	Transformer Ratios*	Mileaf, Singer
1-61	11	C	Introduction to the Code	NEC, Inf. Sheet
1-62		C	Article 110	NEC, Inf. Sheet
1-63		C	Code Definitions	NEC, Inf. Sheet
1-64		C	Conductor Materials	NEC, Inf. Sheet
1-65		C	Conductor Insulations	NEC, Inf. Sheet
1-66	12	B	Drawing and Sketching	NJATC Blueprint Reading
1-67		B	Views	NJATC Blueprint Reading
1-68		B	Scales	NJATC Blueprint Reading
1-69		B	Plans and Specifications	NJATC Blueprint Reading
1-70		B	Symbology I	NJATC Blueprint Reading
1-71		B	Symbology II	NJATC Blueprint Reading
1-72		B	Residential I	NJATC Blueprint Reading
1-73		B	Residential II	NJATC Blueprint Reading

SECOND SEMESTER TEST

*NOTE-see page viii

Codes For Lessons In The First Year

O	Orientation	T	Theory
J	Job Information	C	Code
M	Mathematics	B	Blueprint Reading

Tests In The First Year

Test	Lessons Covered	Your Score	Your Average
1	1-1 —1-9		
2	1-10—1-15		
3	1-16—1-20		
4	1-21—1-25		
5	1-26—1-33		
6	1-34—1-40		
1st Semester Test			

Test	Lessons Covered	Your Score	Your Average
7	1-41—1-45		
8	1-46—1-50		
9	1-51—1-54		
10	1-55—1-60		
11	1-61—1-65		
12	1-66—1-73		
2nd Semester Test			

NOTE: Some tests will include review questions on material studied earlier in your apprenticeship.

APPENDIX N

■ Active, Empathic and Critical Listening Skills

LISTENING RECALL

APPROXIMATE TIME:
45 minutes

PURPOSE:

To experience and observe the process of information change and listening recall in the serial reproduction of information.

PROCEDURE:

1. Have six members of the class leave the room and remain far enough away so that they cannot hear what is going on in the room.

2. Have the remainder of the class read the listening recall story.

LISTENING RECALL STORY

Upon entering a taxi (which is a public carrier), Mrs. Stevens found a purse lying in the corner of the seat. She picked it up and looked inside, noticing a roll of bills and some smaller change. She gave it to the driver who told her he didn't know whose it was, but that he would turn it in at the office. After the company had advertised in the papers for a week and then held the money for one year without anyone claiming it, Mrs. Stevens demanded that it be returned to her. There was $1,200 in the purse. Mrs. Stevens claims that she found it in a public carrier and it belongs to her, since the owner failed to claim it. The taxi company claims that since it was left in their car it belongs to them.

3. When everyone has finished reading, select a volunteer to tell (orally, without consulting the paper) the story as close to verbatim as possible to the first person who was sent out of the room.

4. Call in the first subject and have the volunteer reproduce the story as accurately as

possible. The first subject should be told to listen very carefully because he or she will be asked to reproduce the message for the next person. No question or discussion should occur before, during or after the reproductions.

5. Call in the next person while the volunteer returns to his or her seat. Have subject one tell the story as close to verbatim as he or she heard the story to subject two as the class listens. Repeat this process until all subjects have returned to the room and heard the story.

6. Each time the story is repeated, class members should note what changes occur. When the last subject tells the story to the volunteer, have the class record it verbatim.

DISCUSSION POINTS:

1. What kinds of information were reproduced accurately, omitted, added and changed to conform to "what makes sense"?

2. How do the circumstances of this exercise differ from normal rumor transmission situations? Do these differences make the reproductions in the exercise more or less accurate than would occur in normal life?

3. How much should a person depend on the accuracy of information reproduced from memory through several individuals?

4. What methods can be used to improved the accuracy with which information was produced?

Source: Adler, Rosenfeld, Towns, pp. 57-58

LEARNING ACTIVITIES FOR LISTENING SKILLS

Submitted by Carlajo Cancilla
Adjunct Instructor of Speech
North Lake College

The following activity was conducted in communication classes at U.N.T. (N.T.S.N.) during the 1970's. It is an effective means of demonstrating the importance of language usage and feedback to effective listening.

Time: One class period.

MATERIAL NEEDED:

The instructor will need two identical sets of building blocks. Each set should consist of seven different shapes, such as rectangle, wedge, square, circle, cylinder, etc. There may be duplicate pieces, but each set must be exactly the same. Several pairs of these sets will offer variety if more than two students participate.

The instructor will also need a table with a large poster board propped up in the center and two chairs placed at opposite ends of the table.

PROCEDURE:

Two students will be asked to sit at opposite ends of the table. Each will be given a set of blocks. The poster board should conceal each student's set from the other. Make sure the rest of the class can see both sets.

Instruct Student "A" to construct something with his/her set. They are then to tell Student "B" how to make the same structure. Student B is not allowed to ask questions, and Student A can only communicate verbally (no gestures, drawings, etc.). The class may not assist in any way.

When the students are finished the poster board is removed. The two structures will most likely be very different. Replace the poster board and have Student A build a different structure. Student A again tells Student B how to make it, but this time Student B is free to ask questions and describe what he/she thinks is being said (give feedback). When the poster board is removed again, students should notice a vast improvement in similarity.

DISCUSSION:

1. Note the differences in the two activities in terms of time, frustration level, and results.

    a. Ask the participants how they felt when they were limited in their use of feedback.

b. How is feedback important in the classroom? On the job?
c. How does feedback affect possible outcomes?
d. How important is our vocabulary when we describe something?
e. Stress that although feedback takes longer, it helps to ensure a successful outcome.

SUGGESTIONS:

This activity should be repeated among several sets of students.
The class could take notes regarding ambiguous language usage, nonverbal reactions indicating confusion, frustration of participants, etc. These notes could be covered in the discussion period.

PARAPHRASE ACTIVITY

This activity could be tailored to fit the needs of the electrical technology program by using it in the context of customer/employee relations, employer/employee relations. The activity could be conducted as a telephone conversation or face to face.

PROCEDURE:

Divide the class into pairs. One partner is to convey a message predetermined by the instructor. The message could issue directions, be a complaint, etc. As the partner finishes talking, the other person must paraphrase the first person's comments to that individual's satisfaction, stating his or her own position as well. This position may be the course of action the receiver will take, their own stance or opinion, etc. This process proceeds until you announce the exercise is over.

DISCUSSION:

What are the difficulties and benefits of this activity? How satisfied were the students with their partner's initial paraphrase? Stress that paraphrasing isn't simply repeating another person's words, but re-wording what you understood the sender to be saying. The process of paraphrasing, although frustrating and time-consuming, is necessary to ensure accuracy in communication. It also creates a climate conducive to favorable relations among co-workers, customers, etc.

APPENDIX O

Registration Information

For more information or to registor for the sessions, please e-mail or call the contact person listed. The sessions are free of charge to DCCCD employees.

District Human Resources	Karen Turner	746-2466
District Staff Development	Kathryn Alvis	746-2407
District Resource Development	Theresa Roffino	746-2275
District Quality & Planning (CQI)	Margot Hirsch	746-2120
District Public Information	Claudia Robinson	746-2135
LeCroy Telecommunications Center	Anne Albertson	952-0354
Small Business Development Center	Jeff Blatt	565-5825

Mission: Planning & Development Affairs

This professional development calendar is produced by the District Office of Planning & Development Affairs. The mission of Planning & Development Affairs is to assist faculty and staff in promoting student success. Team members deliver professional services in the areas of strategic planning, research, resource development, staff development, public information, human resources, and quality support services.

Dallas County Community College District
Office of Planning & Development Affairs
701 Elm Street
Dallas, Texas 75202

71400 RESIDENT INSTRUCTION ADMINIST
MARLOW,CAROL,E

1994-95 Professional Development Calendar

Dallas County Community College District

1994-95 Dallas County Community College District
Professional Development Calendar

PROGRAM/TOPIC	PRESENTER	AUDIENCE	E-MAIL CONTACT	TIME	DATE
SEPTEMBER 1994					
COI Awareness Training	Burt Peachy	New DCCCD Employees	Margot Hirsch	8:30-Noon	Sept. 13
New Employee Orientation	Chancellor's Cabinet	New DCCCD Employees	Kathryn Alvis	1:00-4:30	Sept. 13
Business and Corporate Contract Training	Burt Peachy	Account Executives	Theresa Rolfino	1:30-5:00	Sept. 13
Learning Shock 2000: The Changing Frontier in Education	Teleconference	All DCCCD Employees	Anne Albertson	12:30-3:00	Sept. 15
Leadership DCCCD Overnight Retreat	Bill Cantrell	*Class of 1995	Kathryn Alvis	8:30-7:00 8:30-Noon	Sept. 21 & 22
OCTOBER 1994					
Grants Training Session/JTPA	DCCCD Staff	Grant Managers	Theresa Rolfino	1:00-5:00	Oct 12
COI Coaches Training	Burt Peachy	All DCCCD Employees	Margot Hirsch	8:30-4:30	Oct 17-20 & Oct. 27
Leadership DCCCD - Session II	Bill Cantrell	*Class of 1995	Kathryn Alvis	8:30-4:30	Oct 19
Grants Training Session/USDE	DCCCD Staff	Grant Managers	Theresa Rolfino	1:00-5:00	Oct. 19
Americans With Disabilities Act/ Special Populations	Teleconference/ STARLINK	All DCCCD Employees	Anne Albertson	2:00-3:30	Oct. 19
Planning Outlook Forum	Bill Banach & Margaret Maxey	*DCCCD Leaders	Theresa Rolfino	8:30-4:30	Oct. 24
Grants Training Session/Carl Perkins	DCCCD Staff	Grant Managers	Theresa Rolfino	1:00-5:00	Oct. 26
NOVEMBER 1994					
COI Coaches & Supervisors/ Managers as Trainers	Casey Collett	DCCCD Coaches Academy & All Supervisors/Managers	Margot Hirsch	8:30-5:00	Nov 3
Memory Enhancement	Terri David	All DCCCD Employees	Jeff Blatt	TBA	Nov 3
Professional Support Staff Leadership Workshop	DCCCD Staff	*Professional Support Staff Officers	Kathryn Alvis	8:30-4:30	Nov 4
PERSPECTIVES. Dealing With Difficult People	Jacqueline Reid	All DCCCD Employees	Kathryn Alvis	8:30-4:30	Nov. 10
Leadership DCCCD - Session III	Bill Cantrell	*Class of 1995	Kathryn Alvis	8:30-4:30	Nov. 16
Proposal Writing	DCCCD Staff	All DCCCD Employees	Theresa Rolfino	1:00-5:00	Nov. 17
DECEMBER 1994					
Leadership DCCCD Academy	Keynote Speaker	*Leadership Alumni	Kathryn Alvis	8:30-Noon	Dec 1
New Employee Orientation	Chancellor's Cabinet	New DCCCD Employees	Kathryn Alvis	8:30-Noon	Dec 8
COI Awareness Training	Burt Peachy	New DCCCD Employees	Margot Hirsch	1:00-4:30	Dec 8
JANUARY 1995					
Managing & Documenting COI Process Improvement	Enrique A. Cancino	DCCCD Coaches Academy & All Other Employees	Margot Hirsch	8:30-5:00	Jan 18
Leadership DCCCD - Session V	Bill Cantrell	*Class of 1995	Kathryn Alvis	8:30-4:30	Jan. 19
Institutional Effectiveness	Teleconference/ STARLINK	All DCCCD Employees	Anne Albertson	2:00-3:30	Jan. 19
PERSPECTIVES: Self Management	Vickie Hitzges	All DCCCD Employees	Kathryn Alvis	8:30-4:30	Jan. 31
FEBRUARY 1995					
Multiculturalism in the Classroom	Teleconference/ STARLINK	All DCCCD Employees	Anne Albertson	2:00-3:30	Feb 8
Leadership DCCCD - Session VI	Bill Cantrell	*Class of 1995	Kathryn Alvis	8:30-4:30	Feb. 16
PERSPECTIVES Leadership & The New Science	John Cleveland	All DCCCD Employees	Kathryn Alvis	8:30-4:30	Feb. 22
MARCH 1995					
Faculty/Administrative Conference Day	Keynote Speaker	Faculty & Administrators	MVC Host Campus	8:30-4:30	March 2
COI Awareness Training	Burt Peachy	New DCCCD Employees	Margot Hirsch	8:30-Noon	March 9
New Employee Orientation	Chancellor's Cabinet	New DCCCD Employees	Kathryn Alvis	1:00-4:30	March 9
The Adult Learner	Teleconference/ STARLINK	All DCCCD Employees	Anne Albertson	2:00-3:30	March 9
Professional Support Staff Conference Day	Keynote Speaker	Professional Support Staff	NLC Host Campus	8:30-4:30	March 16
COI Systems Thinking	Maury Cotter	DCCCD Coaches Academy & All Other Employees	Margot Hirsch	8:30-Noon	March 24
COI Systems Thinking	Maury Cotter	Instructional Leaders & Faculty	Margot Hirsch	1:00-4:30	March 24
APRIL 1995					
PERSPECTIVES Communication Skills	Dianna Booher	All DCCCD Employees	Kathryn Alvis	8:30-4:30	April 6
Leadership DCCCD - Session VII	Bill Cantrell	*Class of 1995	Kathryn Alvis	8:30-4:30	April 13
MAY 1995					
COI Coaches Training	Burt Peachy	All DCCCD Employees	Margot Hirsch	8:30-4:30	May 1-5
Leadership DCCCD Academy	Keynote Speaker	*Leadership Alumni	Kathryn Alvis	8:30-Noon	May 3
PERSPECTIVES Management Skills	Sam Lloyd & Tina Berthelot	All DCCCD Employees	Kathryn Alvis	8:30-4:30	May 11
JUNE 1995					
COI Customer Focus Implementing Service Quality	Leonard L. Berry	DCCCD Coaches Academy & All Other Employees	Margot Hirsch	9:00-Noon	June 6
New Employee Orientation	Chancellor's Cabinet	New DCCCD Employees	Kathryn Alvis	8:30-Noon	June 8
COI Awareness Training	Burt Peachy	New DCCCD Employees	Margot Hirsch	1:00-4:30	June 8

*BY INVITATION

APPENDIX P

NORTH LAKE COLLEGE TITLE III

FACULTY DEVELOPMENT NEWSLETTER

SPRING 1994

YVONNE ABATSO, ACTIVITY DIRECTOR

TITLE III UPDATE

FACULTY RESOURCE CENTER OPEN HOUSE
February 14 & 15 H310 Ext. 5123

I. Curriculum Development Stipends Awarded for Spring, 1994

A. Judy Keller - To create a computer assisted program for TASP preparation

B. Frances Foret - To create an interactive program for teaching fractions

C. Joyce Powell - To identify, clarify and develop coordinated support materials for ESL classes and LSC

D. Suzanne Padgett - A multiphase project to inventory and update LSC materials for Developmental Writing students

E. Paul Hunter _ Develop two new curriculum modules in Holocaust research

F. Rachel McClung - Develop visual arts from nonwestern cultures for Art classes

G. Francisco Carvajal - Develop computer simulations for introductory physics course

II. Spring Workshop - Collaborative/Cooperative Learning: Active Learning in the community college classroom

Sign-up now by E-Mail (Yvonne Abatso-5373) or call for a reservation.

Friday & Saturday, February 25 & 26, 1994 9:00 a.m. - 3:30 p.m.

North Lake College K216
Continental Breakfast and Lunch

This workshop will provide instructors hands-on experiences for incorporating collaborative/cooperative learning into their methods of instruction. Collaborative learning takes place when students work in groups cooperatively to coordinate efforts to achieve shared goals.

However, in order for group activities to benefit students and instructors, the cooperative lessons must be carefully structured to include positive interdependence and individual accountability. Workshop participants will be actively engaged in model lessons to experience first hand that when we work together "none of us is as smart as all of us."

Don't miss this one!

III. Other Professional Activities

1. Starlink Teleconferences on Teaching Strategies
I Taught It But They Didn't Learn It
Program II: "Sharpening Your Teaching Skills"
Wednesday, February 2, 1994 - 2:00 p.m. - 3:30 p.m.
North Lake College H209

Program III "Student Learning Strategies"
Wednesday, February 9, 1994 - 2:00 p.m. - 3:30 p.m.
North Lake College H209

2. Humanities Workshop
"Text and Image"
Friday, February 18, 1994 9:30 a.m. - 3:00 p.m.
Richland College E070

3. Multicultural Lectures & Discussion

"Africa's contributions in Mathematics and Science"
Dr. Ivan Van Sertima
Tuesday, February 22, 1994 9:30 a.m. - 10:30 a.m.
North Lake College Performance Hall
Discussion-ISTEM Conference Room -10:30 a.m.-11:30 a.m.

"Unraveling Labels as Indicators of Identity"
When Is It Hispanic, Latino or Mexican American?
The conflict of Mexican American women with high educational aspirations.

Dr. Yolanda Romero
Tuesday, March 22, 1994
1:30 p.m. - 2:30 p.m. North Lake College K216

4. Conferences

North Texas Consortium Spring Conference
"Using Technology to Improve Teaching and Learning"

Thursday & Friday, March 10 & 11, 1994
Richland College

NISOD
Celebration of Teaching Excellence
May 22 - 25, 1994
Austin, Texas

Instructional Technology Training Sessions - Revised

1. Exploration of Software Packages in the Faculty Resource Center
   Compel, Word for Windows, Creating Color Overheads

Bill Coppola & Larry Johnson, Instructors

February 23	Wed.		2:00 pm - 4:00 pm	K322
February 25	Fri.		9:00 am - 12:00 pm	K322

2. ToolBook

Bill Coppola, Instructor

April 20	Wed.	(Beginning)	2:00 pm - 4:00 pm	K322
April 22	Fri.	(Beginning)	9:00 am - 12:00 pm	K322

3. Internet

Pam Denton, Instructor

March 2	Wed.	2:00 pm - 4:00 pm	K310
March 4	Fri.	10:00 am - 12:00 pm	K310
April 27	Wed.	2:00 pm - 4:00 pm	K310
April 29	Fri.	10:00 pm - 12:00 pm	K310

Reservations are not necessary unless you want a reminder. If so E-Mail Yvonne Abatso. The first 25 will have seats.

Summer Seminars for College Teachers
National Endowment for the Humanities

The Summer Seminars program seeks to invigorate teaching in the humanities by providing the occasion for college faculty members and other scholars to deepen and enrich their substantive knowledge of their own or related fields. The Endowment has a particular commitment to serving the faculty of two-year and community colleges through the seminars program. Words like "renewal" and "reinvigoration" are among the most common that participants use to describe their seminar experiences.

Stipends range from $4,000 to $2450 depending upon the length of the seminar which vary from eight to four weeks. The stipend is intended to cover travel expenses to and from the seminar location, books and other research expenses, and living expenses for the tenure period.

Following are some of the topics offered for the Summer of 1994. In many cases the seminar is designed to be interdisciplinary and participants need not be specialists in the particular subject of the seminar.

Understanding Culture through Visual Media
Richard Wagner's Festival Dramas
Music and German Modernism, 1885-1915
The Roman Art of Emulation
Constructing the Image of the State, the Family, and the Individual in Renaissance Florence and Venice
The History and Legacy of the Western Roman Empire
Biography and the Uses of Biographical Evidence:The Restoration through the Eighteenth Century
Nineteenth and Twentieth Century Biography
Pragmatism and Cultural Criticism
Romanticism and Gender
American Indian Written Literature
Literature of the Civil Rights Era
The Oral Tradition in Literature
Church, Religion, and Society in Modern Russia, 1860-1930
Psychoanalysis in History
Images of Science
The Ethnohistory of Southeastern Indians
The Democratic Experience in Japan
Democracy and Ethnic Conflict in East Europe
Social Problems: The Constructionist Stance

For detailed information about the requirements and subject matter of individual seminars and for applications instructions write to the seminar directors. A complete listing of seminars and directors is available in the Faculty Resource Center. Application deadline is March 1, 1994.

APPENDIX Q

Competency Profile

Instructional Materials Laboratory
University of Missouri-Columbia
2316 Industrial Drive
Columbia, Missouri 65202
Call Toll Free 1-800-669-2465

Instructor: ____________________
Instructional Program: ____________________

School: ____________________
School Address: ____________________

Date of Enrollment: ________
Date of Withdrawal: ________
Date of Completion: ________

Total Hours Absent: ________
Total Instructional Hours: ________
Total On-The-Job Training Hours: ________

Student: ____________________
Address: ____________________

Telephone: ____________________
Social Security Number: ____________________

IN CASE OF EMERGENCY, CONTACT

Name: ____________________
Telephone: ____________________
Family Doctor: ____________________
Telephone: ____________________

6 89

On-The-Job Training/Work Experience

Duration of Employment	Job Title	Job Description	Supervisor's Name	Name/Address of Employer	Telephone

The following profile ratings represent the knowledges, skills, and attitudes that this student has demonstated at a given time under given conditions. It does not necessarily represent certification of future abilities.

This project was supported in whole or in part by funds from the Department of Elementary and Secondary Education, Division of Vocational and Adult Education. However, the opinions expressed herein do not necessarily reflect the position or policies of the Missouri Department of Elementary and Secondary Education, Division of Vocational and Adult Education, and no official endorsement should be inferred.

Directions: Evaluate the student by checking the appropriate number or letter to indicate the degree of competency. The rating for each task should reflect **employability readiness** rather than the grades given in class.

Rating Scale:
3 **Mastered** - can work independently with no supervision
2 **Requires Supervision** - can perform job completely with limited supervision
1 **Not Mastered** - requires instruction and close supervision
N **No Exposure** - no experience or knowledge in this area

5-89

3 2 1 N

A. Safety Rules and Practices
1. Apply shop rules and regulations
2. Identify safe and unsafe practices when working with electricity
3. Identify and demonstrate proper personal safety procedures, i.e. clothing, jewelry, personal grooming
4. Identify techniques and practices of fire prevention
5. Identify appropriate first aid procedures
6. Demonstrate safe use of tools and related power equipment
7. Apply techniques of lifting and climbing with ladders

Others (specify):

3 2 1 N

B. Basic Theory
1. Identify the scientific theory of electricity as it relates to basic chemical, static and magnetic forms
2. Solve problems using Ohm's law
3. Solve problems using Watt's law
4. Solve problems using Kirchhoff's law

Others (specify):

3 2 1 N

C. Basic Trade Skills
1. Cut and ream conduit
2. Bend conduit to predetermined specifications using conduit bender

3 2 1 N

F. Identification and Use of Materials
1. Identify boxes used in electrical construction
2. Identify devices commonly used in electrical construction
3. Identify covers and plates used in electrical construction
4. Identify common supports and anchors
5. Identify common screws, bolts, nuts and nails
6. Identify common connectors, terminals and lugs
7. Identify types of conduits and fittings
8. Determine type and size of electrical wire
9. Identify common load center accessories
10. Identify parts of a fusible load center
11. Identify parts of a breaker load center
12. Identify interior configurations of a common panel
13. Apply the use of trade catalogs and publications

Others (specify):

3 2 1 N

G. Circuit Layout and Wiring
1. Calculate service entrance loads
2. Identify components and installation procedures for basic residential service entrance
3. Install a basic residential service entrance
4. Identify components and installation procedures for basic commercial service entrance
5. Install a basic commercial service entrance
6. Diagram and install a single-pole switching

3 2 1 N

Leadership Competencies*
1. Demonstrate an understanding of VICA, its structure and activities
2. Demonstrate an understanding of one's personal values
3. Perform tasks related to effective personal management skills
4. Demonstrate interpersonal skills
5. Demonstrate etiquette and courtesy
6. Demonstrate effectiveness in oral and written communications
7. Develop and maintain a code of professional ethics
8. Maintain a good professional appearance
9. Perform basic tasks related to securing and terminating employment
10. Perform basic parliamentary procedures in a group meeting

*(Note: These competencies are addressed in the **Missouri VICA Curriculum Guide** lessons.)

3 2 1 N

Recommended Supplemental Competencies for Building Trades Programs
1. Display safe electrical working habits
2. Demonstrate knowledge of the basic fundamentals of electricity
3. Identify wiring techniques
4. Identify wiring components and devices
5. Read architectural prints and wiring plans
6. Identify electrical symbols and abbreviations
7. Determine the number and type of circuits
8. Divide wiring into circuits according to service

4. Use a hole punch
5. Use pouch tools
6. Operate brace and bit
7. Operate common electrical power tools
8. Operate common hydraulic power tools

Others (specify):

3	2	1	N

D. Trade Information

1. Identify residential wiring practices using the National Electrical Code (NEC) as a reference
2. Identify commercial wiring practices using the NEC as a reference
3. Interpret conduit fill tables using the NEC as a reference
4. Identify and comply with local compliance codes
5. Identify job classifications and prerequisites for employment
6. Calculate allowable ampacities for various conductors using the NEC as a reference
7. Demonstrate techniques of sketching and diagramming

Others (specify):

3	2	1	N

E. Blueprints and Specifications

1. Identify trade symbols used in electrical drawings
2. Read and measure from blueprints and specifications
3. Locate and identify residential construction components
4. Locate and identify commercial construction components
5. Estimate and calculate construction costs

Others (specify):

7. Diagram and install a three-way switching system
8. Diagram and install a three-way and four-way switching system
9. Diagram and install a GFCI (ground-fault circuit interrupter) system
10. Diagram and install small appliance circuits
11. Diagram and install special circuits, i.e. 240 volt
12. Diagram and install special appliance circuits, i.e. 120 volt
13. Design and install a residential lighting system
14. Design and install a commercial lighting system
15. Diagram and install a doorbell system
16. Diagram and install a telephone wiring system
17. Diagram and install a low-voltage system

Others (specify):

3	2	1	N

H. Testing/Troubleshooting

1. Use a volt ohmmeter
2. Use a clamp-on ammeter
3. Use a receptacle polarity testing device

Others (specify):

9. Determine the current-carrying capacity of circuits
10. Size and select circuit conductors, components, devices and outlet boxes
11. Determine size and type of service entrance, conductors, meter base, circuit panel and grounding system
12. Conform to national and local electric codes, as well as builder's specifications
13. Demonstrate skill in the selection, use and care of electrician's hand/power tools
14. Locate and install service entrance, conductors, meter base, circuit panel and grounding system
15. Locate and mark route of individual circuits
16. Install outlet boxes
17. Cut, bend and install electrical conduit
18. Pull conductors through conduit and/or circuit route
19. Rough-in installation (cut, splice and connect circuit conductors)
20. Install devices, fixtures and appliances
21. Perform appropriate tests to ensure electrical continuity, compatibility and safety

Employability Competencies

Personal Characteristics

Directions: Rate the student by checking the appropriate number on each scale. The ratings should be based on your **observation of the student** rather than grades given in class.

Rating Scale: **3** Above Average
2 Average
1 Below Average

3	2	1	Personal Characteristics
			1. **Relations with others** (effectiveness in working with students, instructors, and others; cooperation; shows respect)
			2. **Dependability** (attendance, punctuality; adherence to schedules and deadlines; consistency and results; perserverance)
			3. **Work attitudes** (willingness to learn; willingness to accept and profit from evaluation; enthusiasm; initiative; commitment; pride in work)
			4. **Communication** (listening, speaking, and nonverbal skills; effectiveness in communicating with students, teachers, and others)
			5. **Personal hygiene/grooming** (personal health care and cleanliness; dresses and maintains self appropriately)
			Others (specify): ______
			______
			______

Job Seeking Techniques

Directions: Evaluate the student by checking the appropriate number or letter to indicate the degree of competency. The rating for each task should reflect **employability readiness** rather than the grades given in class.

Rating Scale: **3** Above Average
2 Average
1 Below Average
N No Exposure

3	2	1	N	Job Seeking Techniques
				1. Apply information about self and job opportunities in career decision making
				2. Write a resume
				3. Prepare a job application form
				4. Write letters of application and acceptance
				5. Arrange for personal references
				6. Apply job search techniques
				7. Arrange a job interview
				8. Apply job interview techniques
				9. Evaluate job offers (actual or simulated)
				Others (specify): ______
				______
				______

Entrepreneurship Awareness

Directions: Evaluate the student by checking the appropriate number or letter to indicate the degree of competency. The rating for each task should reflect **employability readiness** rather than the grades given in class.

Rating Scale: **3** Above Average
2 Average
1 Below Average
N No Exposure

3	2	1	N	Entrepreneurship Awareness
				1. Describe five characteristics of a free enterprise economic system (ownership of property, profit motive, risk taking, competition, supply and demand)
				2. Name four forms of business ownership (sole proprietorship, partnership, corporation, cooperative)
				3. Describe advantages and disadvantages of small business ownership
				4. Identify steps necessary to start a business (evaluate need, site selection, marketing plan, financial plan, management plan)
				5. Identify business opportunities related to training
				6. Identify personal traits of the entrepreneur (versatility, aspirations, energy, integrity, adaptability, etc.)
				Others (specify): ______
				______
				______

Certificate of Completion

This is to Certify that

____

Achieved the performance levels as indicated
in the Missouri Competency Profile for

Electrical Trades

and therefore receives recognition for completion.

This __________ Day of __________, 19 ___
at __________________ School, __________________, Missouri

____________________ Instructor

____________________ Administrator

Electrical Trades

Directions: Evaluate the student by checking the appropriate number or letter to indicate the degree of competency. The rating for each task should reflect **employability readiness** rather than the grades given in class.

Rating Scale:
- **3 Mastered** - can work independently with no supervision
- **2 Requires Supervision** - can perform job completely with limited supervision
- **1 Not Mastered** - requires instruction and close supervision
- **N No Exposure** - no experience or knowledge in this area

3	2	1	N	
				Safety Rules and Practices
				Basic Theory
				Basic Trade Skills
				Trade Information
				Blueprints and Specifications
				Identification and Use of Materials
				Circuit Layout and Wiring
				Testing/Troubleshooting
				Leadership Competencies

Other (specify):

				______________
				______________
				______________

				Personal Characteristics
				Job Seeking Techniques
				Entrepreneurship Awareness

Student ratings on specific competencies evaluated during the program are available upon the student's written request. Parent's or guardian's signature is necessary if the student is under 18 years of age.