Abstract

The subject of professional training has become increasingly important in a rapidly changing global economy. All organizations, regardless of their nature, face the challenges of next millennium. Searching for answers to the challenges of the next millennium, attention must be paid to educational processes and programs. Numerous trade union organizations are addressing the professional training needs of their member by joining forces with academia. This paper focuses on the partnership between the International Brotherhood of Electrical Workers (IBEW) and Penn State Altoona.

The paper begins with a discussion related to the importance of professional training and development and what is being done by trade unions, in general, to meet the training needs of their members. Many trade unions outsource a certain percentage of their training and development activities for their members. International Brotherhood of Electrical Workers (IBEW) is an example of such an organization. The paper describes the training function of IBEW which includes the electrical apprenticeship programs conducted in-house and the continuing education & training activities outsourced to external sources. Next, the paper describes the partnership between IBEW and Penn State Altoona to develop and conduct customized training programs for IBEW members. Problems confronting the training & development partnership between IBEW and Penn State Altoona are discussed. Finally, the recommendations are made for an improvement in the above-mentioned training & development partnership.

Background

Since the industrial revolution era, the role of the American worker has undergone drastic changes. At that time, the management defined all work instructions and procedures for the employees to follow. However, over the last several decades, the expectations of the American worker have changed dramatically to include better employee preparation and increased work skills. New technology, teamwork, quality management, and just-in-time production have become the norms of the current and future workplace (Lyimo, 1997). To keep up with the changing technology, USA and the world as a whole need employees with increasingly sophisticated skills. For this reason the subject of workers’ education, training, and retraining is becoming increasingly important all over the world.
The issue of workers’ education & training must confront the new challenges and strategies of labor unions. Once, many people used to think that labor unionism and workers’ education and training were opposed to each other. It can now be asserted that they are complementery. Today’s worker needs not only new knowledge and skills to cope with the production process but also has to be acquainted with the new styles of working relations that go with these processes. The labor unions, using their training experiences, can certainly play a major role in workers’ education, training, and retraining. This paper describes the training function of a labor union and its partnership with educational institutions to provide education and training experiences for its members.

Introduction

International Brotherhood of Electrical Workers (IBEW) is one of the largest labor unions in the world. The membership of IBEW consists of nearly 800,000 industrial, residential, and commercial electrical workers. There are over 8,000 IBEW members working in Pennsylvania. The six specific areas of electrical industry which employ IBEW members are construction and maintenance, manufacturing, government, broadcasting and recording, telecommunications, and utility companies. The highest governing body in the IBEW is the International Convention, which meets every five years. Each affiliated local union in good standing for at least six months prior to the Convention is entitled to elect delegates to the Convention. The International Convention elects all International officers and determines the basic policies of the IBEW through votes on proposed resolutions and constitutional amendments.

The National Electrical Contractors Association (NECA) has been representing, promoting and advancing the interests of the electrical contracting industry since 1901. The NECA members are businesses - companies, divisions, departments, sectors, groups, and subdivisions whose principal function is electrical contracting. NECA represents a group of businesses doing an annual volume of nearly $39 billion and providing work for nearly 600,000 people. NECA and IBEW are working together through the National Joint Apprenticeship and Training Committee (NJATC) to increase the levels of technical training so that the labor force will be able to address changing marketplace needs. NJATC promotes apprenticeship and journeyman training in the electrical contracting industry, develops standards, prepares instructional materials, and assists local joint committees. In addition, both NECA and IBEW work together to develop additional management-oriented programs for employees in such important areas as customer relations, job cost and estimating, and individual job attitude.

This paper describes the training function of the Joint Apprenticeship Committee of IBEW Local Union #5 and the Pittsburgh Division of NECA and the training partnership between this organization and the Pennsylvania State University, Altoona College (Penn State Altoona). Hereafter in this paper, the term “Organization” refers to the Joint Apprenticeship Committee of IBEW Local Union #5 and the Pittsburgh Division of NECA.

Service Area of the Organization
The service area of the Organization includes the counties of Allegheny, Westmoreland, Washington, Greene, Fayette, Armstrong, Indiana, Cambria, Somerset, Clarion, Jefferson, Elk, McKean, Cameron, Clearfield, Blair, Bedford, Center, Huntingdon, and Fulton. More than 2,000 IBEW members are served in these counties by the Organization.

Functions of the Organization

The Organization performs the following functions:
1. To carry out the development and administration of apprenticeship and journeyman training programs in electrical trades.
2. To provide continuing education and training opportunities for the IBEW members in its 20-county service area by forming partnerships with local educational organizations to deliver short-term technical and management-oriented training programs.

Structure of the Organization

In order to serve 2,000 plus IBEW members in a 20-county service area, the Organization has a full-time Director of Training who sits in the Organization’s office at 150 River Avenue in Pittsburgh. He is assisted by seven training representatives for 20 counties.

Electrical Apprenticeship Programs

The National Joint Apprenticeship and Training Committee (NJATC) of IBEW and NECA offer apprenticeship and training in the following areas:
1. Residential Wireman
2. Journeyman Lineman
3. Journeyman Tree Trimmer
4. Journeyman Inside Wireman
5. Advanced Journeyman Training.

The apprenticeship training is conducted by local committees. The Organization conducts apprenticeship training at its 12,000 square feet training center in Pittsburgh. Some of the apprenticeship training is conducted at classroom and laboratory space rented at community colleges (Such as Allegheny County Community College) and vocational-technical schools (such as Clearfield Vo-Tech School).

Apprenticeships historically have consisted of formalized arrangements among employers, employer associations, labor unions, and state governments. Apprenticeship is typically an industry-based basic or initial training process. By definition:

Apprenticeship is characterized by a contractual employment relationship in which the firm or sponsor promises to make available a broad and structured practical and theoretical training of an established length and/or scope in a recognized occupational skill category. Apprenticeship is a work-study training scheme in which part of the training occurs on the job and part occurs off the job in a classroom or workshop setting. (Glover, 1986, p. 5)
Apprenticeship training is particularly useful for occupations requiring diverse skills and knowledge, as well as maturity and independence of judgment. The number and scope of these occupations have expanded dramatically in recent years to include such fields as business and health careers (U. S. DOL, 1989).

Apprenticeships permit employers to train employees to industry-based and controlled standards. Trainees are able to provide immediate services back to the employer while they continue to learn and earn toward the eventual achievement of full journeyman status. These mutual benefits combine to provide a sound base for local and regional economic development (Cantor, 1995b).

The apprenticeship training programs have the following general standards:

- Time of apprenticeship is measured either by years or hours, with one year equal to 2,000 hours. Length of the training period varies from one to five years, with most programs lasting four years.
- A minimum of 144 hours of related classroom instruction is required in all programs. This instruction is usually given one or two nights (totaling four hours) a week during the regular school year. Courses include such subjects as safety laws, mathematics, blueprint reading, draftsmanship, and other sciences connected with the trade.
- Each apprentice serves a probationary period ranging from three to twelve months. During this time, the apprenticeship may be terminated by either the employer or the apprentice. It also serves as a trial period during which the apprentice is expected to meet progress standards, both on the job and in the classroom.
- Upon successful completion of training, apprentices are issued a “Certificate of Completion” by the state.
- Apprentices receive wages usually expressed as a percentage of the journeyman’s wages. The beginning percentage ranges from 40% to 70%, with the average at 50%. The apprentice is given a raise, usually about 5% every six months. In addition to regular wages, apprentices often receive fringe benefits including vacation pay, health and welfare, and pension. In most trades, the apprentice must furnish his own tools and transportation.
- Payment of union dues and initiation fees is required in union-sponsored construction apprenticeship programs.

The general eligibility requirements for admission in Electrical Apprenticeship programs include minimum age of 18, high school diploma or equivalent, good physical health, and good moral character.

The Electrical Apprenticeship programs conducted by the Organization are trade-specific intensive training programs. The Organization believes that these programs cannot be delivered by outside vendors such as trade schools, vo-tech schools or community colleges. Therefore, these programs are the Organization’s responsibility from start to the end. The Organization makes use of its own physical and human resources to deliver apprenticeship training. These resources include the Organization’s fully equipped training center in Pittsburgh, qualified instructors, and rented classroom and laboratory space in vo-tech schools and community colleges, when needed.
Continuing Education and Training Programs

In order to help IBEW members keep up with modern technologies and their applications, the Organization offers numerous short-term continuing education and training programs in partnership with community colleges, vo-tech schools, and the Penn State University. These programs are customer-focused training experiences designed by roughly following an eight-step training development process described by Gunter (1996). The steps are: (1) determine customer needs; (2) determine the behavioral objectives of the training program; (3) determine content to meet the program objectives; (4) choose training methods tailored to the content; (5) determine instructor qualifications; (6) determine logistics; (7) develop a marketing and follow-up strategy; and (8) plan for evaluation and feedback.

In order to determine customer needs, the Organization employs the two most commonly used survey tools: (1) the questionnaires; and (2) the interviewing technique. As described by Emory (1980) and Cannell & Kahn (1966), interviews can be structured or unstructured and could be conducted either face to face or by telephone. In a structured interview, the interviewer does not enter the interview setting with a planned sequence of questions that he will be asking the respondent. The objective of the unstructured interview is to surface some preliminary issues so that the researcher can formulate an idea of what variables need further in-depth investigation. Structured interviews are those conducted by the interviewer when he knows exactly what information is needed and has a predetermined list of questions that will be posed to the respondents. The Organization routinely conducts structured interviews with IBEW members in its 20-county service area to determine their training needs. On a more formal basis, once in every two or three years, the Organization administers appropriately designed questionnaires to determine the continuing education and training needs of the IBEW members in its service area. As stated by Selltiz et al. (1959), a questionnaire is an efficient data-collection mechanism when the researcher knows exactly what is required and how to measure the variables of interest. A questionnaire was developed by Penn State Altoona and administered by the Organization in April 1998 to conduct an assessment of the training needs of the IBEW members in its service area. The questionnaire was sent by mail to the employees of IBEW members and the data collected through this instrument would be used by the Organization and the Penn State Altoona to collaboratively develop training programs for the IBEW members.

To determine the behavioral objectives of training, the Organization follows the methods described by Davis, Larry, & McCallon (1974). Once the training need assessment data is collected through interviews and/or questionnaire, the Organization convenes brainstorming session of a focus group consisting of the employers of IBEW members, the training representatives of the Organization, selected IBEW members, and the subject matter experts chosen from community colleges, vo-tech schools, and other educational organizations. The objective of brainstorming session is to generate ideas for establishing the behavioral objectives for the training to be provided to IBEW members. Once the behavioral objectives of the training program to be conducted are determined, the same focus group is used to determine the content of training program to be administered. The next step carried out by the Organization is to contact the community college or vo-tech school or another educational organization in the area where training program is to be conducted and provide the appropriate staff (usually the Continuing Education Office) of the educational institution with the information regarding the
content of training to be delivered. The reason for contacting an educational organization to deliver training is that a training program is usually developed for IBEW members in a certain region in the Organization’s service area. These members usually work full-time and are location bound. It is not possible for them to travel to Organization’s training center in Pittsburgh to receive training. Also, it is financially prohibitive for the Organization to move its equipment from its training center to the area in which training is to be conducted. Unlike the apprenticeship training which is mandatory for the individuals selected for apprenticeship and which is attended by a large number of apprentices, the continuing education and training programs are somewhat specialized, usually need more advanced equipment, and are attended by smaller groups of people. Therefore, the Organization finds it cheaper to enter into partnerships with educational institutions for the administration of training. Once an educational institution is provided with information regarding the content of training to be delivered, a brief training proposal is invited from the educational institution. The proposal must outline the duration of training to be offered by the institution, the training method, the format of training program, the equipment to be used, and the cost of training. An example of a training proposal on the topic of programmable logic controllers submitted by Penn State Altoona is given in Figure 1.

Upon receipt of training proposal, the Organization’s Director of Training visits the educational institution along with the Organization’s training representative in the area where training is to be delivered. During this visit the Organization officials have an opportunity to discuss the program with the appropriate staff members of the educational institution and to tour the physical facilities of the institution. Following this visit, if the Organization finds everything satisfactory, a contract is signed with the educational institution for the delivery of training program. The responsibility for marketing the training program to IBEW members lies with the area training representative of the Organization who along with the Organization’s Director of Training works to make sure that an appropriate number of participants register for the program. During the duration of the training program, the Organization’s Director of Training or the area training representative performs at least one visit of the location where training is conducted to make sure that training is being delivered in conformance with the specified requirements and conditions. At the end of the training program, program evaluation is conducted.

One of the axioms of quality improvement is that one must measure to improve. Without a yardstick, all we have is subjective opinion, and disagreement and indirection result. Training is subject to the same axioms. Therefore, it is important to evaluate training. There are at least two contexts in which evaluation must occur: short-term and long-term (Gunter, 1996). Short-term evaluation is the usual framework of course evaluation. The purpose is to provide feedback from course participants on the effectiveness of the training process. Training developers would want to know about the course design. Was the content relevant? Did the ideas flow together smoothly? Were the right things being emphasized to the correct degree? Analysis of the ratings from such evaluations usually give a surprisingly accurate assessment of the strengths and weaknesses of the training.

While short-term course evaluations provide much useful information to help improve the dynamics of the training process, they cannot tell how well the training succeeded in changing
participants’ behavior. Since this is the primary objective of training, this important information must be obtained on a long-term follow-up basis. Two key questions of long-term evaluation are: Have you used what you learned? How or why not?

At present, the Organization does conduct short-term evaluations. This evaluation usually takes the form of a survey instrument developed by the Organization and administered by the Organization’s training representatives. However, in some instances the Organization relies on the education institution delivering the training to administer an evaluative instrument developed by the appropriate staff of the educational institution. Figure 2 provides an example of the evaluative instrument used by the Continuing & Distance Education Office of Penn State Altoona to evaluate the training programs conducted by Penn State for IBEW members.

Problems Confronting the Training and Development Function of the Organization

1. Currently, the Organization does not use any alternative to training & development to improve performance of IBEW members. As mentioned before, the training & development function of the Organization is performed by conducting training needs assessments of IBEW members in the Organization’s service area and then developing and administering short-term continuing education and training programs.
2. The Organization has no mechanism in place to conduct long-term evaluation of its continuing education and training programs.
3. Continuing education and training programs developed and administered by the Organization are based on the on-going current training needs assessments of the IBEW members in its 20-county service area. It does not have a mechanism to project future training needs and plan appropriate continuing education & training programs to fulfill these needs.

Conclusions

In order to improve its training function and to increase the effectiveness of its training partnership with Penn State Altoona and other educational institutions, the Organization plans to take the following steps:

1. The Organization is planning to perform long-term evaluation of its training programs. One possible way to do this is to conduct two follow-up surveys roughly six months and one year after training concludes. The key questions to ask in these surveys are: Do you use what you learned during the training? What do you use and how has it proven helpful? What you don’t use and why not? This information will be quite helpful in determining if the training program has met its objectives.
2. The Organization is planning to develop a mechanism to project future training needs of the IBEW members in its service area and to plan an effective strategy to meet these needs.

Bibliography

Proposed Training Program for IBEW

Programmable Logic Controllers (PLCs)

Programmable logic controllers (PLCs) are used in virtually every segment of industry where automation is required. They represent one of the fastest-growing segments of modern industry. Since their inception, PLCs have proved to be the salvation of many manufacturing plants which previously relied on electromechanical control systems.

The course participants will gain significant hands-on experience by working on programmable logic controllers (PLCs) like Allen Bradley SLC 500. This course is designed for anyone who needs to attain basic skills in PLC programming, installation/maintenance, and troubleshooting. Basic knowledge of electricity will be helpful for participants to fully benefit from this course.

Duration of Training Program

This 24-hour training program will be conducted on four Saturdays; 9:00 a.m. - 3:30 p.m. (half hour for lunch) every Saturday. However, it can be conducted in any other format as needed by IBEW.
Topics Covered

1. Basics of a PLC
   a. Parts of a PLC
   b. Principles of Operation of a PLC
   c. Modifying the Operation

2. PLC Hardware Components
   a. The Input/Output Section
   b. Input/Output Modules
   c. The CPU
   d. The Processor-Memory Module
   e. Memory Design and Types
   f. Programming Devices
   g. Program Loaders

3. Basics of PLC Programming
   a. Processor Memory Organization
   b. Program Scan
   c. Relay-type Instructions
   d. Entering the Ladder Diagram
   e. Modes of PLC Operation

4. PLC Installation Practices, Editing, and Troubleshooting
   a. PLC Installation
   b. PLC Preventive Maintenance
   c. PLC Troubleshooting

Textbook Information

The fee for this training program will include instruction, instructional materials, and lab manual. The textbook, Programmable Logic Controllers by Frank D. Petruzella will be used for this class. If you do not own a copy of this textbook, it may be purchased through the Penn State Altoona Bookstore.

Location

The classes will be conducted in 209 Force Technology Center and the labs will be conducted in 103 Force Technology Center at Penn State Altoona.

Continuing Education Units

Continuing Education Units based on a standard of one unit per ten hours of classroom contact, are awarded to noncredit course participants. Upon completion each participant is presented with a certificate or record of the 2.4 CEUs earned.

The Records Office at University Park keeps records of CEUs earned and will furnish, when requested by a participant, a record of units earned at Penn State. A $4.00 fee is charged for the service. The Continuing Education Office can provide details on how to obtain a CEU record.

Figure 1

THE PENNSYLVANIA STATE UNIVERSITY
PENN STATE ALTOONA/CONTINUING EDUCATION

1. CLARITY OF COURSE OBJECTIVES. _____ Unsatisfactory
<table>
<thead>
<tr>
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<th>Rating Options</th>
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</thead>
<tbody>
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</tr>
<tr>
<td>3. PACE OF THE COURSE.</td>
<td>Unsatisfactory, Below Average, Average, Above Average, Very Good, Excellent, Exceptional</td>
</tr>
<tr>
<td>4. SUITABILITY OF HANDOUTS AND/OR MATERIALS</td>
<td>Unsatisfactory, Below Average, Average, Above Average, Very Good, Excellent, Exceptional</td>
</tr>
<tr>
<td>5. OVERALL RATING OF COURSE.</td>
<td>Unsatisfactory, Below Average, Average, Above Average, Very Good, Excellent, Exceptional</td>
</tr>
</tbody>
</table>

**Figure 2**