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Partnerships for Electrical Safety

In the increasing complexity of the global marketplace, employees are expected to integrate electrical safety practices into the continuous workplace transitions that competition and innovation bring. Essentially workers are challenged to distinguish between *acceptable risks* in doing jobs, interacting with technologies, and adapting to different environments, and *unacceptable risks*, like performing electrical maintenance tasks hurriedly or avoiding the inconvenience of personal protective gear.

By way of their actions, employees implement judgments as to whether a risk is acceptable or not by using information acquired through observation and learning. Education plays a crucial role in providing employees with knowledge that can be factored into their consideration about how risks may affect their health and safety.

Here we present a case study of the successful development of an educational partnership between industrial collaborators and university researchers to promote electrical safety. For industrial and academic organizations considering a similar approach, we identify a development methodology to align people and resources to implement electrical safety education.

Regarding electrical safety, U.S. university researchers have often independently completed and published their work without any mechanism in place to take new research findings directly to industry. Professional associations and trade groups have often served as information resources on technology advances through presentations and networking opportunities. Sometimes years have been needed to transfer new medical insights on injury conditions and treatments into industrial settings.

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A Nike mentality to "Just do it" is in order when considering a partnership to promote electrical safety.

To address this lag, educational partnerships offer a bridge to speed the movement of technologies and concepts between different communities like those represented by a plant and a local hospital.

This case study reviews the development of a direct R&D technology transfer educational project targeting electrical safety. Motives to partner were:

- to become more creative;
- to identify the best process and best practice;
- to facilitate the availability of the best care/treatment for those injured on the job through rapid technology transfer;
- to specifically move electrical safety principles to a higher level of awareness for individuals, their workplaces, and their communities.

Case Study

Through the opportunity to meet at a safety general session afforded by an industry conference's safety committee, an electrical engineer of a multinational petrochemical company and two academic professionals were introduced. Within four weeks of that initial contact, a prevention and response presentation on electrical incidents was made at the industrial organization's annual internal electrical engineering conference (Fig. 1).

Growing from the acceptance of the internal presentation, a one-day plant seminar for leaders and professionals from the community and affiliated educational institutions was developed and presented to an audience with a cross section of employees, educators, and medical professionals.

The seminar's success was assessed several ways. A pre- and post-test instrument was used to evaluate learned information. Success was also measured by participation across disciplines from the plant and the community. Finally, cost efficiency and effectiveness of the training experience were considered in comparison to offsite educational experiences. This was especially relevant for attendees with continuing educational requirements, including plant-based medical and nursing professional, EMTs, first responders, fire responders, supervisors, and emergency planners.

Subsequently, the team, created to deliver the one-day plant seminar, wrote a partnership needs assessment identifying strengths, weaknesses, opportunities, and potential difficulties (SWOT analysis) for electrical safety education program planning and delivery. The team agreed on the goal to support electrical safety as a "core value."

To address partnership financial support, the team sought a dual sponsorship arrangement with basic and site components to fund the educational program. This sponsorship arrangement enabled funding of the educational partnership to be shared by the industrial organization, its wider industry counterparts, and local communities so that a basic funding component was requested from the industrial organization's philanthropic foundation and a site component was requested locally for presenter travel/accommodation and location classrooms.

Because of the sponsorship arrangement, local volunteers who requested and organized sessions as partners had ownership of the process and accountability for the educational program. The two-part support of "basic plus site" emphasized the importance of the community, connecting with a "workplace-to-the-home" electrical safety concept. Local volunteers showcased the mutual benefit possible with emergency response continuing education held in cooperation with plant facilities and their local/regional emergency medical service providers.

When funded, in years 1 and 2 the partnership proceeded with the design and delivery of multidisciplinary, varied educational components (i.e., slide shows, videos, and talks) tailored to learners with diverse training backgrounds. In the third program year, the partnership extended to consortium efforts which offered education to broader regional and "off-shore" locations.

Timeline	Project Development
Day 1	Introductions
Day 30	Meeting
Day 60	Plant Seminar Day
Day 70	SWOT Analysis
Day 90	Needs Assessment and Foundation Sponsorship Request
Day 180	Partnership Project Implemented

Fig. 1. Timeline of case study development.

Case Study Experience

- Volunteers Organized/Hosted All Site Activities, Educational Meetings, and Conferences
- 3 Years/125 Different Locations Represented
- Over 1800 Attendees Total
- 50% Local Electricians, Maintenance Team, Supervisors, Foremen, Safety Officers
- 30% EMTs, Fire Fighters, First Responders
- 20% Nurses and MDs

Fig. 2. Summary of partnership results.

Outcome

The partnership resulted in multiple information products developed on an interdisciplinary basis for varied professional, educational, and experience levels in community audiences (Fig. 2). There were several practical project insights.

- Sponsorship of educational projects involving the community allows a business-academic alliance to demonstrate leadership by:
  - sparking dialogue with community resources;
  - focusing actions in planning incident responses; and
  - making connections between key community and industrial representatives.
- There is wide variety in reading ability among audiences, suggesting that visual information in picture or graphical form and verbal information have advantages over written informational materials. Academic presentations may need reformatting to make them usable for general audiences.
- Industrial organizations can span across cultures. Yet for purposes of electrical safety education, some visual images may not be cross cultural, suggesting the need for care in use of cartoons, pictures, and other illustrations.
- Newly assembled workgroups, especially in regions of minimal industrial heritage, crave knowledge of "how to" in addition to "what to" do in electrical safety.
- Audiences have significant differences in language ability. In the United States, for example, audiences may have very different English speaking and reading competencies, as there is no "official" U.S. language.
- Sharing is welcome in educational sessions. Ten minutes of lively Q&A is worth an hour of lecture.
- Depending on the audience, adult learners may have important characteristics which need to be considered when shaping electrical safety presentation materials, including:
  - the presence of learning disabilities;
  - sleep deprivation or fatigue;
  - adult attention problems like adult attention deficit syndrome (adult ADS); and
  - anxieties related to previous classroom experiences.

Development Methodology

This case study presents a model of an electrical safety intervention implemented through an education process (Fig. 3). As a model, it can be adapted to different organizations and their corporate and community cultures using a partnership approach. The belief that a partnership is valuable must be motivating. In the setting of industrial-academic partnerships, elements of this belief are the desire to take theory to practice and a thirst for knowledge. A partnership's feasibility is based on a SWOT analysis, coalition building, and executive sponsorship (Fig. 4).

SWOT Analysis

There is increasing complexity in the global marketplace. The discovery and implementation of new ideas—creativity—is essential to maintain a competitive advantage in the turmoil of today's markets. For each business, communication is critical to achieving the goals of the organization. For each worker, understanding his role in achieving the business goals is critical as well. The educational process described here offers a creative way for a collaborative team to support corporate electrical safety goals in venues from the workplace to home and recreational settings.

An important test of the strength of new ideas is whether their content and value stand the test of time.

The partnership model assumes that a needs assessment is done by collaborators to identify strengths, weaknesses, opportunities, and potential difficulties or threats (SWOT analysis) program planning and delivery. An outline of resource limitations is helpful to push a partnership from concept to project stages. There are two perspectives in this analysis: industrial and academic.

Industrial Perspective

The strengths of petrochemical and other industrial organizations can include:

- safety as a priority;
- a professional culture with high levels of education across employment levels;
- many levels of learning readiness;
- the presence of the team concept.

Industrial challenges include resource constraints on R&D. Also, barriers to technology transfer from academic research scientists to industrial leaders exist at multiple levels especially when

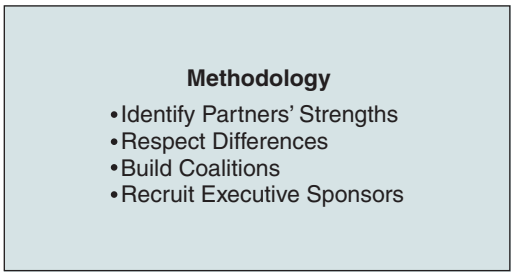

Fig. 3. Building a partnership.

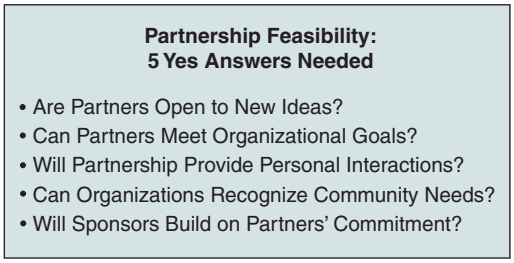

Fig. 4. Key questions in partnership arrangements.

Education is the only way to constructively and proactively focus and channel a corporation's safety goals.

research is viewed as pure, that is to say, for its own sake [1]. It may be difficult for partners to immediately appreciate how to apply basic research findings.

Business concerns around an industry-academic educational partnership are similar to those for any partnership opportunity, including:

- appropriateness of the partnership to essential business operations;
- implications for the market position;
- potential impact on profitability;
- confidentiality and business secrecy issues;
- human resource constraints, especially when everyone has enough to do;
- evaluation biases emphasizing that outcomes be assessed with real-world terms like cost effectiveness and cost efficiency.

Evaluation biases may be especially problematic when pricing the future value of an education-related financial saving is based on poor historic or current data on safety failures.

Academic Perspective

An important test of the strength of new ideas is whether their content and value stand the test of time. Generally in academia there is a deep commitment to make a difference with new knowledge by making the world a better place as history progresses. The mechanism for enacting this commitment is education. In the medical sciences, closure on the cycle of investigation is reached when insights are taken from the laboratory bench to the patient's bedside and to prevention.

Challenges in academia include resource constraints on research associated with inadequate available funds. Also, academic organizations tend to be bureaucratic, which limits their flexibility. Some academic considerations specific to partnership opportunities are:

- Potential conflicts of interest;
- Bias entering the assessment of ongoing and future research;
- Publication issues (including the unrestricted ability to publish acquired data and experience);
- Proprietary issues, particularly as technology is transferred broadly;
- Financial commitments (their quality, consistency and continuity) which are required to build and maintain investigative teams;
- Communications issues, including bureaucratic hurdles connecting large research oriented academic institutions with large industrial organizations' decision-making structures; and
- Limited staffing to deal with logistics such as billing and travel arrangements.

Coalition Building

Coalition building is an important step in securing a partnership. For industrial organizations, there must be "buy in" at multiple levels and across departments. Obviously embedding safety into a corporate culture requires such a commitment apart from educational partnership opportunities. The inherent readiness to form a coalition around electrical safety education is an advantage for industry. For academic partners, coalitions must form within the scientific teams considering the partnership. This facilitates completion of tasks necessary to delivery of the information products.

In building coalitions, the participants can take advantage of the varied levels of ability and familiarity that active team members may have within their industrial, academic, and social communities. Through a partnership, talents that may not be commonly employed in routine work can be used. By this means, the safety connections between work, community, home, and schools, for example, can be emphasized. In the case study, this happened when plant employees who were local EMTs arranged for their community's emergency room doctors and nurses to attend programs on first response and triage of electrical and chemical burns.

Not every employee is naturally inclined to excel in group activities. However, partnerships provide new venues for learning across a task continuum, including:

- project promotion;
- attendee recruitment;
- teaching arrangements.

Working with professionals from diverse perspectives, these tasks can take participants out of their regular responsibilities and challenge them with cross-disciplinary and multilevel learning experiences.

Executive Sponsorship

Within industrial organizations, executive sponsorship is essential for a partnership to succeed. Because of their size, partnering organizations may find it difficult to identify individuals who, through their skills and interests, would make the best advocates for collaboration. Yet without executive sponsorship in corporate and university management, gathering financial resources to implement a partnership project can be nearly impossible.

Discussion

Partnerships for electrical safety do not replace engineering innovation, electrical safe work practice training, continuing education, safety standards, or reporting and tracking systems around safety per-

formance. Each of these has an important value in managing electrical hazards. However, electrical safety failures persist in the workplace. Corporate strategies alone have not been sufficient to address the challenge of electrical safety education spanning work, school, home, and recreational settings.

This case study suggests that the role of an educational partnership can be complementary to industrial safety activities (Fig. 5). Educational partnering offers businesses a process to effectively and efficiently manage to save on the direct and indirect costs of safety failures. Whether at work or not, when an electrical safety failure occurs, a company is robbed of resources to compete in the market. When people, time, and dollars are directed to an electrical incident resulting in injury or environmental damage, those assets are not available for the competitive future. If not spent on the response to safety-related losses, corporate resources can be committed internally and externally to other uses identified to further corporate and community goals.

Steps to foster partnerships include:

- Promotion of local interviews, in-services and cross training between industrial, academic, and community enterprises;
- Participation of researchers in applications-oriented and industrial professional associations, publications, and presentations;
- Development of small projects to pilot the practical aspects of partnering, including budgeting, logistics, and standard operating procedures.

Electrical Safety Education

Electrical safety education presents unique challenges. First, as a hazard, electricity is silent, odorless, and invisible, even though the equipment that conducts it may be huge and located in difficult environments (which by themselves may be potentially hazardous, as with explosive chemicals, moving machines, or construction activities).

Second, electricity use is routinely viewed as a safe experience: every time a light is turned on or a computer mouse points a cursor on a video display, electrons flow and injury or damage rarely if ever occurs. In other words, there are numerous common experiences in each person's daily life where electricity is essential but not noticeable in the completion of work.

For electrical safety educators, the obligation is to raise awareness of electrical risk even though truly no risk may be perceived. After raising risk awareness, the challenge is to modify risk acceptability. This is more difficult when at the same time an employee personally, or an organization generally, may be friendly to the mentality or spirit that is captured by the notion of having the right stuff, a reference to an indomitable risk-taking attitude.

A. Develop Session Information

- Review SWOT Analysis for Current Situation
- Identify Session Purpose
- Agree on Session Location/Dates
- Target Participating Private Organization
  - Industry
  - Employers and Subcontractors
  - Educational Institutions
- Target Participating Public Organizations
  - Fire Services
  - Medical Services
  - Government Health Officials
  - Government Regulators
  - Government Energy Officials
  - Building Inspection Officials
  - Labor Representatives
- Confirm Sponsorship for Local Session

B. Identify Session Structure

- Assess Facilities for Seating, Breaks, and Food Service
- Review Attendee Availability Given Operational Consideration
  - 1 hr
  - 2 hrs
  - 4 hrs
  - 8 hrs
- Determine Audience Characteristics
  - By Job Titles and Content
  - By Organizational and Community Responsibilities
  - By Educational Level
  - By Need for Accommodations for Special Physical or Learning Needs

C. Assign Session Preparation Tasks and Deadlines

- Design Tasks
  - Determine Final Session Logistics
  - Specify Audience Size
  - Finalize Session Goals
  - Customize Objectives
  - Set Agenda and Evaluation Strategy for Attendee Feedback
- Coordination
  - Confirm Training Dates
  - Identify Session Coordinators, Speakers, and Hosts
  - Confirm Session Facilities, Equipment, Hospitality
  - Arrange Travel
  - Manage Budget
- Registration
  - Track Attendance Interest and Registrations
  - Identify Continuing Education Credits
  - Confirm Attendee Participation and Materials Needed for Classroom or Activities
- Promotion
  - Identify Interest in Session
  - Distribute Promotional Information Via Telephone, Interent, and Print Venues
  - Acknowledge Contributions of Sponsors, Partners, and Volunteers

Fig. 5. Planning template for electrical safety education session.

Once an employee can discern an electrical risk as unacceptable, he or she can take the position of being in charge of their personal response to the hazard. Similarly, with greater knowledge, businesses can adapt their infrastructure and work management decisions. When hazards are identified and appreciated for their injury and damage possibilities, accountability to respond through engineering, administrative, and individual actions is more obvious.

Modifying how an individual understands the acceptability of a risk, such as testing a circuit with a screwdriver or wet finger, is a different safety approach than making a rule of how an individual must behave, such as requiring the use of electrical tester to check the possible energy flow of a circuit. The approaches are not mutually exclusive. However; public health practice has numerous examples of how difficult it is to legislate behavior.

Ultimately an organization must grapple with the reality that there is no way to control all the individual acts that comprise business operations. Education is the *only* way to constructively and proactively focus and channel a corporation's safety goals. Learning, as demonstrated through changed individual and organization practices, is the education-based mechanism that can optimize safety performance in electrical work environments.

Conclusion

After a tragic electrical incident, huge cash outlays may be necessary to address the incident's significant consequences. Funds expended after such an event often represent reactive and unbudgeted spending. When electrical safety and incident prevention are the goals, cross-disciplinary and multi-level learning partnerships afford a complementary and proactive use of business, academic, and community resources.

In any successful partner arrangement, the detailed long-term implications of the emerging relationship merit thorough definition and discussion. Perhaps a Nike mentality to "Just do it" is in order when considering a partnership opportunity to promote electrical safety, in that until industrial-academic interactions are more fully developed, the nuances of these relationships will be difficult to predict and manage. Meanwhile, the globalization of economic forces and the very real consequence of research resource constriction demands new thinking about how academic investigators are involved across a range of problems important to industry and the future of our worldwide economy.

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