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Ideas at Work

Leveraging Resources for Workforce Development: West Virginia's Industrial Construction Project Management Program

Abstract

Completed in March 2017, the Industrial Construction Project Management program became the first for-credit construction management program in West Virginia. The program curriculum, created by Extension faculty and industry professionals, is designed for mid-career craft workers and supervisors in the construction industry and comprises 180 hr of instruction. The program demonstrates the pivotal role Extension professionals can play in meeting economic development needs in their states. The program pilot phase provided a new career pathway for 25 journeymen craft workers who received a 12-credit-hr construction management certificate and fulfilled a long-term need of industrial construction employers in the region.

Keywords: curriculum, construction, project management, partnership, skilled labor

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Introduction

The well-documented skilled labor shortage in the construction industry includes professional positions in project management and supervision. According to *Engineering News-Record* (2014), representatives from 83% of the more than 1,000 construction firms surveyed indicated that they planned to expand in 2015 but that shortages of skilled employees at the craft and professional levels created hiring difficulties. Olsen, Tatum, and Defnall suggested in 2012 that since the 1980s the shortage of skilled craft labor in the industrial construction sector had been severe and was expected to be long term. In the Ohio River Valley region, associated with the Utica and Marcellus Shales gas boom, shortages of skilled industrial construction labor is creating problems for high-end construction projects (Jacobs, 2018). These same hiring problems, however, created an economic development opportunity for the West Virginia University Extension Service (WVUES).

In July 2013, organizations associated with the industrial construction sector approached the Institute for Labor Studies and Research (ILSR), a program of WVUES, requesting assistance in designing a training program to address the labor shortage associated with field project managers (Associated General Contractors of America, 2018). The resulting training program met needs identified through a survey of West Virginia State Building and Construction Council members who indicated a strong preference for

project management classes. The Appalachian Construction Users Council (ACUC), a regional tripartite group of construction owners, contractors, and crafts organizations, served as the oversight committee to help define the project and deliverables. The West Virginia Community and Technical College System contracted ILSR faculty to lead the curriculum design project for creating a new training program that would encompass 180 contact hr available in face-to-face, fully online, and blended course formats. As ILSR faculty, we developed the course content and conducted pilot testing of the curriculum.

Description, Design, and Implementation of the Program

The first phase of our project involved conducting a survey, analyzing existing construction management programs, and soliciting suggestions on curriculum content from ACUC members. The key concept behind the curriculum was to upgrade the project management skills of experienced craft workers and make them more valuable to industrial construction owners and contractors while simultaneously helping meet challenges associated with the regional skilled labor shortage. Perhaps this concept was expressed most clearly by a construction manager from DuPont who stated, "We can't give a project engineer or new project manager 20 years of craft experience, but we can give an experienced craft worker the knowledge, tools, and language skills needed to work more effectively with our managers."

The 180-hr curriculum we developed consists of three 4-credit-hr courses (see Table 1). Each 4-credit-hr course comprises 45 classroom hr and 15 software lab hr focused on basic project management principles, scope, time, cost management, and relevant software applications. Communications and other soft skills also were important topics raised by industry stakeholders that received emphasis in the curriculum. In conducting a similar project focused on the food industry, Kraft (2001) found that specialized industry-based training in interpersonal, teamwork, and communication skills is necessary in rapidly changing and diverse workplaces. We pilot tested the curriculum for 33 weeks of face-to-face instruction in 2015 at the West Virginia University Parkersburg campus in Parkersburg, West Virginia, and for 21 weeks in a blended course format during 2016–2017 at West Virginia Northern Community College in Wheeling, West Virginia.

Table 1.

Overview of the Industrial Construction Project Management Program Curriculum

Component	No.	Title
Course 1		
Core course modules	1.1	Introduction to construction management, project management, and project life cycles
	1.2	Overview of the construction industry user, contractor, and labor perspectives
	1.3	Project management processes and project integration management
	1.4	Project risk management
	1.5	Regulatory environment and integrated safety management I
	1.6	Integrated safety management II
	1.7	Construction delivery models, project organization, bidding, contracts, and legal structures
	1.8	Project stakeholder management

	1.9	Project scope management and work breakdown structure
	1.10	Certified Associate in Project Management review (project management processes, integration, risk, stakeholder, and scope management)
Software lab modules	1.1	Computing basics, communications, web browsing, and data retrieval
	1.2	Introduction to Microsoft Word and Adobe PDFs
	1.3	Microsoft Word (continued)
	1.4	Fillable forms in Word
	1.5	Tables in Word
	1.6	Introduction to Microsoft Excel
	1.7	Worksheets in Excel
	1.8	Functions in Excel
	1.9	Formulas in Excel
	1.10	Excel (continued)
Course 2		
Core course modules	2.1	Introduction and review of key concepts
	2.2	Estimating
	2.3	Project time management and introduction to scheduling
	2.4	Network diagrams and critical path method
	2.5	Project cost management and budgeting
	2.6	Earned value tracking
	2.7	Human resource management and industrial relations in the construction industry
	2.8	Integrated safety management (multi-employer worksites) III
	2.9	Quality management
	2.10	Certified Associate in Project Management review (time, cost, human relations, and quality management)
Software lab modules	2.1	Introduction to Microsoft Project, setting up a project, creating a project calendar
	2.2	Entering tasks and durations
	2.3	Entering dependencies, Gantt charts, and network diagrams
	2.4	Critical path in Microsoft Project
	2.5	Entering resources in Microsoft Project
	2.6	Earned value in Microsoft Project
	2.7	Entering assignments
	2.8	Defining work and duration, entering estimates
	2.9	Assigning costs
	2.10	Review

Course 3		
Core course modules	3.1	Introduction and review of key concepts
	3.2	Project communications management
	3.3	Materials, equipment, and project procurement management
	3.4	Closing processes and lessons learned
	3.5	Integrated safety management IV
	3.6	Productivity in construction and lean construction
	3.7	Leadership in energy and environmental design, green building, and environmental concerns
	3.8	Emerging technology and the future of construction technology
	3.9	Building information modeling
	3.10	Certified Associate in Project Management test: tricks and traps, credentials, and registration and practice exam
Software lab modules	3.1	Introduction to large scale project
	3.2	Entering deadlines, constraints, and task calendars
	3.3	Tracking completed work
	3.4	Customizing, formatting, and printing reports
	3.5	Scheduling interruptions
	3.6	Optimizing the schedule
	3.7	Updating the schedule
	3.8	Evaluating a project
	3.9	Software applications integration
	3.10	Review and wrap-up

Partnership

Managing the partnerships involved in the program proved to be one of the most challenging aspects. Whereas the construction owners, contractors, and craft labor organizations had a history of working together as a matter of course, institutions of higher education in West Virginia did not have a consistent pattern of cooperation. In general, the community colleges compete against each other at times, and relationships between the 4-year colleges and individual community colleges are either inconsistent or nonexistent. Additionally, WVUES is not well known for engaging in purely academic work. In short, managing the partnerships involved in the program required a great deal of time, especially when turnover of key personnel necessitated the education of new individuals regarding project details. Fortunately, Extension professionals cultivate community contacts and are advantaged partners in building these types of programs. In fact, Extension can facilitate partnership building in ways that most educational institutions simply cannot achieve (Ohnoutka & Hughes, 2002).

Results and Implications for Extension Programs

When completed in March 2017, the program became the first for-credit construction management program

in West Virginia and one of the few programs of its kind in the country focused on the industrial construction sector. The curriculum comprises 180 hr of instruction, including 135 hr of core subject matter instruction and an additional 45 hr of software application material (see Table 1). During the pilot testing phase of the program, 25 industry-sponsored journeymen craft workers received an educational 12-credit-hr certificate. More importantly, the enrolled pilot program students helped improve the curriculum and their word-of-mouth advertising has been invaluable in moving the program forward. Employers, who sponsored the students by paying their tuition, fees, and textbook expenses, highly valued the data from the course evaluations (see Table 2).

Table 2.

Student Responses to Course Evaluation Items

Evaluation item	Mean
I have become more competent in this area because of this course.	4.33
The course helped me develop new skills.	4.36
The course gave me skills that will be directly applicable to my career.	4.43
This course deepened my interest in the subject matter.	4.50

Note: The sample size was 25. Students answered each item by selecting response options from a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).

As designed, the curriculum is flexible enough to be used in a variety of ways and in different formats, according to regional industry needs. Focused on employer and workforce needs, the Industrial Construction Project Management certificate program will add value to employer organizations by providing apprentices and craft workers with the foundational knowledge, industry-based tools, and leadership and communication skills necessary to coordinate and control large industrial construction projects. The curriculum will help fill the mid-level management and supervisory needs of construction industry employers and provide a new career pathway for construction craft workers (Morrison, 2018). As such, the construction management certificate program meets an immediate and long-term need of industrial construction employers in the region, especially for those employers associated with the Marcellus and Utica Shales gas industry. Further, the curriculum is available via download from the U.S. Department of Labor's online library Skills Commons (https://www.skillscommons.org/handle/taaccct/11389) and may be used by others as a starting point for developing their own curricula. As our project demonstrates, Extension professionals are uniquely positioned to create the partnerships needed to design and build training programs necessary for workforce development.

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