

Why Should We Take Engineering Technology Programs On-Site?

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Abstract

In a booming economy, colleges with engineering technology programs in small to medium size markets struggle to attract students. Higher wages, overtime opportunities, retiring workers, and a tight job market pull potential students away from college. This is occurring at a time when workers need more skills, especially technical skills like those acquired in an engineering technology program. In this dilemma, what should industry and education leaders do? They should move to a new paradigm by taking engineering technology programs to the workers on-site. At Chattanooga State Technical Community College in Chattanooga, Tennessee, an innovative alliance with Dupont Chattanooga has shown that providing engineering technology programs on-site is viable. In the fall 1999 semester, 66 student FTE's were generated and in the fall 2000 semester, 54 student FTE's were generated in three engineering technology programs: Electro-Mechanical Engineering Technology, Automated Control Engineering Technology, and Process Operator Chemical Technology. Success of this innovative approach was made possible by addressing critical issues: 1) a workable method of instruction that includes a combination of independent study, class, and lab; 2) a schedule of classes that accounts for rotating shifts; 3) a system of verifying acquired technical skills; 4) a practical schedule for instructors; and, 5) a lab with appropriate equipment. This successful alliance provides employees of Dupont educational opportunities that they would not have otherwise. Also, Chattanooga State boosts its engineering technology enrollments and provides a needed service to its industrial community.

I. Introduction

A French immigrant, Eleuthère Irénée du Pont de Nemours established the Delaware based Dupont Company in 1802 to produce black powder. Providing a quality product that ignited when it was suppose to, the Dupont Company quickly became successful with a reputation for quality. In the early 1900's, the company lost its competitive edge in the black powder market. Three du Pont grandsons purchased the company and began producing products through successful synthetic fibers research. A worldwide revolution in materials science research and product development began when Dupont researchers invented Nylon in 1938. As new materials were invented, Dupont opened production facilities all over the world including a nylon fibers plant in Chattanooga, Tennessee supporting the carpet industry in Southeast Tennessee and North Georgia¹.

Chattanooga State Technical Community College was founded in 1967 at the urging of a group of engineers who were influential with local and state politicians. They needed a technical college that produced high-quality engineering technicians. Since then, the college has grown to over 9,000 students with over 45 different career programs. Over the years, Chattanooga State has demonstrated to the Chattanooga community its commitment to quality educational programs and services.

As is Chattanooga State, Dupont is committed to staying competitive and producing quality products. Training and education are important pieces of Dupont's commitment. Demonstrating this commitment at the Dupont nylon production plant in Chattanooga, an educational partnership was established between Dupont and Chattanooga State Technical Community College in the 1990's.

II. The Need

By the year 2005, the Dupont Chattanooga plant demographics will change dramatically: 85 of 130 maintenance craftsmen, 24 of 27 power operators, 74 of 120 polymer operators, and 26 of 35 development assistants are eligible for full retirement. That is an aggregate of 67% retirees among the workers that run the plant². These workers are highly skilled and Dupont is very concerned that the company's competitiveness will diminish as future employees with fewer skills take over the responsibilities of the retirees.

Hiring qualified workers away from other chemical companies or providing educational opportunities for the unskilled Dupont laborers are two options that could solve the dilemma facing Dupont. Hiring workers away from other companies in large numbers has its advantages and disadvantages; the biggest disadvantage in a tight labor market is the propensity to begin a hiring war resulting in upwardly spiraling wages and lost productivity and loyalty due to numerous job changes. On the other hand, providing in-house educational opportunities provides two big advantages: promoting qualified employees builds moral among employees and education can be tailored to meet specific plant needs.

Chattanooga State Technical Community College offers technical degrees and certificates in electronics, mechanics, and industrial maintenance. However, in the decade of the 1990's enrollments have slipped to an all-time low in these programs. Two factors contribute to this decline in enrollment.

First, Chattanooga was known as a dirty manufacturing city and manufacturing jobs represented 45% of the labor force. Pictures of downtown Chattanooga in the first half of the twentieth century show smoggy, sooty streets. Being a tourist city as well as a manufacturing city, political leaders determined that Chattanooga had to change its image. In the 1960's and 1970's, enforcement of tough environmental laws cleaned up the city. However, the cleanup took its toll and the decline of manufacturing jobs in Chattanooga is still occurring today. In 1985, manufacturing jobs represented 26% of the workforce. In 2000, 19% of the Chattanooga

workforce is in manufacturing³. Tourism and service related jobs are replacing the manufacturing jobs.

The second factor relating to enrollment declines in technical programs at Chattanooga State relates to the strong economy that we are presently enjoying. In the latter half of the decade of the 1990's, unemployment across the nation has been as low as it has been since the post WW II era. People are working; they have full-time jobs and many are working overtime hours. In the Chattanooga MSA, the unemployment rate at the end of 2000 was 3.3%⁴.

With Dupont facing major employee changes and Chattanooga State facing major enrollment difficulties, the opportunity to do something different was presented and a new educational partnership was formed between Dupont and Chattanooga State. The difference between the Chattanooga State-Dupont partnership and other company partnerships is that all classes and labs are taught on-site and on-line using Dupont's specially built educational facilities. Also, this education partnership provides WorkKeys assessments, non-credit, and credit training for all 1800 Dupont employees. The credit programs are Automated Controls, Electro-Mechanical, Powerhouse Operator, Polymer Operator, and Development Assistant.

III. The Program

Dupont's leadership team created a vision of how they wanted to integrate education into their operations. Their goals included the following⁵:

- Create a "Learning Organization" that facilitates ongoing self-development by employees.
- Establish and fully support a progression system that rewards people for certified skills acquired.
- Provide employees with an opportunity to have more impact on their own future and the business.
- Create and support multi-functional teams that engender flexibility of resources in a manufacturing environment.
- Facilitate involvement of all employees in meaningful work roles that provides personal growth and developmental opportunities.
- Offer employees an opportunity to obtain universally recognized, portable skills and college credit.
- Create highly motivated, customer oriented, team players and involved stakeholders who work safely, listen, and learn from each person's uniqueness.
- Provide employees with the knowledge, technical and interpersonal skills required to improve safety, quality, teamwork productivity, and customer relations.
- Increase yields, uptime, and profitability.
- Improve ability to rapidly respond to changes in customer demand.
- Deliver an uninterrupted supply of products, goods, and services.

To accomplish these goals, Dupont wanted an educational program that 1) provides career pathways that match employee interests; 2) offers flexible class times for shift rotations; 3) pays employees for their coursework, books, and supplies; 4) has courses available over the Internet; 5) allows any Dupont employee the same educational opportunities; and 6) makes all classes and labs available on-site. These objectives presented a challenge for Chattanooga State and critical issues had to be addressed to provide workable solutions.

A method of instruction that includes a combination of independent study, class, and lab was developed so that employees would only have to attend a three-hour lab once a week. All coursework is available through the Internet on a server purchased by Chattanooga State specifically for the Dupont project. Multiple sections of the same lab are scheduled each week such that when employees rotate to a new shift, a lab will be available to them. With the instructional emphasis on labs, Dupont had to provide quality lab facilities, and they did. More than 40,000 square feet of space was converted into classrooms, labs, and offices.

For each course, a skill test was created by Dupont to assure that workers are developing the necessary skills. This test comes at the completion of a course and it is independent of the course grade. To receive promotions, employees must pass each skill test.

Chattanooga State instructors teaching at Dupont had to be flexible and coordinate student progress with each other because Dupont students attending a laboratory section on Monday morning the first week may attend a Tuesday evening section the next week and a Thursday afternoon section the next.

Appendix A lists the technical courses in each of the programs⁵. Completers of these programs receive certificates. Those Dupont employees wanting to complete an Associate degree must take additional general education courses on the Chattanooga State campus.

In the fall 1999 semester, 66 student FTE's were generated and in the fall 2000 semester, 54 student FTE's were generated. These numbers have helped Chattanooga State boost its engineering technology enrollments.

IV. Conclusion

Could this model be used to take engineering technology programs to other companies besides Dupont? Yes, it can. In fact, after the Dupont alliance was created, Chattanooga State has developed successful alliances with Wheland, Planters, and several other companies that are bringing additional student FTE's to the college and providing a valuable service to the region.

Bibliography

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Appendix A: Curricula for Chattanooga State Programs at Dupont.

1. Engineering Technology Core Curriculum
(Required for Electro-Mechanical, Automated Control, and Powerhouse Options)

CS 102	Computer Literacy	3
EZ 110	DC Circuits	4
MZ 110	Mechanical Principles	4
EZ 111	AC Circuits	3
MZ 111	Mechanical Tool Applications	3
MZ 260	Maintenance Drawings & Standards	3
EZ 120	Electrical Theory	3
MZ 120	Mechanical Maintenance Principles	3
EZ 210	Plant Safety	3
		<u>29</u>

2. Electro-Mechanical Option

EZ 122	Applied Electricity	3
MZ 122	Fluid Mechanics	3
MZ 112	Mechanical Piping Systems	3
EZ 124	Motor Control	3
MZ 124	Principles of Thermodynamics	3
MZ 130	Principles of Machine Operation	3
MZ 200	Machine Shop Principles I	3
MZ 131	Intro To Welding	3
MZ 201	Machine Shop Principles II	3
MZ 210	Planned Preventive Maintenance	<u>3</u>
		30

3. Automated Control Option

EZ 122	Applied Electricity	3
MZ 122	Fluid Mechanics	3
EZ 115	Active Devices/Circuits	3
EZ 124	Motor Control	3
EZ 131	Digital Circuits	3
MZ 210	Planned Preventive Maintenance	3
EZ 201	Instrumentation Theory	3
EZ 134	Basic Programmable Controls	3
EZ xxx	Advanced Instrumentation	3
EZ xxx	Advanced Print Reading	3
EZ xxx	Automated Control Systems	<u>3</u>
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4. Powerhouse Operator Option

PZ 110	Powerhouse Operations I	4
PZ 111	Powerhouse Operations II	4
PZ 210	Powerhouse Operations III	4
EZ 210	Instrumentation Theory	3
PZ 211	Powerhouse Operations IV	4
PZ xxx	Filter Plant & Water Treatment Systems	3
PZ xxx	Refrigeration Systems	3
PZ xxx	Dowtherm Systems	3
PZ xxx	Boiler and Steam Systems	<u>3</u>
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5. Chemical Technology Core Curriculum

(Required for Polymer Operator and Development Assistant Options)

CS 102	Computer Literacy	3
CT 112	Industrial Mathematics	3
OS 116	Industrial Safety	3
CT 113	Industrial Chemistry	4
CT 107	Plant Statistics	1
CT 111	Intro To Process Technology	3
CT 115	Process Chemistry	3
CT 121	Industrial Process Equipment	3
CT 122	Intro to Quality Control	<u>3</u>
		26

6. Polymer Operator Option

CT 150	Unit Operations I	4
MZ 111	Mechanical Tools	3
CT 220	Unit Operations II	4
EZ 110	Electrical Principles I	4
MZ 260	Maintenance Drawings & Standards	3
CT 124	Intro to Controls & Instrumentation	3
EZ 210	Plant Safety	<u>3</u>
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7. Development Assistant Option

CT 210	Laboratory Techniques	4
CT 211	Instrumental Analysis	4

(And other courses to be determined at a later time.)