

A Multidisciplinary Approach toward Widening the Pre-K-12 to Baccalaureate Pipeline

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Abstract - *The paper describes the development of an articulation between the Hazleton Area School District, the associate degree Engineering Technology Programs at Luzerne County Community College (LCCC), the associate degree Engineering Technology Programs at Penn State Hazleton, and the baccalaureate degree in Business Administration program at The Pennsylvania State University (PSU). The articulation creates a new option in Technology Management with an entrepreneurial focus. This option is the combination of existing associate degrees in the Engineering Technology programs and the baccalaureate degree in Business Administration program. The project's main emphasis will be to restructure the engineering technology and business administration curriculum in order to create the opportunity for associate degree engineering technology graduates to complete the option in Technology Management.*

Index Terms - *Multidisciplinary, entrepreneurial, engineering technology. Classes are offered to junior and senior year students.*

Introduction

Current and future job markets in the manufacturing industry require graduates to have cross-disciplinary skills. Multidisciplinary education enables students to develop a combination of skills that are difficult to acquire otherwise and, therefore, increases students' employability. A number of universities have begun to offer training that combines disciplines, but usually only for elite or graduate students. The paper describes initiatives to make these programs accessible to a broader range of students, including community college students, in order to satisfy the need in industry. Combining the associate degree in Engineering Technology with a baccalaureate degree in Business Administration will produce graduates with an understanding of engineering, business, and the international aspects of industry. Such understanding is valuable for future entrepreneurs and owners of small manufacturing companies.

Program Development

The scope of the paper is the revision of curricula to combine separate programs into several complete 2+2+2 curricula, and to complete the articulation between the Hazleton Area School District, the Engineering Technology Programs at Luzerne County Community College (LCCC), and several programs at Penn State Hazleton. (See Fig. 1)

The LCCC programs are Electronics Engineering Technology, Computer Systems Technology, Automated Manufacturing Systems Technology, and Computer Aided Drafting and Design Technology. These programs will articulate with the baccalaureate programs in Business Administration at Penn State and the Penn State Engineering Technology Programs (Mechanical Engineering Technology – MET, Electrical Engineering Technology – EET, and Nanomanufacturing Technology – NMT). Once these curricular changes are made, they are compatible to Penn State programs offered across the state and to other community colleges.

The proposed curriculum seamlessly blends Tech Prep courses with courses presently required for the associate degree in Engineering Technology and those of the baccalaureate degree in Business Administration. Although other institutions deliver degrees that combine business with engineering at the graduate level, the focus in this proposal is to mesh the programs at the undergraduate level. Since the primary focus of both PSU's and LCCC's associate programs is to provide a hands-on approach to engineering, this program will continue that emphasis.

Modifications were made to all programs to allow students to complete foundational engineering technology courses during the first two years. As part of the articulation, general education requirements that complement the business administration curriculum will be added to the community college requirements. The quantification segments of both PSU's and LCCC's degrees are fairly equivalent and will be modified to complement the baccalaureate degree. All four of the community college degrees require between 64 and 68 credits and demand several semesters with 17 and 18 credit hours. The engineering technology degrees at PSU require 68 credits, and, like the community college degrees, include several 17 and 18 credit semesters. Since most students are

accustomed to prescribed and heavy credit semesters as a result of the engineering technology base, heavy credit load semesters at the junior and senior levels should be manageable.

Tech Prep courses taken at the 11th and 12th grades are integrated into the Mechanical Engineering Technology

Program (freshman and sophomore years) at Penn State Hazleton. The junior and senior years focus on a baccalaureate degree in Business.

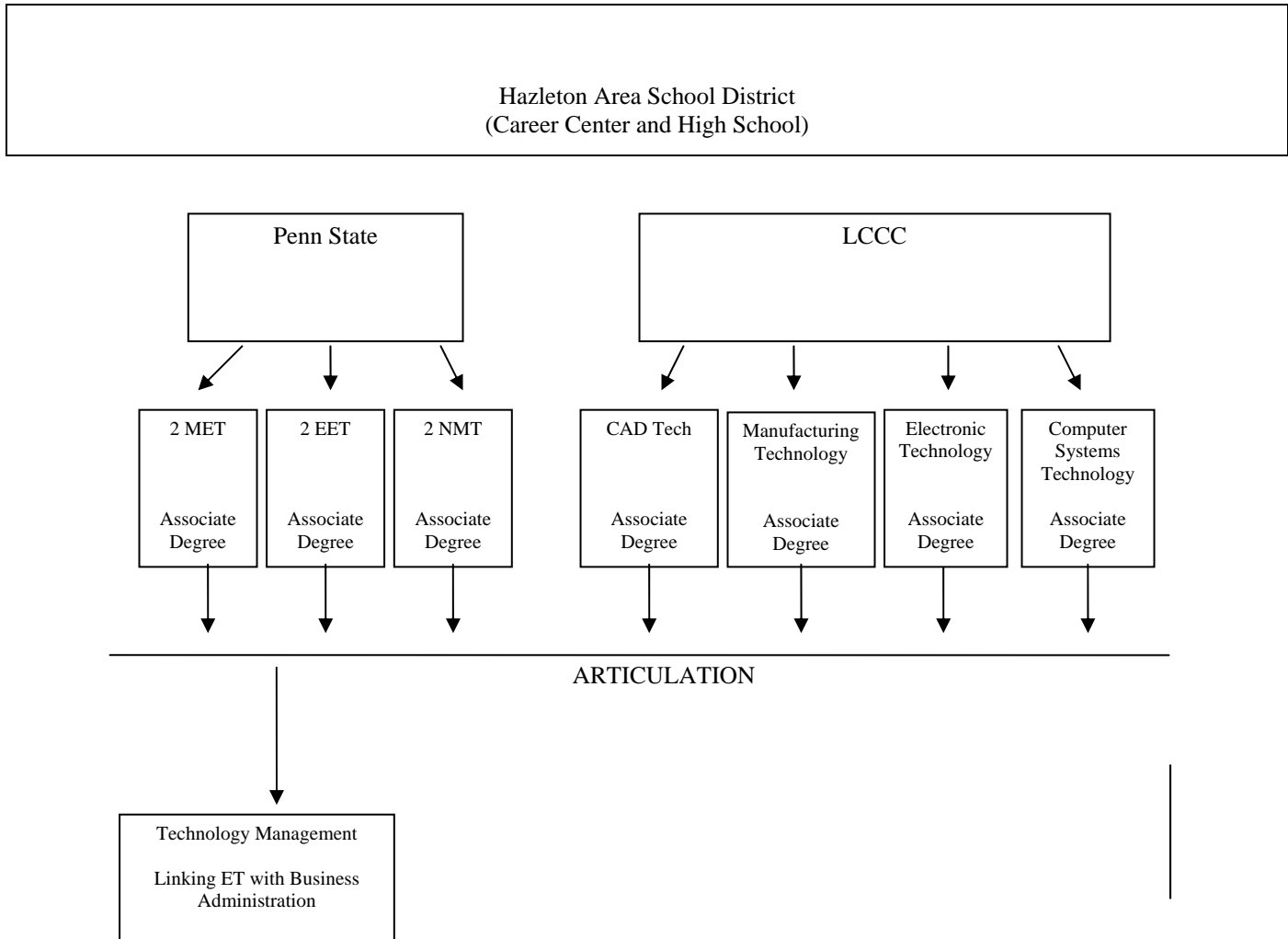


Fig.1. 2+2+2 Articulation between Hazleton Area School District, LCCC, and Penn State

Once PSU students reach the upper division level and students from LCCC transfer into PSU's baccalaureate program, they will use their engineering technology base as the foundation for business administration courses. As students work through a traditional business administration core, they use their engineering technology background to master critical thinking skills in areas like logistics, marketing, management principles, accounting, ethics and data base management. With some minor modifications in the technical electives in the engineering technology

curriculum, students should be able to complete the degree in eight semesters.

To ensure that the Hazleton Area School District Tech Prep courses and LCCC courses articulate with the PSU Business Administration degree, PSU's Advising Center and Business Administration Coordinator work closely with their counterparts at LCCC, thereby facilitating a smooth transition for the community college students.

After the successful completion of the Technology Management Program, the graduates will exit with the following competencies:

- Knowledge of mechanical or electrical engineering technology fields;
- Knowledge of routine design and structural analysis using state-of-the-art methods;
- Knowledge of designing and overseeing a manufacturing process;
- Knowledge of designing and maintaining web pages;
- Ability to store and manipulate large amounts electronic information;
- Experience with international engineering teams;
- Knowledge of international patent law;
- Experience with international/intercultural communication skills;
- Knowledge of import/export international laws and procedures;
- Knowledge and understanding of continuous quality improvement;
- Knowledge of corporate law and accounting; and
- Experience with business/engineering management skills.

Presidents of large corporations and CEO's observe what many business leaders have recognized in recent years, that an understanding of the fundamentals of engineering and the vital role technology plays in every aspect of modern society is as essential to the background of a future manager as the knowledge of sound management principles. A key feature of the Technology Management Program is its integrative nature. The students' primary focus will be the mastery of the technical and managerial skills needed to deal effectively with the challenges and opportunities in today's complex technological society. Equally important is the balance between humanities and professional coursework, ensuring a truly liberal education. The structure of the joint-degree program gives each student considerable flexibility in meeting these goals. A degree which blends management and technology produces graduates that are well prepared for careers in both the private and public sectors. Graduates of this type of program can pursue career interests in such diverse fields as new venture development, strategic planning, financial analysis, product management, and managerial or technical consulting. Today's successful engineers and technicians often need strong business management skills to complement their technical degrees. These skills are especially important for engineering technicians who are interested in working for technology companies, launching their own business ventures, or pursuing non-traditional jobs such as consulting. Generally, engineers and technicians will need to develop advanced business skills as their careers progress. This program will give technicians a competitive advantage for advancement or lead to accelerated opportunities for growth into management positions. Enhanced business skills will open a more diverse offering of career choices.

The program will offer a coherent, integrated set of core courses that are based upon analytical methods and organizational concepts and have application in the planning

and control of the complex systems required by modern technological society. Emphasis is placed on the problem-solving capabilities of the computer for improving decision-making. Whether the graduates are starting new businesses or working within the corporate environment, the skill sets developed by completing this program enhance the marketability and career choice of graduates.

Conclusion

This program is structured in 2+2+2 modules. After completion of every module, students will have the opportunity to exit to the job market or enter the next module. High school graduates (or presently employed individuals) who cannot commit themselves to the entire associate degree module can enroll in the Maintenance Technician, Programmable Logic Controller (PLC), or Computer Aided Design (CAD) certificate program. These certificate programs can be applied toward the Associate Engineering Technology degree if a student desires to return to college. Penn State's Electrical and Mechanical Engineering Technology programs are accredited by the Accreditation Board for Engineering and Technology (ABET). ABET accreditation is an ongoing guarantee that the accredited programs are complying with curriculum development requirements. After successfully completing the 2+2+2 curriculum, graduates will qualify for admission to the graduate programs at Pennsylvania State University as well as other universities.

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