

Bridging the Technical Competency Gap: An Innovative Approach to High-Tech Education for the New Millennium

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Abstract

The traditional public high school is not satisfying the industrial high-tech needs demanded by the highly competitive global marketplace. A “technical competency gap” exists between industry and public high school education. The Mechanical/Industrial Engineering Technology Division of State Technical Institute at Memphis has developed an innovative approach to help “bridge” this technical competency gap. Dual-credit courses, school-to-work programs, college transfer credit, and resource sharing are all involved in the State Tech endeavor. This paper will explain how this innovative approach develops qualified manufacturing technicians and engineers to serve the Memphis community for the new millennium.

I. Introduction

The new global marketplace has forced industry to restructure to a more technology-intensive work environment in order to meet the demands of customers and competition. New technologies are constantly emerging requiring companies to hire more highly skilled, well-educated, and technically flexible employees. However, most of our public high schools are not able to meet these New World demands because of their rigid political structure, lack of hi-tech equipment, lack of highly technical instructional expertise, and lack of a rigorous, relevant course curriculum. In fact, seventy percent of our public high school graduates will not graduate from a four-year college or university and will struggle to develop a long-term career of substantial wage growth and advancement opportunities. The traditional public high school system is not satisfying the high-tech needs demanded by the New World, thus creating a “technical competency gap” between industry and public high school education.

Furthermore, the traditional path from high school to college is no longer working effectively. In order to attend college, most young men and women must work at low skilled, low wage jobs taking at least eight years to get a four-year degree and four years to get a two-year degree. For many, the financial burden is too great with the cost of education continuously increasing and the time span too long for their education to be technically relevant in this rapidly changing high-tech New World. The Industrial / Mechanical Engineering Technology Division of State Technical Institute at Memphis (STIM) has developed an innovative High-Tech, Step-By-Step, School/Career Approach which is helping to elevate the high-tech manufacturing skill level of the Memphis and Shelby County labor force. This innovative Step-By-Step Approach can be adapted to other cities and communities. It is a seamless series of industrially endorsed certificate programs centering at the community college level, connecting to the high school

level, and extending to the university level. A qualified high school student with a 3.0 GPA first earns STIM's Manufacturing Fundamentals Certificate while in high school under the Dual-Credit program. This technical certificate is designed to give high school students the opportunity to be immediately employable in the high-tech world at decent wages while continuing their technical education at State Tech progressing from the certificate to the associate degree level. The option also exists for the State Tech associate degree graduate to obtain a bachelor's degree in engineering at the University of Memphis. All of the supporting curricula are fully accredited by the State of Tennessee and endorsed by industry certifications.

II. Program Discussion

First Step--Manufacturing Fundamentals Certificate

The **"First Step"** in STIM's Step-By-Step Approach is the **Manufacturing Fundamentals (MF) Certificate**. Designed for high school graduates or those entering industry for the first time, the MF Certificate Program is composed of four courses (**Appendix, See Schematic #1**). These courses include the study of materials and how they behave; basic machine processes and how they create everyday products; computer-aided design concepts; and the use of modern computer software including word processing, spreadsheet, and database. This MF Certificate is the foundation for the entire Step-By-Step Approach and emphasizes the basic engineering technical skills needed to prepare the high school graduate for entry-level employment into the high-tech industrial world. All qualified high school graduates can acquire the knowledge to secure employment in as little as one semester at STIM. Students who complete the MF Certificate with a 2.5 GPA also qualify to enter the Cooperative Education (CO-OP) Program. The purpose of the CO-OP Program is to train students in the industrial world by combining classroom with industrial work experience. The company would pay for the student/worker's college tuition and books, while the CO-OP student is working and contributing to the company. This expense for education would be tax-deductible for the company. The student can gain free tuition and books, an income, and more importantly, invaluable high-tech industrial work experience along his or her career path. Most technical education students are working part-time in unrelated areas outside their industrial career path, thereby wasting valuable time. The MF Certificate gives the graduate the basic high-tech skills to gain industrial work experience.

A very special endeavor by STIM is the Dual Credit Certificate Program featuring the MF Certificate. The MF Certificate program is tied to the high schools in a special way so that the young high school student can commit early to a career in manufacturing. Qualified high school students can take the MF Certificate courses at the STIM's campus under a Dual Credit Program in which a high school student can complete a college course and earn both college and high school credits. Junior and senior students with 3.00 GPA are eligible. These honor students must also receive the approval of both the high school principal and the two-year college president before enrolling in the MF Certificate program courses. For the convenience of the students, selected courses are offered by STIM at the high school depending on the high school's facilities. Courses are also offered in the evening and on Saturday at the STIM campus during the regular high school year and summer breaks. The honor students who graduate from the MF Certificate Program will possess more skills and training than the regular graduates, and obviously would be in great demand by the manufacturing companies. They will have the foundation to become highly productive employees. Youth who commit early to a life of learning and working will be rewarded with a chance to build a long-term career. Not only are these high school students eligible for the CO-OP Program, but they are also eligible for STIM scholarships, and very competitive salaries from their employers.

Second Step--Manufacturing Graphics and Quality Assurance Certificates

The “**Second Step**” at State Tech in Memphis provides two choices, each with its own unique opportunities. Students can either take the **Manufacturing Graphics (MG) Certificate or the Quality Assurance (QA) Certificate (Appendix, See Schematic #1)**. The Manufacturing Fundamentals Certificate ties into these two certificates both of which are based on the high-tech skills most needed by manufacturing and industrial companies. Each of these certificates contains six courses and is two semesters in length. The MG Certificate emphasizes the computer-aided design and graphics needed in industry. Students learn how to use the computer to create engineering graphics and 3D prototype models, as well as develop animated technical slide shows, 3D Web pages, and 3D plant layouts. These skills are in great demand because currently there are many unfilled jobs available for qualified CAD technicians.

The QA Certificate provides the student with intensive quality inspection, measuring, and testing skills. The QA student will learn to conduct destructive and non-destructive tests and to tabulate and analyze the results. Extensive use of computer-controlled precision measuring and testing equipment is provided. The field of quality assurance is a tremendously important industrial area that will continue to grow and to provide more jobs every year as companies strive to develop quality products to compete in the global marketplace.

Students in both the MG and QA Certificate programs who receive their Manufacturing Fundamentals Certificate will be eligible for the CO-OP program and receive an opportunity to have part of their educational costs paid by industry while continuing to acquire valuable industrial work experience. Furthermore, graduates from either the QA or the MG Certificate programs are eligible to become certified industrial technicians by passing the ASQ Certification Exam designed by the American Society of Quality, or the AutoCAD Certification Exam designed by the AutoCAD Certification Exam Board, respectively. These certifications are endorsed and supported by industry. Thus, technical education programs whose graduates pass industrially related certification exams will earn industrial credibility and continued industrial support.

Third Step--IET and MET Associate Degrees

Even though an individual can develop a lucrative career in the fields of quality assurance or manufacturing graphics, there is still room for advancement along his or her career path. At STIM, the “**Third Step**” is to complete the requirements for a **two-year associate degree in Industrial Engineering Technology or Mechanical Engineering Technology**. The majority of the courses from the certificate path will transfer to the associate degree program, enabling the certificate graduate to obtain the two-year degree in a minimum of three additional semesters. The student/worker will also continue to be eligible for the CO-OP program. Furthermore, the Industrial and Mechanical Engineering Technology programs are both nationally accredited by the Accreditation Board for Engineering and Technology (ABET) and both programs are highly endorsed by the Society of Manufacturing Engineers. Thus, the IET and MET graduates are eligible for the SME Certification Examination that is internationally supported by industry.

Final Step--Engineering Bachelor's Degree and Beyond

In the “**Final Step**” the student/worker who completes a two-year associate degree can further continue along the career path completing a related engineering baccalaureate program in two

more years. For example, the University of Memphis gives junior level status in the Manufacturing Engineering Technology bachelor's degree program to graduates from the IET and MET associate degree programs from State Technical Institute at Memphis. Thus, a student/worker can go "step-by-step—working, and learning" from high school, to a two-year college, and to a four-year university as he or she desires and his or her needs require. Student/workers may even wish to pursue graduate degrees, but more importantly, they are taught the value of life-long learning to stay competitive. Advantages of the Step-By-Step Approach over traditional education include accelerated time to the technical job market, education delivered in smaller and efficiently integrated steps, and the reduction of educational costs while earning career-related work experience. The Step-By-Step Approach is a prime example of just-in time, practical education.

III. Evaluation and Results

The certificate programs and the Dual Credit Program have existed at STIM for almost two years, starting in January, 1997. The Dual Credit Program exists at one Memphis City high school and has produced three graduates with the MF Certificate. A manufacturing company immediately hired these three high school graduates. They were also given scholarships to STIM where they are currently attending courses in the Manufacturing Graphics Certificate Program. They will continue their education pursuing the Mechanical Engineering Technology associate degree. Because of economical limitations, none of these three youths would have been able to attend a four-year college immediately after graduating from high school. But now they can work, go to school, and continue to build their dreams. Fifteen high school students are currently enrolled in the Dual Credit Program taking MF Certificate courses.

In addition to the graduates from the Dual Credit Program, another twenty-three recent high school graduates or people who wished a career change have completed the Manufacturing Fundamentals Certificate Program. Every one was placed in a manufacturing-related job and are continuing their education, either for the MG or QA Certificates, or the Mechanical or Industrial Engineering Technology associate degrees. Average starting annual salaries ranged from \$21 to \$31 thousand. One person recently graduated from the QA Certificate Program and reported an annual \$35,000 salary. These early results show that the MF Certificate graduate can obtain gainful employment in the modern industrial world and continue earning meaningful work experience while furthering their careers and education.

IV. Conclusion

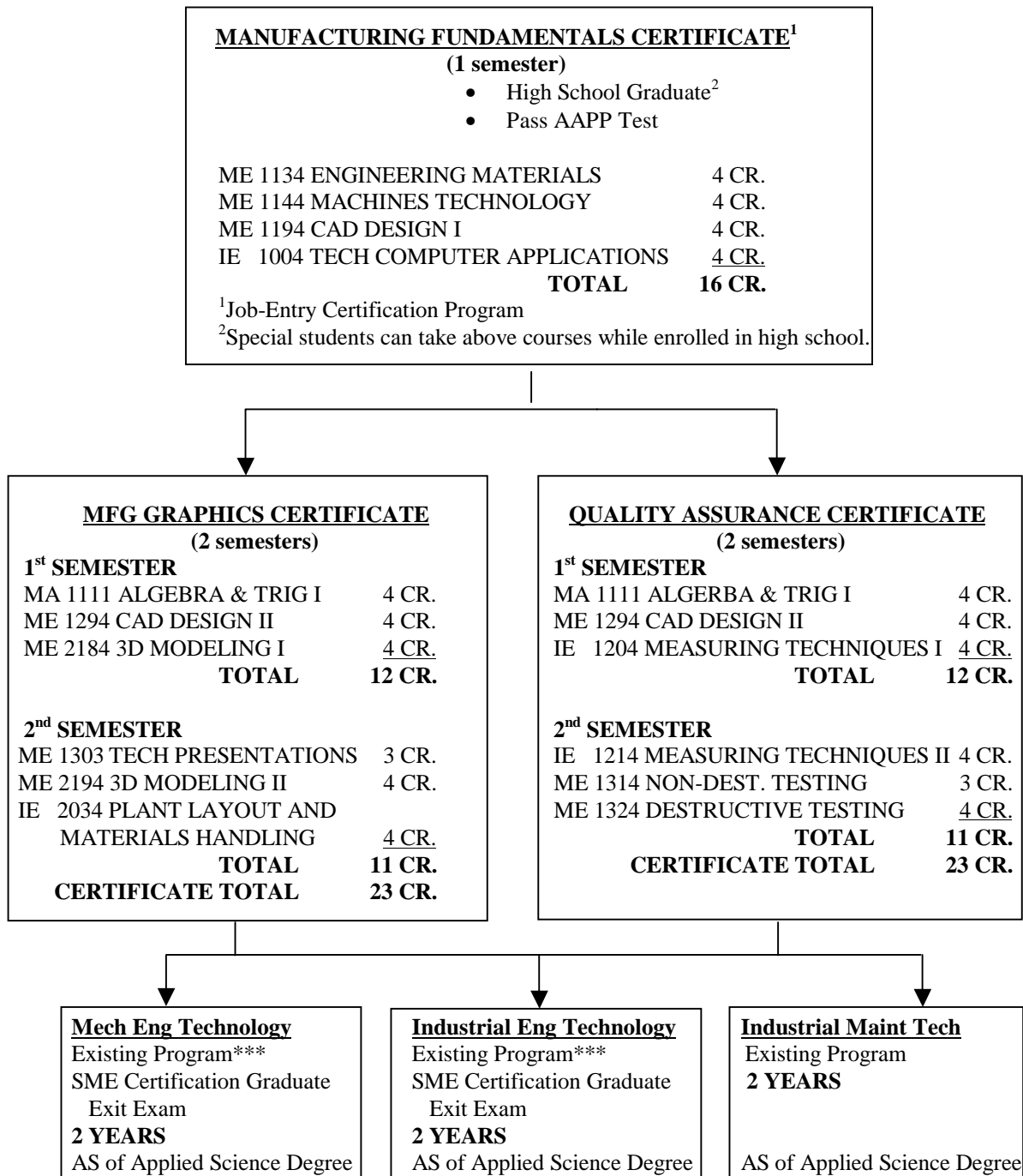
The New High-Tech, Step-By Step, School/Career Approach gives more than hope. It gives opportunity for the individual to work and learn both in school and on the job. A young person can build a career as he or she progresses through the programs. These programs are designed to get an individual into the job market as quickly as possible, train him or her in the necessary high-tech skills, and enable him or her to learn on the job and in school while earning good wages. This School-Career Approach will strengthen the local high-tech labor force and help modern companies meet the demands of its customers and challenge the global competition. By uplifting the education level of the labor force, more high-tech companies will consider locating in the community, thus creating more employment, higher wages, and a much-improved economy. Ultimately, there will be high-tech industrial employment available at all levels and with it the opportunities for skilled workers, technicians, and engineers. Thus, the local industry

can be assured of obtaining extremely qualified manufacturing technicians and engineers to help develop the community in the next millennium.

However, the cost of education has risen beyond the pocketbook of many of those it is supposed to help. Thus, it is strongly suggested that the industrial and political leaders of the community commit scholarship and transportation money to the high school students who make the early commitment to become high-tech manufacturing technicians. These young people are the wealth of the community and should be developed along a positive and productive path if the community is to prosper in the next millennium.

V. Appendix

Schematic #1 State Technical Institute at Memphis
Manufacturing Certificate & Degree Options



** CO-OP work is optional, student must maintain 2.5 GPA to be eligible.

*** M.E.T. and I.E.T. programs transfer to related baccalaureate programs at University of Memphis.

For further information contact Dr. Greg Maksi at (901) 383-4158 <<http://www.stim.tec.tn.us/etweb>>

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Dr. Maksi is currently the Division Coordinator of the IET/MET/IM Engineering Technologies at State Tech. He holds a Ph.D. from the University of Mississippi, a Master's degree from Georgia Tech, and a professional engineer's license from the state of Tennessee. He was awarded the Memphis Joint Engineer's Featured Engineer, the SME Mid-South Engineer of the Year, and the American Technical Education Association's National Teacher of the Year.