

**Preparing the
Entrepreneurial Technician**

Final Report to the Appalachian Regional Commission

**Regional Technology Strategies
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Executive Summary

The current design of technical education and training programs typically rests on one or more of the following three assumptions: the primary vocational goal of education is to prepare students to become employable in existing organizations, those students who aspire to operate a business will follow different career paths and require different skills than future employees of companies and, therefore, should be enrolled in special “entrepreneurship” programs, or entrepreneurial skills are supplementary, not integral, to formal education and the exceptional student who chooses self-employment can acquire them as electives or in continuing education programs. In reality, educators and students alike assume that most budding entrepreneurs are “born” and/or learn their skills on the job.

The approach to entrepreneurial education described in this report differs from most others in that it assumes that the technician will gain experience and additional technical knowledge by working for someone else before becoming an entrepreneur and considers and treats entrepreneurial competencies within the context of technical education programs rather than as appendages.

The project was carried out in cooperation with an alliance of four Appalachian community colleges in four states—Haywood Community College in North Carolina (lead school), Hazard Community College in Kentucky, Lawson State Community College in Alabama, and West Virginia University Technical Branch at Parkersburg. Each is a member of the Consortium for Manufacturing Competitiveness, established in 1988 with support from the ARC, and the Trans-Atlantic Technology and Training Alliance. Expert consultants from Virginia Tech, CMC member Oklahoma State Technical Branch, and REAL Enterprises, and a number of small business owners, assisted the collaborative.

The team chose as its illustrative model the associate of applied science electronics technician program, which is widely offered and supports an industry with large numbers of small and mid-sized enterprises (SMEs). The project produced three innovative approaches (which may be used in combination with each other) through which entrepreneurial competencies might be strengthened within that program:

- by integrating entrepreneurial competencies into traditional curricular courses by, for example, posing problems that require business understanding and decisions and framing discussions in broader business environment contexts (“embedded” approach)
- by establishing real or fictitious enterprises operated by student teams and used as a context for applying technical skills (“enterprise” approach).
- by developing a second year program that deals with entrepreneurship in an economic setting and uses complex technical problems whose solution requires an understanding of risks, costs, and profits (“self-contained” approach).

Three key factors explain the motivations for this project:

- (1) *Importance of entrepreneurial development to rural Appalachia:* The entrepreneur, including the high tech entrepreneur, has long been an important source of local wealth and a stable source of employment in Appalachia, particularly in small towns. But he or she is becoming

even more important in today's economy because the options for employment in many traditional industries such as mining, textiles, and apparel are much scarcer. The competition for local investment is much more intense, and Appalachia's low cost advantage is disappearing due to (1) rising incomes in the region, (2) lower cost regions, usually in other countries, becoming more attractive locations for low-tech operations and, (3) areas with higher levels of education becoming more attractive for new high growth high-tech companies.

- (2) *Contributions of experiential and entrepreneurial education model to effective learning.* In addition to its economic payoff, entrepreneurial education has recognized educational benefits, because, if done well, it creates a locally relevant context for learning and problem solving at all levels of education. If implemented properly, entrepreneurial education ought to serve as a contextual environment for introducing and enhancing basic employability skills.
- (3) *Value of entrepreneurial skills and behaviors to small and mid-sized high performance businesses.* Companies typically have few complaints about the technical capabilities of graduates of community colleges but do fault them for lack of basic communications and problem solving skills and, knowledge about how a business operates and an economy functions. While any educational environment cannot—and indeed probably should not—replicate the actual business world, more realistic contexts and experiences better prepare students for the work environment, regardless of whether they ever become entrepreneurs.

Three Models for Integrated Entrepreneurial Technical Education at Community Colleges

The three approaches to integrating entrepreneurial skills and behaviors into educational programs are: (a) an embedded model that integrates entrepreneurial content into existing courses, (b) an enterprise model in which students assume roles and make decisions related to a real or simulated enterprise, and (c) a self-contained program (typically offered as a second year capstone course) in which complex situations that require knowledge of firms, industries and the “systemic approach” are used in a multi-disciplinary course.

Each creates contextual environments for students to learn entrepreneurial competencies and to foster entrepreneurial behaviors. Timing and placement within the educational process are the primary differences between the models. The enterprise and self-contained approaches typically place near the end of the program so students already have built their foundation skills and next learn to solve complex problems associated with creating and operating an entire organization. The entrepreneurial experience in effect becomes not only the opportunity to learn entrepreneurial skills but to apply technical knowledge in a cumulative manner. The rationale for such placement is that students need to concentrate first on the technical aspects of their chosen vocation and that they may not have any idea about what kind of businesses they could start until they learn more about the field.

The “embedded” model integrates entrepreneurial education throughout the program of study within the realm of regular courses, introducing students gradually to business concepts and allowing them to understand and perhaps build their business plans over time. It also allows faculty to use pedagogical techniques that will instill creativity, flexibility and other

characteristics that are associated with entrepreneurs throughout an entire program. In contrast, the enterprise and self-contained models attempt to impart those characteristics in a more condensed time period.

The three options, each of which has its own strengths and weaknesses, might be best used in combination. For example, the enterprise model can provide a framework for a self-contained capstone course and for problems that can be embedded into other technical courses.

The following describes the three models in greater detail:

The Enterprise Approach: European Practice Enterprise Networks (EUROPEN), managed out of Essen, Germany and active in a few U.S. colleges illustrates the enterprise approach. EUROPEN activities take place outside the realm of traditional courses and resembles a “laboratory” experience near the end of a program where students come together weekly for several hours at a time to operate a fictitious business. It is based on the concept of creating and running Practice Firms to simulate the operations of real companies. However, instead of using techniques such as case studies and role-playing, the Practice Firms trade with each other. Each firm in the network is also assisted by a local mentor company whose products and services the practice firm silhouettes.

The Embedded Approach: In the embedded approach, faculty alter the content and pedagogy in existing technical courses to include management and business issues. For example, courses in CNC machine operation might also include issues that demand knowledge of customers’ requirements, cost and budget considerations, scheduling, and decisions about up-grading or replacing outmoded equipment. This approach assumes that (a) the technical curriculum is too full to simply add more business or management courses and (b) that technical skills can be more easily and effectively learned in a problem-oriented business context. Haywood Community College is using this approach in its Fundamentals of Programmable Logic Controllers (PLC) course. It introduces entrepreneurial concepts by structuring projects in a team-oriented approach with an emphasis on project management, problem solving, and effectively documenting and communicating technical information.

The Self-Contained Approach: This approach is designed to maximize the development of entrepreneurial characteristics and competencies while minimizing the changes required in existing technician programs—although it does require different teaching methods than those typically used in conventional entrepreneurship courses. The approach differs from traditional appended entrepreneurial courses because the entrepreneurial skills are taught deductively, in the context of a technical enterprise and through complex problems or case studies, not inductively as discrete sets of abstract competencies. This approach resembles the enterprise model (and can in fact utilize a simulated enterprise) but its distinctive feature is that it can use means other than enterprises, such as case studies, as pedagogical tools. Because of the more complex nature of the problems students are expected to solve, the classes and faculty operate in cross-disciplinary teams.

Table 1 summarizes the differences between these approaches.

Summary Comparisons of Approaches

Dimension	Approach		
	Embedded	Enterprise	Self-Contained
<i>Planning</i>	Systemic reform	Continuous	New courses
<i>Implementation</i>	Comprehensive	Elective	Elective or Required
<i>Source of students</i>	Program specific, for all	By application and multidisciplinary	Elective or required and multidisciplinary
<i>Private sector involvement</i>	Advisor	Partner	Mentor
<i>Content</i>	Competency driven	Situation driven	Problem driven
<i>Faculty relationships</i>	Instructors	Peer like	Facilitators
<i>Models real world</i>	Case studies	Realistic or simulated	Semi-realistic or simulated

Instructional Issues

Satisfactory outcomes for students in all the models require that participating instructors are both adequately trained in experiential teaching/learning methods (as well as the relevant business content) and committed to using them. A good instructor should be able to address a variety of learning styles, abilities, and interests among students and be prepared to deal with their discomfort and help them adapt to different ways of learning. Keeping these students engaged in a business planning and management process requires extra skill and creativity and an ability to relate the process to the intrapreneurial needs of larger organizations so that students recognize them as important even if they never intend to start a business.

For students, the challenges are different. With experiential curricula such as these being discussed, tasks such as developing and writing a business plan or proposal require basic skills in mathematics and writing, as well as more complex research, problem-solving, and critical thinking skills. Some students may lack the necessary core skills. Instructors must be able to help them overcome or circumvent any lack of these competencies.

To be successful, students and teachers must have access to materials and resources that include:

- appropriate course planning tools and field-tested activities (for instructors)
- useful books and periodicals geared toward entrepreneurship and small business practice, as opposed to business theory
- computer labs, telephone, financial templates, and the internet
- community resources such as accountants, bankers, insurance brokers
- role models and links to other successful technical entrepreneurs.

Comparison of Instructional Factors

Trait	Embedded	Enterprise	Self-Contained
Students	All in program	Application	Optional course
Teacher role	Instructor	Learning broker	Facilitator
Pedagogy	Competency based	Situation oriented	Problem oriented
Experience	Least experiential	Most experiential	Experiential, if linked to internship
Curriculum needs	Revised curriculum	Limited curriculum	New curriculum
Teaching Arrangements	Individuals	Cross-disciplinary teams	Cross-disciplinary teams

Recommended Policies

The key to developing a continuous pipeline of entrepreneurs into the manufacturing and value-added services is to expand the notion of entrepreneurial education for potential entrepreneurs to all technical personnel. But given increasing bodies of technical knowledge that students must master, this cannot be done in ways that diminish graduates’ technical skills; it must enhance technical abilities. This will require both recognition and commitment from state and federal agencies. Suggestions that would support entrepreneurial education are as follows:

Federal Policy

Specific federal agency actions could be:

1. The U.S. Department of Education requires schools receiving funds for vocational-technical education to develop a plan for integrating entrepreneurial behaviors into “all aspects of the industry” and evaluation tools that take into account entrepreneurial outcomes.
2. The National Science Foundation requests proposals for curriculum development of entrepreneurial education for technicians and supports a National Center for Technician-Based Entrepreneurial Education.
3. The National Skill Standards Board reviews technical skill standards to ensure that they include entrepreneurial competencies and behaviors.
4. The Appalachian Regional Commission establishes a network of community colleges charged with, and funded for, serving as beta test sites for the entrepreneurial curricula under development in this report.

State Policies

State education agencies should:

1. Support the in-service retraining of instructors to use systemic approaches in technical education.
2. Develop appropriate evaluation methods for technical courses and programs that utilize team- and project-based course work.

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3. Provide a program of stipends and financial support for entrepreneurial technical education advisors, mentors, and faculty participants at community colleges.
4. Create statewide entrepreneurial education advisory boards to oversee the design and implementation of entrepreneurial technical education.

I. Introduction

Internationally, America is known as the land where new ideas are constantly transformed into market opportunities and entrepreneurs flourish. Despite an educational system that still leaves much to be desired in terms of academic achievement or opportunities for entrepreneurial behavior, and an economy that is dominated by giant corporations, the entrepreneur remains an American icon in the eyes of many world leaders. Within the U.S., however, there is some concern that the entrepreneurial spirit, and the willingness to take risks, among young people is waning, and that there are too many barriers and too few incentives for the kind of entrepreneurial energy that has driven the economy for the past century. This is of particular concern in rural areas, where branch plant economies undermine economic stability, and where job creation from within is increasingly important.

The current design of technical education and training programs typically rests on one or more of the following three assumptions. First, the primary vocational goal of education is to prepare students to become employable in existing organizations. Second, those students who aspire to operate a business¹ will follow different career paths and require different skills than future employees of companies and, therefore, should be enrolled in special “entrepreneurship” programs. Third, entrepreneurial skills are supplementary, not integral, to formal education and the exceptional student who chooses self-employment can acquire them as course electives or after graduation in continuing education programs. In reality, educators and students alike assume that most often budding entrepreneurs are “born” or learn their skills on the job.

A. Entrepreneurial Opportunities in Value Added Industries

The new enterprises that drive regional economies are those that add value to the economy either by exporting a new good or service or replacing a currently imported good or service. Other businesses re-circulate existing capital. While the current re-structuring and re-engineering of corporations to concentrate on core competencies with leaner organizations is playing havoc with corporate careers, it is at the same time creating numerous opportunities for employees to independently market their own value-adding skills. Danish Technological Institute Vice President and RTS Board member Niels Christian Nielsen, in a paper delivered to the Organization for Economic Cooperation and Development (OECD) last year, remarked that workers who find they are not core employees must create their own company. “At a general level this means,” he wrote, “that job creation and employment is and will dramatically depend more on entrepreneurship than at any time since the Second World War... Can we develop entrepreneurial values and capabilities among our knowledge workers?”² The director of a large business incubator in Virginia said that at least 90 percent of the entrepreneurs in the facility had been an employee recently. In the past, the impetus was fear of layoff; in today’s economy, it is more often market opportunity.

Many technically competent workers, in fact, at some point in their careers think about setting out on their own. In manufacturing, the majority of businesses (60 percent) are started by employees who had gained experience and either became frustrated by lack of opportunity to

advance, anticipated being downsized, had a new idea that could not be realized in their former jobs, or simply wanted more independence and income potential.

Industry sectors such as furniture, machining and tooling, food services, information technologies, and printing are highly dependent on new businesses started by their skilled work force. Many of the nation's industrial clusters are products of these entrepreneurial employees. The vast majority of the owners of small and mid-sized businesses in thriving industry clusters learned their trade under the wings of large corporations. For example, most of the initial entrepreneurs in Silicon Valley comprise a family tree rooted in Fairchild; the furniture companies in Tupelo, Mississippi spun out of Futorian Furniture; the hosiery firms in Hickory, North Carolina from Sara Lee; the houseboat builders on Lake Cumberland in Kentucky from Somerset Houseboats; and many SME owners around Seattle began their careers with Boeing. While these technicians and middle-level managers continually acquired the tacit skills and knowledge that made them so valuable, they were able to informally learn about starting and running a business, and some did. But for every person who chooses to become an entrepreneur, there are many more with good ideas who lack the confidence, information, skills, and motivation to take full advantage of the opportunities.

B. Oblivion in the Schools

The successful business clusters named above developed largely without preparation or attention from public schools. A Gallup survey in 1996 found that eight in ten high school students said they were taught "little" or "practically nothing" about business or the economy.³ America, for all its belief in entrepreneurship, does little to equip students who are not in business programs with the skills, knowledge, and vision that can help them become owners, because the vast will initially pursue employment, not self-employment. Even recent education reforms, aimed at preparing more flexible workers, rest on the needs of mid-sized to large companies, not on a desire to create more independent business people.

Preparation for future ownership and management was the original stimulus for the requirement in the Carl Perkins Vocational and Applied Technology Education Act that vocational education address what the Act calls "all aspects of the industry." But few states obligated to meet this goal fully understand its significance, or the entrepreneurial dimension that was the original intent of the legislation. Therefore, it has rarely been effectively implemented.

Many schools and colleges do teach an assortment of business skills that serve as proxies for entrepreneurial competencies. Courses such as business financial management and marketing are well-intentioned but not always effective attempts to tackle the more poorly understood and elusive goal of real entrepreneurship education. Marilyn Kourlesky of the Ewing Marion Kauffman Foundation contends that:

Current entrepreneurial education tends to migrate towards its natural focus of "least resistance," i.e., the traditional business management process areas, which are both the most widely recognized and accepted knowledge areas linked to entrepreneurship as well as the areas for which the most content knowledge exists. Unfortunately, these programs miss the heart of the entrepreneurship process. The students do not personally experience the search for the market opportunity and the generation of the new business idea; real

entrepreneurship education cannot succeed without focusing on these crucial antecedents.⁴

True entrepreneurs are marked by three skills: the ability to identify or recognize market opportunities and generate business ideas that address the opportunities; to marshal and commit resources in the face of risk to pursue the opportunities; and to create an operating business organization to implement opportunity-motivated business ideas.⁵ Most of today's school and college curricula do not address the tensions between thought and action.

C. A Surfeit of Knowledge

There is an abundance of knowledge and experience about the needs and traits of entrepreneurs from which to develop an entrepreneurial education program – far more than can be covered in detail in this report. Entrepreneurial education has been studied and advocated for decades. A few examples follow to illustrate some of what is known and has been tried.

In public education, most of the emphasis has been on entrepreneurship in secondary school business education programs and research universities, not on Associate of Applied Science programs at community colleges. Entrepreneurial education generally has been much less visible in community colleges than in high schools, where Junior Achievement programs, agricultural programs, and economic education have all influenced curricula. For example, for nearly a century agricultural education in the United States, more successfully than any other vocational program, has integrated entrepreneurship and leadership with technical skills. Graduates learned not just how to use equipment, but whether or not to purchase it and how to finance it; they learned not just how to grow and handle their products but how to market them. They had to know not just how to compete in markets but how to cooperate with other businesses. For these reasons, agricultural education is considered by some to represent one of America's most successful educational philosophies.

Community colleges also receive less entrepreneurial attention than flagship universities, through which states have promoted policies to support high technology development and transfer them to private markets and where MBA programs often focus attention on entrepreneurship. And many research universities, accused of too much attention on publications and too little on commercialization, are trying to develop an entrepreneurial bent, especially in their science and engineering programs. Yet even in universities, it is more common to find a separate center for entrepreneurship than an integrated entrepreneurial philosophy.

Entrepreneurial education also is often introduced as a remedial or poverty program – typically in the form of “micro-enterprise” programs – to create opportunities for displaced workers in areas with high unemployment, or to improve economic opportunities for students who have been relatively unsuccessful in mainstream programs. However, while valuable to participants, most of these efforts result in low value-added, non-technical and non-exporting enterprises.

Gary Rabbior⁶ contends that we know enough about entrepreneurial education to describe successful programs. They:

- do not focus on or expect “right answers”
- are highly participatory with a hands-on focus
- are goal and achievement oriented

- encourage short-term accomplishments
- focus on challenges to the status quo
- adopt a community integration focus: entrepreneurs are hunters in their own environment
- use a variety of teaching styles: shake up the ways students view the world, because creativity and inspiration flow from variety
- surprise the student and present the unexpected
- present familiar information in unfamiliar contexts
- are easily amended and augmented (give teachers freedom).
- provide focus for entrepreneurial ventures, not just business start-ups
- are fun and exciting
- enable frequent and unanticipated feedback
- use approaches and activities that build self-confidence
- enable students to apply knowledge/skills to a particular project
- provide opportunity for student to build to a “launch point” for an entrepreneurial endeavor
- encourage group and team activities
- alert students to common pitfalls and reasons for failure
- emphasize recognizing and evaluating opportunities
- expect the teacher to be entrepreneurial and set good role models
- link entrepreneurship to innovation
- focus on disequilibrium as opposed to equilibrium
- create a flexible, fluid, and adaptable learning environment
- use case studies that represent a variety of types of entrepreneurs, degrees of success, and types of initiatives
- address behavioral dimensions of learning as well as content
- focus on individuals not institutions

In addition to curricular research, substantial research exists on the personal qualities that make a person a potential entrepreneur. For example, a researcher at the University of Southern California’s Entrepreneur Program, found, after years of observing her students, what makes a person a good entrepreneur. Assessing an entrepreneur required only three simple questions of students: “Are they tenacious? Do they have the technical skills to run a business? Do they believe in their own ability?” This research states that entrepreneurial training is most often successful “when students know they can succeed, when they exert the effort to learn everything they need to know, and when they apply that passion and knowledge with imagination.”⁷

There is also a wealth of information available from private foundations, such as the Ewing Marion Kauffman Foundation, and from government agencies that have invested millions in scores of efforts to develop entrepreneurs. One such program, called YESS (Youth Empowerment and Self-Sufficiency) creates a mini-society as a learning environment and then embeds entrepreneurial education in the workings of the society by creating “triggers” for entrepreneurial responses from students.⁸ In addition, the concept of school-based enterprises now has been tested and validated for more than a decade, and a number of U.S. and European colleges have developed innovative programs that target entrepreneurs through materials, methods, and lessons. Ireland’s Galway-Mayo Institute of Technology, for example, has designed and piloted a program for enterprise development that builds on individual creativity. It is introduced into the education process to “ensure that the emerging generations of graduates

will bring that creativity to bear on their work, be it in the existing company context where it will manifest itself as intrapreneurship or in the context of new start-ups when it becomes entrepreneurship.”⁹

Yet in all of this research, community colleges, and particularly their technical programs, receive short shrift. One of the most respected proponents of entrepreneurial education, Albert Shapero, in a report prepared for the Small Business Administration in 1981,¹⁰ recommends that secondary schools focus on teaching the value of entrepreneurship through workshops, games, and clubs, and leave the instruction and details to universities. Community colleges were never mentioned in the report, perhaps because at the time community colleges were viewed as (and mostly acted as) transitional institutions, feeding students to four-year colleges.

This does not mean that entrepreneurial education has been completely ignored at the community college level. In 1980, the American Vocational Association dedicated a special issue of its *VocEd* journal to entrepreneurial education. The issue included a prescient article about entrepreneurial education in Illinois community colleges where instructors gave students more control over their learning environments and curricula, and assigned out-of-class projects.¹¹ Regional Technology Strategies, Inc., through a grant from the Alfred P. Sloan Foundation from 1993 to 1995, targeted entrepreneurial education at the two-year college level by supporting the development of a dedicated entrepreneurial education and training curriculum at Somerset Community College in Kentucky and West Virginia University at Parkersburg (Appendix D). REAL Enterprises, which will be discussed later, originally operated only in high schools, but now has moved into community colleges. In North Carolina, 31 (of the state’s 59) community colleges offer the REAL Entrepreneurship program.

II. An Integrative Approach to Educating “Delayed” Technician Entrepreneurs

This project takes an approach to entrepreneurial education that differs from most others because it (1) assumes that the technician will gain experience and additional technical knowledge by working for someone else before becoming an entrepreneur and (2) considers and treats entrepreneurial competencies within the context of technical education programs, rather than as appendages to them.

A. The Importance of Experience

As early as 1984, Peter Drucker argued that “many become entrepreneurs only after they develop managerial experience in large organizations.”¹² Research confirms that most of the knowledge and skills needed to start a business are acquired informally, either incidentally or accidentally, from the experience of being employed. But entrepreneurs do not come only from large corporations. People working in small businesses, or with family members who are entrepreneurs, have the chance to both learn a business and observe possible role models. One survey of technical entrepreneurs found that 41 percent learned business skills on the job while far fewer learned them in schools: 18.5 percent in undergraduate programs, 2.7 percent in community colleges, and 0.7 percent in high schools.¹³ Experience is an undeniably important step to becoming an entrepreneur, but there are ways that experience can be built into the educational process. The educational approaches in this project intend to provide sufficient interest in and knowledge of entrepreneurial opportunities and requirements to help the potential or latent entrepreneur recognize opportunities, assess risks, and optimize success after he or she accumulates the necessary experience, wisdom, and capital.

B. The Reason for Integration

Most entrepreneurial curricula are groups of modules that teach skills such as financial management and marketing as an attempt to tackle the more poorly understood and elusive goal of real entrepreneurship education. Even the well-intentioned traditional business and management courses are rarely found in technical programs of study. Integrating entrepreneurship into – rather than distinguishing it from – vocational and technical education and training programs, we contend, will expand possibilities for eventual self-employment and enhance local development. It will allow students to more easily recognize and exploit opportunities based on an innovation or a desire for more independence, or to more easily recover from job loss by turning their skills into entrepreneurial opportunities. It should also increase their chances for succeeding in their ventures. Integration will give youth opportunities to learn about future business opportunities for technicians and could increase enrollment in technical courses that are often under-enrolled, thereby addressing growing technical skill shortages in some parts of Appalachia.

Further, as the skills and knowledge of the intrapreneur (that many progressive businesses now want as their mid-level employees) grow increasingly similar to traditional entrepreneurial skills, entrepreneurial education will increase chances for career advancement. For example, Drucker asserts that in a new high performance work environment, “knowledge workers, in effect, cannot be supervised.”¹⁴ A leading proponent of entrepreneurial education, the vice president of the

Ewing Marion Kauffman Foundation's Center for Entrepreneurial Leadership, told an audience that "intrapreneurship is on the rise" with a "necessity to apply entrepreneurial thinking within large organizations." This approach will create a much more flexible worker who will not be as dependent on any single employer.

C. Selection of a Pilot Program and Collaborative Member Colleges

This report examines various options for improving the ways in which schools treat entrepreneurship in associate degree programs aimed at technicians. These technicians are the individuals who will carry out the applied, hands-on work and accumulate the technical skills and who can, with the right set of skills, knowledge, confidence, and capital, become the business owners of tomorrow—without diminishing their employability skills and opportunities.

We selected the electronics technician program as a pilot field of study because the industries that utilize the skills (a) have demonstrated growth potential; (b) include many types of small enterprises that do not require large initial investments; (c) are ubiquitous within the ARC region; and (d) are taught at most community colleges. The goal was to identify, design and compare approaches to producing more entrepreneurial technicians, and to acquire additional support for implementation in order to test the feasibility of the approaches.

The project was carried out in cooperation with an alliance of four Appalachian community colleges in four states—Haywood Community College in North Carolina (lead school), Hazard Community College in Kentucky, Lawson State Community College in Alabama, and West Virginia University Technical Branch at Parkersburg. Each is a member of the Consortium for Manufacturing Competitiveness, established in 1988 with support from the ARC, and the Trans-Atlantic Technology and Training Alliance. Expert consultants from Virginia Tech and CMC member Oklahoma State Technical Branch, from REAL Enterprises, and from a number of small business owners assisted the collaborative scope of the project.

The team chose as its illustrative model the associate of applied science electronics technician program, which is widely offered and supports an industry with large numbers of small and mid-sized enterprises (SMEs). The project produced three innovative approaches (which may be used in combination with each other) through which entrepreneurial competencies might be strengthened within that program by:

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- establishing real or fictitious enterprises operated by student teams and used as a context for applying technical skills (*enterprise* approach).
- developing a second-year program that deals with the entrepreneurship in an economic setting and uses complex technical problems, where the solutions require an understanding of risks, costs, and profits (*self-contained* approach).

III. Rationale for Project

Three key factors explain the motivations for this project: (1) the importance of entrepreneurial development to many parts of rural Appalachia, (2) the benefits of experiential and entrepreneurial education models to aid effective learning, and (3) the value of entrepreneurial skills and behaviors to small and mid-sized high performance businesses.

A. Importance to Local Development in Appalachia

The entrepreneur, including the high tech entrepreneur, has long been an important source of local wealth and stable employment in Appalachia, particularly in small towns.¹⁵ But he or she is becoming even more important in today's economy because the options for employment in many traditional industries (such as mining, textiles, and apparel) are much scarcer. The competition for local investment is much more intense, and Appalachia's low cost advantage is disappearing due to (1) rising incomes in the region, (2) lower cost regions, usually in other countries, becoming more attractive locations for low-tech operations and, (3) areas with higher levels of education becoming more attractive for new high-growth high-tech companies. Yet, according to ARC federal co-chairman Jesse L. White, Jr., "the culture of entrepreneurship is neither broad nor deep throughout the region, and evidence suggests that there are many gaps in the infrastructure for supporting entrepreneurship"¹⁶

These challenges have led to a variety of state and local programs and policies to help small businesses, including business incubators, seed capital, and small business assistance centers. The Southern Growth Policies Board documented some of these programs for ARC in 1997.¹⁷

Increasingly, however, regions realize that support mechanisms are most successful if they operate within an environment loosely called an "entrepreneurial culture" or "entrepreneurial economy," and that such a culture is inextricably linked to education. A group of experts convened by the Kentucky Science & Technology Council formulated a strategy for growing entrepreneurial economies around concepts, competencies and connections, and made a series of recommendations in which human capital and intellectual capital are fundamental building blocks. This approach rebels against traditional American education, which teaches students to thrive in discrete function-oriented work environments associated with Fordist-style production, not in team-oriented and intra- or entrepreneurial environments. As such, the old style educational models do not encourage independence, innovation, risk taking, or self-employment.¹⁸ We know what is needed to achieve an entrepreneurial culture; the literature on conditions and support mechanisms to support new business formation is extensive. Encouraging independent and creative behavior requires not only different educational content but also new pedagogy and sets of social relationships, changes in what anthropologist Jules Henry called the "hidden culture" of schools.

B. Contributions to Effective Learning

In addition to its economic payoff, entrepreneurial education has recognized educational benefits, because, if done well, it creates a locally relevant context for learning and problem solving at all levels of education. In fact, in most states the predominant aim of implementing "all aspects of the industry"¹⁹ has been to improve the contexts of programs rather than the federal legislation's original intent to link programs more closely to local economies and

promote new business development. Meanwhile, many attribute much of the historical success of agricultural education to its enterprise focus, such as requiring students to plan and develop businesses in order to provide an economic context for learning as well as to introduce entrepreneurial skills.

Entrepreneurial education can introduce industry and the enterprise as “an organizer for curriculum rather than an end in itself.” Thus, it becomes a means for achieving a “thematic curriculum,”²⁰ embedding entrepreneurial and intrapreneurial skills without diminishing the technical content. If implemented properly, entrepreneurial education ought to serve as a contextual environment for introducing and enhancing basic employability skills. In the old economy, the values and behaviors associated with entrepreneurs were sometimes viewed as antithetical to the workplace in branch plants. But in today’s business environment, they are quite consistent with current “best practice” management philosophies.

C. Value to Small and Mid-Sized High Performance Companies

Companies typically have few complaints about the technical capabilities of graduates of community colleges. But they do fault them for lack of (a) basic communications and problem solving skills and, (b) knowledge about how a business operates and an economy functions. A focus group of seven small information technology (IT) companies agreed that students graduating from schools at all levels lack business and communications skills. One executive said that in assessing applicants, “we value real world situations more than course completion.” Graduates “think they can run a business. But succeeding is more than ideas. It’s execution, and they need experience.” In general, all the companies preferred:

- systemic and management skills over technical skills
- experience and “street smarts” over formal education
- business savvy over course completion
- skill sets over degrees.

These companies can find technical wizards more easily than businesspeople. One IT company executive said, “Our in-house IT departments are no longer just made up of technicians, [and] employees have to understand that they have joint responsibility for the company’s organizational and strategic development through their advice and actions.”²¹

While any educational environment cannot—and indeed probably should not—replicate the actual business world, more realistic contexts and experiences better prepare students for the work environment, regardless of whether they ever become entrepreneurs.

IV. Elements of Entrepreneurial Programs

Supporting entrepreneurship is a perpetual policy goal (if not an actual budget line item) of virtually every economic region, and public education is expected to support that goal. One of the first questions often raised is: “What is an entrepreneur?” *Webster’s Dictionary* defines an entrepreneur as “the organizer of an economic venture; one who organizes, owns, manages, and assumes the risks of a business.”²² Other definitions are found in professional literature on entrepreneurship. In *Unleash the Entrepreneur Within*, the author attempts a definition by asking “whether it is possible for one person to be wisely entrepreneurial: enough of a risk-taker, innovator and improviser to recognize and create new opportunities, while still able to employ enough managerial skill to exploit them profitably?”²³ The Harvard Business School regards entrepreneurship more generally as the pursuit of opportunity without regard to resources currently controlled.

The Entrepreneurial Technician Collaborative (ETC) colleges that met in Atlanta suggested a definition adopted by Haywood Community College: “Entrepreneurs are those who see opportunities that others do not and marshal the resources to capitalize on them.” Project team members decided that agreeing on a precise definition was less important than agreeing on the traits and behaviors that are associated with an entrepreneur.

Entrepreneurship literature identifies or recommends appropriate traits and values of an entrepreneur, needed skills or competencies, characteristics of good programs, learning environments or “cultures,” and support programs. There are divergent views among researchers on how to teach entrepreneurship and when or where to introduce their recommendations. Nonetheless, we draw on the existing body of research as noted below. Specifically, most entrepreneurial educational programs include a set of desired competencies and traits; exposure to entrepreneurs and entrepreneurial experiences; pedagogical principles; and support structures.

A. Entrepreneurial Characteristics

When thinking about entrepreneurship, one must address the issue of whether entrepreneurs must be *born* or can be *made*. One expert names the following attitudes and behaviors as requisites for entrepreneurial behavior:²⁴

- Commitment and determination—tenacity and decisiveness, discipline, persistence in solving problems, and willingness to undertake personal sacrifice.
- Opportunity obsession—intimate knowledge of customers’ needs, driven by markets, and obsessed with value creation and enhancement.
- Tolerance of risk, ambiguity, and uncertainty—calculated risk taker, risk minimizer or sharer, tolerance of lack of certainty and structure, tolerance of stress and conflict, and ability to resolve problems and integrate solutions.
- Creativity, self-confidence, and ability to adapt—unconventional, open-minded, restlessness with status quo, ability to adapt, ability to learn, and willingness to fail.
- Motivation to excel—goal and results orientation; drive to achieve and grow, low need for status and power, and awareness of weaknesses and strengths.

- Leadership—self-starter, internal locus of control, integrity and reliability, patience, team builder, collaborator, and hero maker, and experienced.

An unpublished Danish government white paper suggests that the educational system can foster these entrepreneurial characteristics, thus helping *make* entrepreneurs. It contends that an entrepreneurial society is actually the confluence of three types of cultures, each of which may be supported by the educational system:

1. an “entrepreneurship culture” that relies on education to provide concrete business skills, using a practical and project-oriented curricular approach
2. an “innovation culture” that relies on schools to teach cooperation, problem solving, ability to compile and process information, and project management; and
3. an “independence” culture, which includes broader personal qualities such as initiative, willingness to taking risks, decision making, and flexibility. This culture is the hardest to teach.

The Danish paper suggests five general pedagogical principles to support the creation of these three cultures:

- Make students responsible for their own learning.
- Teach using a problem-oriented approach, with real and realistic problems that motivate creativity.
- Adopt experience-based activities, using learners’ own experiences to the extent possible.
- Allow students to use their own styles of learning and cooperate with others.
- Develop project-oriented and interdisciplinary curricula, with self-defined tasks cutting across subject areas.

B. Entrepreneurial Competencies

At the college level, entrepreneurship programs generally try to teach business and management skills—such as types of ownership, goal setting, writing business plans, conducting industry analyses, managing people, budgeting and cash flow, marketing, investment decisions, and setting up a business. These courses most often are taught by business (commercial) program faculty and assume little, if any, technical knowledge on the part of the students.²⁵ In addition, good programs attempt to inculcate certain habits and behaviors commonly associated with entrepreneurs, as described above. The ETC adapted its own set of entrepreneurial competencies and goals for the chosen technical AAS curriculum (electronics) based on the experience of member institutions. They are (See Appendix A for details):

1. Introduction

- *Introduction to Entrepreneurship*: Students will identify and describe the basic characteristics of small business ownership.
- *Introduction to Business Planning*: Students will identify and understand importance of each section of the business plan.

2. Planning to Plan

1. *Self-Assessment*: Students will assess personal characteristics and develop skills relevant to the business planning process.
 - *Finding a Niche/Business Idea Research*: Students will identify strategies and methods for generating new business ideas in an industry that are needed to fill economic gaps or seize an economic opportunity. Students will learn to assess merits of enterprise based on objective criteria and choose most appropriate enterprise for community, industry, and student.
 - *Introduction to Financial Concepts*: Students will become familiar with the concepts of cash flow and break-even.

3. Assembling the Business Plan

- *Products & Services*: Students will analyze and understand roles of products/services in business.
- *Market Feasibility*: Students will use market research to develop business feasibility studies.
- *Financial Feasibility*: Students will develop initial financial feasibility studies for business ideas.
- *Marketing Product*: Students will analyze features of products related to design/packaging.
- *Price*: Students will determine pricing policies for the business.
- *Place*: Students will determine selling and distribution strategies for delivering products and/or services to customers.
- *Promotion*: Students will identify and determine appropriate promotional and selling strategies for the proposed enterprise.
- *People*: Students will identify stakeholders that are key to producing, promoting and delivering the product and/or service to the customer.

4. Operations Management & Personnel

- *Customer Service*: Students will learn to understand the customer, describe characteristics of good customer service, and determine appropriate customer service policies for an enterprise.
- *Legal Structure*: Students will demonstrate an understanding of the legal obligations of operating business.
- *Operating Procedures*: Students will describe the internal operations and management for the enterprise and develop operating policies to guide operations.
- *Location and Layout*: Students will develop a space plan for the facility.
- *Renovations and Capital Equipment*: Students will identify equipment and a physical facility needed to operate business.
- *Taxes, Licenses and Insurance*: Students will analyze risks, determine required licenses and permits, and identify tax reporting liabilities.
- *Key People*: Students will determine needs for key support professionals and describe roles.
- *Financials*: Students will learn to accurately predict and describe the start-up costs, ongoing operational costs and revenues of the enterprise.
- *Executive Summary*: Students will summarize the main points of the business including its purpose, goals, legal structure, start-up costs, funding requirements, and profit potential.

- *Producing the Business Plan:* Students will assemble a comprehensive business plan, receive feedback, learn to revise and refine their work, and learn to communicate in an effective and professional manner when making presentations.

C. Role Models, Mentors, and Advisors

The importance of mentors and role models is frequently noted in studies of entrepreneurial economies. A study of minority manufacturing entrepreneurs for the Tennessee Valley Authority by RTS found that “having [an entrepreneurial] role model was strongly correlated with expectations of ownership.” A survey revealed that 82 percent of minority youth with two role models, 70 percent of those with one role model, and 51 percent of those with no role model aspired to ownership.²⁶ Another found that 75 percent of all entrepreneurs had parents or other role models who were self-employed.²⁷ A recent survey in Kentucky reported that 60 percent of entrepreneurs surveyed indicated that role models motivated them.²⁸

Yet while exposure to an entrepreneur clearly inspires individuals to go on to ownership, the typical community college student rarely has access to “technicians/entrepreneurs” through their educational programs. Most community colleges that are able to build bridges to local industry favor large employers who provide most of the internships and are more likely to purchase training services from the school. They also often have more time to devote to educational issues. The lack of interaction with technicians/entrepreneurs is detrimental since high quality entrepreneurial education programs depend on advice, internships, apprenticeships, and job shadowing opportunities from small, entrepreneurial businesses.

D. Support Structure

In addition to conventional support such as incubator space, capital, and technical or business assistance, entrepreneurs also rely on informal learning, shared experiences, and support networks. Business incubators, policy devices to encourage business start-ups, are sometimes established at community colleges to provide low-cost office and/or production space in a place where access to assistance and other entrepreneurs is readily available. An incubator, if integrated into the programs of the college, offers role models, internships, inspiration, and an outlet for students and faculty. A U.S. Department of Education report on incubators at community colleges suggests that “one of the advantages of affiliating incubators with community and technical colleges is their flexibility to react to curricular changes compared to university settings. The two-year college can move faster from an idea to program development and implementation to meet the needs of the community than the university.”²⁹ A 1996 report on entrepreneurship in Appalachia recommended that community colleges offer flexible programs of continuing education and technical assistance to entrepreneurs.³⁰ Although entrepreneurs tend to be individualists, they are not lone wolves, and many researchers attribute the entrepreneurial energy of Silicon Valley, for example, to its tightly woven social structure. A Welsh study of entrepreneurs concluded that “voluntary association is probably a better principle than competitive individualism as far as entrepreneurship is concerned.”³¹

E. Learning Environments

Drawing on the earlier discussion of what researchers and policy makers know—or as least postulate—about successful entrepreneurial pedagogy, we know that traditional classrooms with right and wrong answers to text-driven problems are not compatible with entrepreneurial

education. Instead, successful entrepreneurial education depends heavily on creating a different environment for students—one where students have more responsibility for their own learning, real or at least realistic problems motivate creativity and, to the extent possible in technical areas, contextual and experiential learning dominates. The learning environment should be project-oriented and interdisciplinary, with self-defined tasks that transcend subject areas and are carried out in cooperation with others.

F. Skill Standards

The current movement towards national skill standards affects the content and goals of most occupational programs. The American Electronics Association (AEA) has developed skill standards for electronics technicians. There are elements of these national standards that are clearly relevant to an entrepreneurial education. Basic competencies of problem solving, decision making, understanding and working with systems, and focusing on customers are all important to the entrepreneur, and there exist clear skill standards for these. Additionally, the standards presume a high level of independence and authority for technicians.

More specifically, although the current emphasis of most skill standards is on the production aspects of the industry and on supporting a company's culture (i.e., group values and behaviors), AEA's standards also include industry knowledge, such as requiring that a student "identifies, understands, tracks, and knows how to respond to current market conditions" and "seeks to understand strengths and weaknesses of existing and potential customers." However, the AEA assumes a certain amount of intra-field specialization, and many of the skill standards most relevant to entrepreneurial endeavors are separated by specialty—meaning they are not deemed important for all workers. For example, the AEA standards distinguish among manufacturing specialist, administrative/information services support, sales specialist, and manufacturing team leader, all of which have similar core competencies but with different emphases and expectations.

In developing its embedded approach to entrepreneurship (as will be described later), Haywood Community College matched the competency objects of its program with AEA's standards (Appendix E) and found many compatibilities.

The most glaring gaps in the entrepreneurial bent of skill standards relate to micro-enterprise or new business skills, such as "the ability to identify and evaluate new business opportunities," "budgeting and understanding the financial aspects of the business," and "comparing the pros and cons of different forms of enterprise organization." Though the existing standards do an exemplary job of addressing the skills of a high performance organization, they lack a focus on risk taking, tolerance, stress, and conflict—all conditions that arguably impact both workers in high performance companies and entrepreneurs.

V. Three Proposed Models for Integrated Entrepreneurial Technical Education at Community Colleges

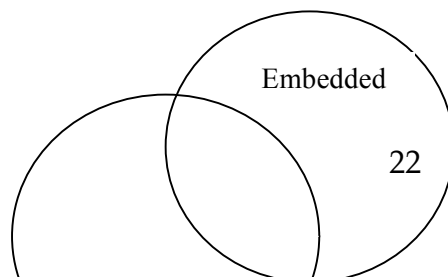
After reviewing the literature, meeting with college faculty, and interviewing company representatives, project team members identified three general approaches to integrating entrepreneurial skills and behaviors into educational programs. We believe these approaches would have greater impacts than the more conventional approach of appending entrepreneurship curricula to a program. These are: (a) an embedded model that integrates entrepreneurial content into existing courses, (b) an enterprise model in which students assume roles and make decisions related to a real or simulated enterprise, and (c) a self-contained program (typically offered as a second year capstone course) in which complex situations that require a knowledge of firms, industries and the “systemic approach” are used in a multidisciplinary course.

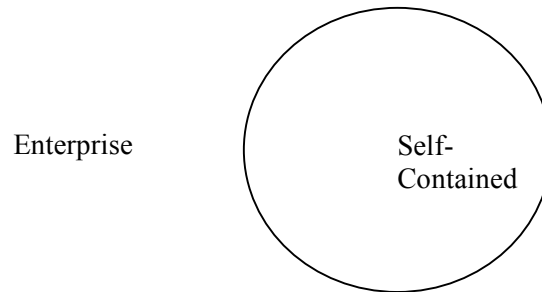
Importantly, all the models create contextual environments for students to learn entrepreneurial competencies and to foster entrepreneurial behaviors. Timing and placement within the educational process are primary differences between the models. The enterprise and self-contained approaches typically place the entrepreneurship component close to the end of the program so students can expand on their foundation skills and learn to solve complex problems associated with creation and operation of an entire organization. The entrepreneurial experience in effect becomes not only the opportunity to learn entrepreneurial skills but to apply technical knowledge in a cumulative manner. The rationale for such placement is that students need to concentrate first on the technical aspects of their chosen vocation and that they may not have any idea about what kind of businesses they could start until they learn more about the field.

The “embedded” model integrates entrepreneurial education throughout the program of study within the realm of regular courses, introducing students gradually to business concepts and allowing them to understand and perhaps build their business plans over time. It also allows faculty to use pedagogical techniques that will instill creativity, flexibility and other characteristics, as discussed earlier, that are associated with entrepreneurs throughout an entire program. In contrast, the enterprise and self-contained models attempt to impart those skills in a more condensed time frame.

The intent of this report is not to recommend a choice among three options, each of which has its own strengths and weaknesses, but to suggest options that might in fact be best used in some combination. For example, the enterprise model can provide a framework for a self-contained capstone course and for problems that can be embedded into other technical courses. RTS submitted a proposal to National Science Foundation (described later) that would create simulated enterprises for students in an information technology program as a capstone (self-contained) program. Yet the curriculum also would be divided into modules to be incorporated as case studies or activities within regular courses (embedded), including courses for students not in IT programs.

Figure 1





A. The Enterprise Approach

Learning by running enterprises dates back to the turn of the century when rural schools, supported by the banks and agribusiness, expected students to start and operate small-scale agricultural enterprises to make rural education more relevant to local economies. The project team closely examined the European Practice Enterprise Networks (EUROPEN), which is headquartered in Essen, Germany but active in a few U.S. schools—as an example of the enterprise model and to determine its potential for application toward technical curricula at community colleges.

EUROPEN activities take place outside the realm of traditional courses and resemble a “laboratory” experience near the end of a program where students come together for several hours per week to operate a fictitious business.

An Example: EUROPEN

The European Practice Enterprise Network (EUROPEN) is a novel business training and education approach that began in Germany over 30 years ago. It is based on the concept of creating and running Practice Firms to simulate the operations of real companies. However, instead of using techniques such as case studies and role playing, the Practice Firms trade with each other. Each firm in the network is also assisted by a local mentor company whose products and services the Practice Firm silhouettes.

From 1993 through 1997 EUROPEN functioned as a European project and involved over 1,500 Practice Firms in 15 European countries. In January 1998 the organization began operating as a non-profit association and expanded its reach beyond Europe. At present, over 2,500 schools in 30 countries are involved in the training program. (In the U.S., schools in New York and California are involved.)

Target students vary according to each country’s national and regional training objectives. At present, target groups include unemployed people (long-term and new entrants), students, women returning to work, disabled people and those on income support. The Practice Firm program for each country is guided and supported by a Central Office that supports the network of firms and supplies business services. National Central Offices in turn are members of the transnational support network called EUROPEN. Organizations that use and/or sponsor this approach include vocational institutions, universities, colleges, high schools, and actual companies. The participating institution begins by determining which students/trainees would benefit by working in a practice firm. Normally 10 to 15 participants are sufficient to run a firm. Then, the participating institution then sets up the firm or several firms usually with the help of

another Central Office. Practice Firms then start using the services of foreign Central Offices. Once six to ten Practice Firms are operational, the country in question is usually in position to set up its own Central Office. The Practice Firms begin trading on an international basis and the new Central Office is in contact with foreign Central Offices. The new Central Office can then apply for an associate membership in EUROOPEN, which in turn votes on acceptance or rejection of the application. After one year the associate member can apply for full membership.

Once operating, the Practice Firm is a company set up by students/trainees with the assistance of staff or trainers to simulate commercial activities. Practice Firms function like “real” businesses only they cooperate with other Practice Firms in a closed network. Each Practice Firm purchases, produces, and sells a specific range of goods in a fictitious market. The customers who are buying the goods are the participants in the network (including the Central Office). All “employees” in the Practice Firms receive fictitious salaries, which must be spent within the network in order to make the economic circulation function.

Meanwhile, the national Central Office has four main functions:

- facilitating the development of Practice Firms throughout the country;
- providing training and support for new Practice Firms;
- developing active trading links between its Practice Firms and Practice Firm networks in other countries;
- providing a range of business services to the Practice Firms in its network.

The business services function of the Central Office provides the enabling support for the entire network. The services are typically divided into the following areas:

<i>State:</i>	the Government, the Country (customs and excise)
<i>Bank:</i>	the financial sector (banks, credit providers)
<i>Register:</i>	the legislative and judicial powers (registrar of companies)
<i>Post Office:</i>	postal and telecommunications services (ordinary and electronic mail services)
<i>Market:</i>	regulation and guidance of daily trade (acts as a buffer, purchases goods, and organizes trade fairs)
<i>Information:</i>	information services (courses and seminars and sends out news, publications)

As stated, EUROOPEN is the international support network, coordination center and information platform. Its membership is comprised of the national Central Offices. Practice Firms that wish to engage in international trade are members of EUROOPEN through their national Central Offices. The organization’s responsibilities and activities include:

- coordinating the work that is necessary for the Practice Firms’ market to function
- helping set up Practice Firms and Central Offices in other countries
- monitoring, together with the member Central Offices, the educational system, the economy, and the legal regulations in member countries and disseminating this information
- promoting the network and Practice Firm concepts
- fundraising for the network
- developing common worldwide standards

- publishing the EUROPEN Bulletin to inform Central Offices, Practice Firms, trainers, and other interested parties on developments in the practice enterprises market
- offering a clearinghouse service that allows Central Offices to send their Practice Firms data to a server, and at the same time to receive all the updated Practice Firm data from all other countries (international bank transfers are also done automatically via this server).

Advantages and Disadvantages

EUROPEN does not have much experience with technical programs. It focuses more on commercial activities in “back office” or non-technical aspects of companies. Yet EUROPEN’s fictitious enterprise does create a realistic but controlled environment where conditions and challenges can be varied. Through simulation, business activities can be artificially accelerated and extended over longer periods and in higher performance environments. On the negative side, EUROPEN Practice Firms, because they “shadow” real mentor firms, have little emphasis on the business start-up process. While there is certainly some organizational work involved, for the most part EUROPEN firms typically begin as fully functional companies so that they can operate alongside their “real” mentor firms.

Nonetheless, EUROPEN is well-established and has experience to bring to bear on adoption in technical programs. With more than 2,800 firms and at least 28,000 individual Practice Firm employees with “salaries” to spend on goods and services in this “market,” EUROPEN could be a valuable resource for planning and launching a business for electronics technicians and other students in manufacturing-related training programs. It might be feasible for electronics technician students/trainees to go through the process of starting Practice Firms and then to trade within the EUROPEN organization either as a supplier of electronic parts, components and/or equipment to other firms or as a final goods producer. ETC colleges could work with EUROPEN to develop an entrepreneurial process within the EUROPEN Practice Firm approach and then become a EUROPEN participant.

B. The Embedded Approach

Simply put, the objective of the embedded approach is to change the way content is presented and student problems and activities are framed in regular technical courses, so that they include management and business issues. For example, training in courses where students learn to operate CNC equipment would also include issues that demand knowledge of customers’ requirements, cost and budget considerations, scheduling, and decisions about upgrading or replacing outmoded equipment. This approach assumes that (a) the technical curriculum is already too overloaded to add more business or management courses and (b) that technical skills can be more easily and effectively learned in a broader context.

An Example: Haywood Community College

Under a grant from the North Carolina Rural Center, Haywood Community College is applying this approach to a course on fundamentals of Programmable Logic Controllers (PLC). The course introduces entrepreneurial concepts by structuring projects in a team-oriented approach with an emphasis on project management, problem solving, and effectively documenting and communicating technical information. Upon completion of the course, students not only demonstrate an understanding of how to apply programmable logic controllers to industrial control applications, but also basic knowledge of the skills and practices that go into developing

and implementing a full-scale technical systems integration project, from concept to factory floor. In the course, project teams prepare a proposal for the customer that includes: selecting components based on customer requirements; drafting a rough diagram of the system; identifying major tasks, estimating person-hours; preparing a schedule; estimating the cost based on components selected and projected labor requirements; and combining the information into an informal proposal for the customer. Then they must assign responsibilities among team members and complete the project.

There are other examples of the embedded approach. As a result of the collaborations between ARC region colleges and European colleges, two members of the Trans-Atlantic Technology and Training Alliance (a 29-member alliance of technical and community colleges, managed by RTS) also have developed an embedded approach for electronics technicians. A Danish member college established, in cooperation with schools in Germany and Spain, a fully integrated entrepreneurial and technical curriculum. A module on planning an electronics installation business, for example, requires students to develop business and management plans, financing options, budgets, and legal frameworks for an enterprise.

Advantages and Disadvantages

The embedded approach holds promise because it does not add additional courses or radically change the traditional Carnegie unit structure found in most Appalachian colleges. It is also more natural than separate “entrepreneurship” courses. This approach promotes just-in-time learning, diminishes just-in-case learning, and provides flexibility for creating real-world, authentic learning experiences. It uses students’ interest in technical learning as an enticement to also support learning entrepreneurial competencies that technical students often do not have the patience to learn in traditional entrepreneurial education approaches. The project orientation and case study methods result in “doing” the competencies, not just “learning about” them. The focus on performance of soft skills, rather than just knowledge of technical skills, gets at the heart of what makes an entrepreneur. Using individualized projects enables individuals to determine the level of risk they are willing to take in pursuing entrepreneurial paths.

Yet the embedded or “integrated” approach is perhaps the most difficult to implement successfully because it demands new behaviors and teaching methods from a large number of faculty members who may be resistant. They must embrace significant change in organization and approach, and likely work as teams in planning and implementing. This is a “systems reform” approach that requires significant faculty training, resources and commitment.

C. The Self-Contained Approach

The self-contained model is designed to maximize the development of entrepreneurial characteristics and competencies while minimizing the changes required in existing technician programs—although it does require different teaching methods compared to traditional entrepreneurship courses. This approach differs from typical appended entrepreneurship courses because the entrepreneurial skills are taught deductively, in the context of a technical enterprise and through complex problems or case studies, not inductively as discrete sets of competencies. This approach resembles the enterprise model (and can utilize a simulated enterprise), but its distinctive feature is that it can use means other than enterprises, such as case studies, as

pedagogical tools. Because of the more complex nature of the problems students are expected to solve, the classes and faculty operate in cross-disciplinary teams. The approach might comprise the following components.

An Academy of Entrepreneurship offering one 6-credit or two 3-credit capstone courses during the final semester of a two-year Associate of Science program. It would be staffed by a multidisciplinary team of existing or new faculty members (full-time or part-time) who have the necessary background. The academy environment can also be used for shorter non-credit workshops and other related services that promote entrepreneurship. In addition, the Academy might maintain a roster of entrepreneurs and business specialists who provide one-on-one technical assistance to students; provide guest speakers in courses offered as part of associate degree programs; and provide mentors for students.

The *Continuing Education* component serves technicians who have already completed their associate degree and are working in the local community. Continuing education opportunities are available to help employed technicians develop entrepreneurial skills including college credit courses, workshops, and seminars.

The *Technical Assistance* component is provided on-site to students who have an idea for a new business and are seeking advice. There are no limits to what types of assistance are offered so long as the Academy has individuals available with the knowledge and skills necessary to dispatch the assistance in question. Most technical assistance is provided by individuals who work at the Academy on a part-time (or sometimes contract) basis as needs arise.

An Example: REAL Enterprises in North Carolina

North Carolina REAL Enterprises is a non-profit organization that works in partnership with rural high schools and community colleges to foster entrepreneurial knowledge and skills and small business development. It is a member of a national federation of REAL (Rural Enterprise through Action Learning) organizations known as REAL Enterprises. Rural youths and adults participating in REAL research, plan and operate enterprises of their own choosing and design. Instructors from participating high schools and community colleges teach REAL courses for credit. At the community college level, the program is offered either through continuing education or curriculum courses. NC REAL Enterprises and the national REAL Enterprises provide a variety of products and services to support instructors and students:

- intensive professional development in the areas of experiential education and small business development
- curriculum and resource materials designed especially for a hands-on approach to entrepreneurship
- on-site support and evaluation for teachers and students
- continuing support for those students who open businesses.

The REAL Entrepreneurship program uses teaching and learning methods that provide students the opportunity to actually experience the entrepreneurial process, not just study it abstractly. The course guides students through the process of creating businesses of their own design. The process includes:

- self-assessment to determine students' potential and existing market strengths
- community analysis to identify needs and trends in the local economy
- research and writing of a comprehensive business plan for a chosen enterprise
- start-up support (including access to loan capital), if students choose to open and operate enterprises.

In addition to providing a hands-on, student-centered learning experience, the REAL class serves as a support network for individuals engaged in the difficult and stressful process of business creation. Through a Community Support Team at each site, local business leaders and small business assistance staff act as mentors and advisors for students, furthering their understanding of work in the small business sector.

In North Carolina, 31 (out of the state's 59) community colleges offer the REAL Entrepreneurship program. At most, the class is offered as a continuing education course and/or a curriculum elective. Haywood and Tri-County Community Colleges, however, have chosen to more fully integrate REAL Entrepreneurship into academic, vocational, and technical curricula. While the program goals are the same at both schools, the two institutions have implemented somewhat different models, as will be described later.

At Tri-County Community College in Murphy, REAL uses the self-contained approach for its automotive, electrical installation, and office systems students. The college's faculty chose to teach entrepreneurial skills by replacing an existing small business management course with REAL Entrepreneurship, a semester-long course, taught by Business Administration instructors who had been trained by REAL Enterprises. Each of the programs selected where to place the REAL entrepreneurship in their course sequences. In practice, most REAL classes contain a mix of students from several programs (as well as continuing education students), but Automotive Systems students often have separate sections because of different needs. The course follows the basic REAL entrepreneurship format with respect to competencies, content, and teaching methods.

Student enthusiasm for the REAL course at Tri-County varied from program to program. Among those students who see themselves as likely to start a business, and those who favor "hands-on" learning to "book" learning, the class has received high marks. Those who see themselves as unlikely to start a business or who are more comfortable with traditional textbook-and-lecture courses find the course to be more work (and more difficult work) than they want to do. Faculty responded to this feedback by making the course an elective, rather than a requirement, in programs with a low number of students who see themselves as potential entrepreneurs. In addition, instructors are creating alternative project options (such as an employment plan or a "life plan") for those students who feel a business plan is irrelevant for their lives. Overall, Tri-County faculty believe that REAL Entrepreneurship is a major improvement over the course it replaced, and graduates from 1996 to 1999 have begun 22 new businesses and expanded 21 existing businesses.

Advantages and Disadvantages

Advantages of this approach include the fact that it is the easiest to implement because it does not "disrupt" traditional program offerings and requires a limited number of "champions," which

is important in cases where a significant number of faculty are not equipped to adapt to the teaching entrepreneurship. The self-contained model also can be easily adapted for delivery in continuing education.

The disadvantages inherent in the self-contained approach are that it is difficult to learn entrepreneurial skills and behaviors in a typical class environment that meets for a short time once, or a few times, per week for a semester (or even two). A course is too limited a venue to teach competencies required for successful entrepreneurship and intrapreneurship. Because competencies are composites of knowledge, skills, and attitudes addressed in many courses; they are too broad based to be taught in one or two special courses. The model also requires a significant change in teaching methods by faculty who will have to take a more systemic, problem solving approach.

Table 1 summarizes the differences between these approaches.

Table 1
Summary Comparisons of Approaches

Dimension	Approach		
	Embedded	Enterprise	Self-contained
<i>Planning</i>	Systemic reform	Continuous	New courses
<i>Implementation</i>	Comprehensive	Elective	Elective or Required
<i>Source of students</i>	Program specific, for all	By application and multidisciplinary	Elective or required and multidisciplinary
<i>Private sector involvement</i>	Advisor	Partner	Mentor
<i>Content</i>	Competency-driven	Situation-driven	Problem-driven
<i>Faculty relationships</i>	Instructors	Peer-like	Facilitators
<i>Models real world</i>	Case studies	Realism	Semi-realistic

VI. Instructional Issues

The instructional issues for the models have some similarities, but also marked differences. Satisfactory outcomes for students in all require that participating instructors are both adequately trained in experiential teaching/learning methods (as well as the relevant business content), and are committed to using them. This is true whether the content is embedded in “regular” courses or appears in an enterprise or self-contained approach. Faculty should have access to ongoing assistance from experienced instructors (and/or a training and technical assistance organization such as REAL Enterprises) as well as full support from administrators at all levels.

Student readiness for entrepreneurial education will vary. A good instructor should be able to address a variety of learning styles, abilities, and interests among students. Nonetheless, in environments that use primarily experiential methods, those students who prefer, and who have been successful with, textbook-and-lecture methods and “right or wrong answers,” will be less comfortable. Based on experiences reported by REAL Enterprises, such students may express discomfort in a variety of ways from outright protest to non-participation and withdrawal. Instructors must be prepared to deal with their discomfort and help them adapt to different ways of learning. A certain percentage of students will not see themselves as potential entrepreneurs and hence not perceive the value. Keeping these students engaged in a business planning process requires extra skill and creativity and an ability to relate the process to the intrapreneurial needs of larger organizations so that students recognize them as important even if they never intend to start a business.

For other students, the challenges are different. With experiential curricula such as these being discussed, tasks such as developing and writing a business plan or proposal require basic skills in mathematics and writing, as well as the more complex research, problem-solving, critical thinking skills. Some students may lack the necessary core skills. Instructors must be prepared to help them overcome or circumvent any lack of these competencies.

To be successful, students and teachers must have access to materials and resources that support experiential learning, including (but are not limited to):

4. appropriate course planning tools and field-tested activities (for instructors)
5. useful books and periodicals geared toward entrepreneurship and small business practice, as opposed to business theory
6. computer labs, telephones, financial templates, and the Internet
7. community resources such as accountants, bankers, insurance brokers
8. role models and links to other successful technical entrepreneurs.

In the absence of these resources, teachers and students will feel lost and frustrated, and teachers who are so inclined will lapse back into traditional teaching methods.

Table 2 compares instructional factors as they relate to the three approaches.

Table 2
Comparison of Instructional Factors

Trait	Embedded	Enterprise	Self-contained
<i>Students</i>	All in program	Application	Optional course
<i>Teacher role</i>	Instructor	Learning broker	Facilitator
<i>Pedagogy</i>	Competency-based	Situation-oriented	Problem-oriented
<i>Experience</i>	Least experiential	Most experiential	Experiential, if linked to internship
<i>Curriculum needs</i>	Revised curriculum	Limited curriculum	New curriculum
<i>Teaching arrangements</i>	Individuals	Cross-disciplinary teams	Cross-disciplinary teams

VII. Evaluation

Both formative and summative evaluations are important in assessing the effectiveness and value of entrepreneurially-focused programs. Formative assessments should provide information such as whether the right entrepreneurial contexts and content are being used, faculty acceptance, organizational and process issues, and whether faculty select appropriate pedagogical techniques and delivery methods. Summative assessments should focus on outcomes and impacts: How effective is a program at teaching entrepreneurial skills and fostering entrepreneurial attributes such as independence and informed risk taking? Is the program better than what it replaced? What impact does it have on students, teachers, and, in the long term, the economy?³²

Using Kirkpatrick’s assessment model as described by Finch et al., educators can assess a program using different levels of scrutiny—a continuum that begins with student and faculty *reaction* (level 1) to a program; moves to assessing degrees and types of *learning* (level 2); finds indications of *behavior* (level 3) changes; and finally measures *results* (level 4). Table 3 indicates what measures might be applied to a technical/entrepreneurial program under each of the three models, though the examples given are more general than the actual measures that should be applied to a specific program.

Table 3
Assessing Curriculum Impact

Approach	Reaction (Level 1)	Learning (Level 2)	Behavior (Level 3)	Results (Level 4)
Embedded	Students and faculty react favorably.	Students demonstrate “fused” technical and entrepreneurial competencies.	Students continue to enroll in higher-level program courses and pursue avenues to learn more about entrepreneurial opportunities.	Some graduates start businesses at some point and/or employers recognize their intrapreneurial skills (long-term tracking necessary).
Enterprise	Students and faculty react favorably.	Students demonstrate “fused” technical and entrepreneurial competencies.	Students encourage others to take part in the program and pursue avenues to learn more about entrepreneurial opportunities.	Some graduates start businesses at some point and/or employers recognize their intrapreneurial skills (long-term tracking necessary).
Self-contained	Students and faculty react favorably.	Students demonstrate entrepreneurial competencies that reflect the context of their particular technical program.	Students encourage others to enroll in the course and pursue avenues to learn more about entrepreneurial opportunities.	Some graduates start businesses at some point and/or employers recognize their intrapreneurial skills (long-term tracking necessary).

VIII. Progress Toward Implementation

This project entailed developing a design and recommendations for implementation, as well as identifying and securing support for implementation, either by RTS directly or by an Appalachian community college. A number of proposals for various types of implementation have developed:

- As the project began, four of the colleges submitted proposals to a small grants program from the Coleman Foundation in Chicago, but none was successful.
- RTS worked with Haywood Community College on a proposal to the North Carolina Rural Development Center that resulted in a \$50,000 grant to Haywood to embed entrepreneurial skills into their electronics technician curriculum.
- RTS submitted a proposal to the National Science Foundation for \$472,000 to embed entrepreneurial skills into an electronics-related information technology program. The proposed project includes four Appalachian colleges. It has passed the preliminary competition and is under consideration in the final competition.
- RTS acquired funding from the German Marshall fund to build transatlantic regional partnerships between two Appalachian regions and two European regions, and part of the funds are being used to establish cooperative efforts between Welsh and Kentucky colleges around this project.
- A proposal by Haywood Community College submitted in cooperation with a Belgian college in Ghent for an exchange program focusing on entrepreneurial technician curricula to the Fund for the Improvement of Post-secondary Education (joint program of U.S. Department of Education and European Union) was not funded.
- RTS submitted a proposal to the Ford Foundation that includes planning for a collaborative implementation of an entrepreneurship curriculum by a network of colleges. Verbal confirmation of funding beginning in January 2000 for about \$90,000.
- Considerable attention was given this project at CMC and TA3 functions, and part of the match is attributable to the unreimbursed expenses associated with project. The figure of \$18,000 is a conservative estimate based on travel and \$300 per day for time.
- West Virginia University at Parkersburg submitted a second proposal to the Coleman Foundation for implementation.

Table 4
Summary Matching Funds Requested/Granted

Source	Purpose	Funds	Estimated \$ targeted to ARC region
<i>North Carolina Rural Development Center</i>	Embed in two technical courses	\$50,000	\$50,000
<i>Ford Foundation</i>	Build implementation alliances	\$96,000	\$26,000
<i>National Science Foundation</i>	Design and pilot enterprise approach	\$472,000	Pending
<i>British Council</i>	Student exchange between KY and Wales	\$10,000	Pending
<i>U.S. Fund for the Improvement of PS Education/EU</i>	Student exchange in entrepreneurial programs	\$40,000	Not funded
<i>In-Kind</i>	Unreimbursed time and expenses associated with development.	\$18,000	\$18,000
<i>Coleman Foundation</i>	Implement one course	4 @ \$25,000 each	Not funded
<i>Coleman Foundation</i>	WVU at Parkersburg, for implementation	\$25,000	Pending

A. Implementing the Embedded Approach

Haywood Community College, as a result of initial local team meetings and the ARC ETC meetings selected two courses in which to embed entrepreneurial skills: Programmable Logic Controller Applications and AutoCAD. These courses teach advanced subject matters conducive to projects and innovation, and they lend themselves to the “embedded approach.” Both the ARC collaborative and the local implementation team at Haywood agreed that the ideal model characteristics of an instructor teaching entrepreneurial competencies are to be open to new ideas concerning pedagogy, flexible in approach, innovative and possessing an appreciation for the broader application of entrepreneurship as it relates to learning and the workplace. Two qualified electronics instructors on staff met these criteria and were willing to serve on the local team and support the project objectives.

Haywood Community College selected skill standards from both its own Entrepreneurial Skills Sets (the result of previous work in preparation for integration into other non-technician programs) and the American Electronics Association Skill Standards that could be met through the revised embedded approach. Fortunately, many of the AEA standards match the intent and definition of entrepreneurship education. The skills were submitted to the local advisory team for input and recommendations. Appendix E indicates specifically where selected skills have been integrated into the pilot offering of the Programmable Logic Controller course.

B. Implementing the Enterprise Approach

RTS' recent proposal to the National Science Foundation (briefly described earlier) included as an objective to teach

entrepreneurial and intrapreneurial (also called "technepreneurial") skills without diminishing technical content. Providing students with this larger world view is particularly important as the Internet alters both relationships within the firm and with suppliers, customers, and partner firms and provides a growing number of entrepreneurial opportunities.³³ ...It builds on a current RTS grant from the Appalachian Regional Commission to [include] entrepreneurial skills in a two-year technical curriculum, which recommends using simulated enterprises within technical curricula.³⁴

The executive summary proposes a network of six community colleges, university experts, and industry leaders to establish, pilot, assess, and document a contextual, collaborative process to better prepare technical workers for the information technology (IT) service industry. The structure for contextual and systemic skills will be by "learning through a simulated information technology enterprise" (L-SITE), a realistic but fictitious enterprise that operates under varied conditions in each of the community colleges and represents the complexities and uncertainties of the real business world. The collaborative will design two different information technology service enterprises as templates for systemic learning for students in IT and other technical curricula. Using the two L-SITEs as "templates," student teams will simulate business operations in a high performance context under the rapidly changing, global, and challenging transactional, technical, and market circumstances facing IT and other industries.

Thus, students will learn by "experiencing" various challenges and problems they may face in the real workplace. Each L-SITE will be incorporated into the curriculum in each college in two basic formats: (1) a second-year practicum for IT degree students, and (2) experiential learning modules to be integrated into other courses and programs. The deliverable, which will be presented to other faculty in workshops, will be a validated and documented simulated experiential learning methodology for IT service and related technical associate degree programs. In addition to the design network, five field test colleges will participate to prepare for subsequent adoption, and four international colleges will participate to provide global connections and experiences for the U.S. students and faculty. NSF will make a funding decision by the end of the 1999 calendar year.

IX. Recommended Policies

In the past, entrepreneurial education has been seen as an outlier in education policy. Support has come from special allotments of grants from government agencies or private foundations. The key to developing a continuous pipeline of entrepreneurs into the manufacturing and value-added services is to expand the notion of entrepreneurial education for potential entrepreneurs to entrepreneurial education for all technical personnel. But given the increasing technical demands, this cannot be done in ways that diminish graduates' technical skills; it must be done in ways that enhance technical abilities. This will require both recognition and commitment from state and federal agencies. A few suggestions that would support entrepreneurial education are as follows:

Federal Policy

1. The U.S. Department of Education will require that any school receiving federal funds for vocational-technical education develop a plan and methodology for integrating entrepreneurial behaviors into "all aspects of the industry," and will redesign its evaluation tool for technical education to take into account short- and long-term entrepreneurial outcomes.
2. The National Science Foundation will request proposals for curriculum development of entrepreneurial education for technicians and support a national center for technical entrepreneurial education.
3. The National Skills Standards Board will review its skill standards to ensure that entrepreneurial competencies and behaviors are included in all technical standards.
4. The Appalachian Regional Commission will establish a network of community colleges charged with, and funded for, serving as beta test sites for the entrepreneurial curricula under development.

State Policies

State education agencies will:

1. Support the in-service retraining of instructors to use systemic approaches in technical education.
2. Develop appropriate evaluation methods for technical courses and programs that utilize team- and project-based course work.
3. Provide a program of stipends and financial support for entrepreneurial technical education advisors, mentors, and faculty participants at community colleges.
4. Create a statewide entrepreneurial education advisory board to oversee the design and implementation of entrepreneurial technical education.

Appendix A

Entrepreneurial Competencies for Technical AAS Curriculum

I. Introduction

A. *Introduction to entrepreneurship*

Goal: Student will identify and describe the basic characteristics of small business ownership.

Objectives:

- Describe entrepreneurship and small business ownership.
- Identify factors contributing to the success of a small business.
- Summarize the role of management in operating a small business.
- Identify the personal qualities and skills needed to be a successful entrepreneur.
- Evaluate ability to be a successful entrepreneur.
- Observe a business owner “in action.”
- Understand what business owners do daily.

B. *Introduction to business planning*

Goal: Student will identify and understand importance of each section of the business plan.

Objectives:

- Identify and understand sections of the business plan.
- Determine why each section is important to the business being planned.
- Understand overall purposes for the business plan, and different ways entrepreneurs and investors/lenders use a business plan.

II. Planning to Plan

A. *Self Assessment*

Goal: Student will assess personal characteristics and develop skills relevant to the business planning process.

Objectives:

- Assess talents, skills, attitudes, preferences, learning and work styles and relate these to personal goals.
- Set personal goals for the course and for the future.
- Develop a personal budget and understand its relationship to the business planning process.

B. *Finding a Niche/Business Idea Research*

Goal: Student will identify strategies and methods for generating new business ideas in an industry that are needed to fill economic gaps or seize an economic opportunity.

Goal: Student will learn to assess the merits of enterprise ideas based on objective criteria and choose the most appropriate enterprise for the community, industry and the particular student.

Objectives:

- Identify sources and methods of market research.
- Utilize market research techniques to analyze trends in an industry.
- Utilize market research techniques to analyze demographic information for the community served by the business.
- Identify sources and methods of new enterprise ideas.
- Identify potential businesses.

- Recognize complimentary products and services of potential businesses.
- Interview successful business owners and determine why their businesses are successful.
- Identify owners of businesses that have failed and determine why the businesses failed.
- Understand the economic and industry trends as they relate to the business.
- Identify market demand, competition and sales potential for products and services.
- Determine personal “fit” of the student with the enterprise.
- Identify new product opportunities and develop new product ideas.

C. *Introduction to Financial Concepts*

Goal: Student will become familiar with the concepts of cash flow and break-even.

Objectives:

- Understand the concept of cash flow.
- Understand the concept of break-even.
- Identify the types of data that must be collected to develop financial projections.

III. **Assembling the Business Plan**

A. *Products & Services*

Goal: Student will analyze and understand the role products and services play in business.

Objectives:

- Recognize what business one is really in.
- Identify the best mix of products and/or services for the business.
- Measure the quality, relative value, and convenience of the products and/or services.
- Identify and interpret factors affecting market demand and market share for products and/or services.
- Describe how the products and/or services will be delivered to customers.
- Identify key suppliers and the terms and arrangements for buying from them.

B. *Market Feasibility*

Goal: Student will use market research to develop initial market feasibility study for business.

Objectives:

- Identify the target market(s) for the business.
- Determine the characteristics of the potential customer including personal characteristics, spending power, spending behavior and location.
- Identify major competitors.
- Estimate potential market share.
- Identify ways to predict and then estimate sales potential for the business.

C. *Financial Feasibility*

Goal: Student will develop an initial financial feasibility study for the business idea.

Objectives:

- Determine the initial and ongoing costs of starting and operating the enterprise.
- Prepare an initial break-even analysis.
- Project a preliminary cash flow statement.

D. *Marketing*

1. *Product*

Goal: Student will analyze features of products related to design and packaging.

Objectives

- Understand the product life cycle and how it relates to products being sold.
- Analyze products and services from the customer's point of view.
- Determine product design and packaging requirements.
- Identify the competition and evaluate their strengths and weaknesses.
- Describe how the business will successfully compete with competitors.

2. Price

Goal: Student will determine pricing policies for the business.

Objectives:

- Identify pricing methods and factors that influence the price of products and services.
- Calculate the costs of producing products and/or services.
- Select methods to calculate selling price.
- Compare pricing strategies to the competition.

3. Place

Goal: Student will determine selling and distribution strategies for delivering products and/or services to business' customers.

Objectives:

- Analyze potential business locations considering the target market and competition.
- Choose a business location.
- Identify and select appropriate channels for delivering the product and/or services to customers.

4. Promotion

Goal: Student will identify and determine appropriate promotional and selling strategies for the proposed enterprise.

Objectives:

- Identify promotional and selling strategies for the proposed enterprise.
- Analyze the cost, advantages and disadvantages of promotional and selling strategies.
- Evaluate promotional strategies used by the competition.
- Determine an appropriate promotional mix for the enterprise.

5. People

Goal: The student will identify stakeholders that are key to producing, promoting and delivering the product and/or service to the customer.

Objectives:

- Identify the key sources of help in producing and marketing products and/or services.
- Evaluate potential sources of technical assistance to the business.
- Understand role of "professionalism" and "professional image" in marketing products and/or services.

E. Operations

1. Management & Personnel

Goal: Student will describe the management/owner and staffing requirements for business.

Objectives:

- Evaluate the staffing needs of the enterprise.
- Determine the skills and characteristics of each staff member.
- Identify the tasks that the owner/manager must perform.
- Develop job descriptions for the owner/manager and employees.
- Create an organizational chart that describes the governance structure of the enterprise.
- Determine job application and interview processes.

- Identify professional development strategies that will allow the business to grow.

2. Customer Service

Goal: Student will explore being a customer, describe the characteristics of good customer service and determine appropriate customer services policies for the enterprise.

Objectives:

- Recognize characteristic of good customer relations and analyze why customers become repeat customers.
- Develop one or more means for gathering feedback from your customer.
- Establish customer service policies related to product returns and dissatisfaction, pricing discounts, credit, etc.

3. Legal Structure

Goal: Student will demonstrate understanding of the legal obligations of operating business.

Objectives:

- Understand the federal, state, and local regulations that impact the business and identify agencies responsible for enforcing those regulations.
- Understand contracts and the rights and obligations contained therein.
- Develop strategies for winning work (RFP's, negotiations, contract awards).
- Define and evaluate the different forms of organizational structure.
- Select a business structure and collect appropriate legal documentation.
- Determine applicable taxes, licenses, and permits for the business.

4. Operating Procedures

Goal: The student will describe the internal operations and management for the enterprise and develop operating policies to guide operations.

Objectives:

- Describe how the business will work on a daily basis, including hours of operation, flow of work, and functions that must be accomplished.
- Describe how the product is produced.
- Develop draft operating policies for the enterprise which address: personnel, customer relations, purchasing, inventory control, facility maintenance, and collection.
- Determine the environmental impact the business has on the community and how the enterprise will deal in a responsible way with any potential negative impact.

5. Location and Layout

Goal: Student will develop a space plan for the facility, including display of any products.

Objectives:

- Develop a facility layout for the enterprise.
 - Describe advantages and disadvantages of the facility.
 - Renovations and Capital Equipment
- Goal: Student will identify equipment and facility up-fit needed to operate the business.

Objectives:

- Identify office and operating equipment costs and sources needed for your business.
- Determine supply needs for the business, including costs and sources.
- Design plans for renovations and/or modifications to equipment and facility.

6. Taxes, Licenses and Insurance

Goal: Student will analyze inherent risks, determine required licenses and permits and identify the tax reporting liabilities for the business.

Objectives:

- Understand liability issues affecting your customers, suppliers, and employees; identify ways to minimize risks.
- Show that operating personnel policies are consistent with federal, state and local laws.
- Identify the licenses and permits required to legally operate.
- Identify the tax reporting requirements for the business and a plan to meet the filing deadlines for federal, state and local laws.

7. Key People

Goal: Student will determine needs for key support professionals and describe their role.

Objectives:

- Determine how and when to use an accountant, lawyer, banker, insurance agent, or other business advisor.
- Identify support professionals needed and the costs for their service

F. Financials

Goal: The student will learn to accurately predict and describe the start-up costs, ongoing operational costs and revenues of the enterprise.

Objectives:

- Determine the start-up and operational expenses based on the operational plan. .
- Develop monthly revenue projections based on the enterprise's marketing plan.
- Create and manipulate cash flow statements for the first three years of operations.
- Create and manipulate break-even analysis for the business.
- Create detailed financial assumptions for the cash flow statement.
- Prepare a personal financial statement for the owner including a personal budget.
- Identify funding needs of the business, evaluate alternative funding sources and develop funding strategies.
- Create a plan for accomplishing the ongoing financial tasks of the business.
- Identify potential "pitfalls" that would negatively impact the financial condition of the business.

G. Executive Summary

Goal: Student will summarize main points of the business, including purpose, goals, legal structure, start-up costs, funding requirements, and profit potential.

Objectives:

- Summarize the basic characteristics and history of the business.
- Identify funding needed to start the business.
- Identify the owner's investment and/or collateral.
- Describe why this is a feasible venture for the owner.

IV. Producing the Business Plan

Goal: Student will assemble comprehensive business plan, receive feedback, learn to revise and refine his/her work, and learn to communicate in an effective and professional manner when making presentations.

Objectives:

- Assemble and write *Products and Services* section of plan.
- Assemble and write *Marketing* section of the plan.
- Assemble and write *Operations and Management* section of plan.
- Assemble and write *Financial* section of plan.

Preparing the Entrepreneurial Technician

- Assemble and write an *Executive Summary*.
- Assemble supporting documentation in *Appendix*.
- Prepare a cover page and table of contents for the plan.
- Obtains constructive feedback from a variety of sources.
- Makes corrections/changes to the plan as needed.
- Identify areas of improvement for the business plan.
- Prepare and deliver an oral presentation to an audience and respond to questions.
- Develop “to do” list of activities necessary to open the business.

Appendix B

Simulated Enterprises: The EUROPEN Approach

The European Practice Enterprises Network (EUROPEN) is a novel business training and education approach that began in Germany over 30 years ago. It is based on the concept of creating and running practice firms to simulate the operations of real companies. However, instead of using techniques such as case studies and role-playing, the practice firms trade with each other. Each firm in the network is also assisted by a “real” local mentor company whose products and services the practice firm silhouettes.

From 1993 through 1997 EUROPEN functioned as a European project and involved over 1,500 Practice firms in 15 European countries. In January 1998 the organization began operating as a non-profit association and expanded its reach beyond Europe. At present over 2,500 firms from 30 countries are involved in the training program.

Target groups for students vary according to each country’s national and regional training objectives. At present, target groups include unemployed people (long-term and new entrants), students, women returning to work, disabled people and those on income support. The kinds of organizations that use/sponsor this approach include vocational institutions, universities, colleges, high school, and real companies. The practice firm program for each country is guided and supported by a Central Office that supports the network of firms and supplies business services. The National Central Offices in turn are members of the trans-national support network called EUROPEN.

Outcomes

The intended training outcomes once again vary according to each country and central office’s training objectives and needs. In general the practice firm program provides, extends, and consolidates professional knowledge and skills for anyone seeking a business-related career. The service is used as a substitute for hands-on training, to enrich a theory-based training course, or as “real life” training within the private sector. Finally, this approach is also intended to benefit the participating local mentor companies.

Upon completing their practice firm work, trainees/students will have developed or improved their inter-personal skills, business administration and planning skills, customer service skills, and their own key skills within a particular business area. In addition, participants can improve their multi-disciplinary qualifications across a number business functions and activities including:

- Marketing
- Sales
- Travel
- Distribution
- Purchasing
- Customer Service
- Finance

- Information Technology
- Export
- Personnel
- Reception
- Languages Skills

In some cases, participants are trained toward more formal standards such as General National Vocational Qualifications and National Vocational Qualifications. The range of anticipating outcomes for mentor companies include:

- Reduced recruitment costs
- A ready trained workforce
- Enhanced marketing in participating EUROPEAN countries
- A test bed for new or improved products, procedures, and techniques
- A practical way to support the community
- Good public relations opportunities

Characteristics

Important characteristics of the training approach include:

- Learning that is experienced as a natural process through interaction
- Problem solving through working in teams in which knowledge and know-how are shared to achieve common goals
- Key skills are experience and practiced
- Participating in a comprehensive and dynamic business operations experience
- The opportunity to experience real events while allowing participants to make mistakes and to learn from these mistakes

Launching the Program

The kinds of organizations that use/sponsor this approach include vocational institutions, universities, colleges, high school, and real companies. The participating institution begins by determining which students/trainees would benefit by working in a practice firm. Normally 10 to 15 participants are sufficient to run a firm. The participating institution then sets up the firm or several firms usually with the help of another Central Office. Practice firms then start using the services of foreign Central Offices. Once 6 to 10 practice firms are up and running the country in question is usually in position to set up its own Central Office. The practice firms begin trading on an international basis and the new Central Office is in contact with foreign Central Offices. The new Central Office can then apply for an associate membership in EUROPEAN which in turn votes on acceptance or rejection of the application. After a year the associate member can apply for full membership. The program operates at three levels: the practice firm, National central office, and EUROPEAN.

The practice firm is a company set up by students/trainees with the assistance of staff or trainers to simulate commercial activities. Practice firms function like “real” businesses only they cooperate with other Practice Firms in a closed network. Each Practice Firm purchases, produces, and sells a specific range of goods in a fictitious market. The customer who are buying the

goods are the participants in the network (including the Central Office). All “employees” in the Practice Firms receive salaries, which must be spent within the network in order to make the economic circulation function.

The central office is A national central office has four main functions:

- To facilitate the development of Practice Firms throughout the country
- To provide training and support for new practice firms
- To develop active trading links between its practice firms and practice firm networks in other countries
- To provide a range of business services to the Practice Firms in its network.

The business services function at the Central Office provides the enabling support for the entire network. The services are typically divided into the following areas:

- **State:** The Government, the Country (customs and excise)
- **Bank:** The financial sector (banks, credit providers)
- **Register:** The legislative and judicial powers (registrar of companies)
- **Post Office:** Postal and telecommunications services (ordinary and electronic mail services)
- **Market:** Regulates and guides daily trade (acts as a buffer, buys goods, organizes trade fairs)
- **Information:** Information services (courses and seminars and sends out news, publications)

EUROPEN is the international support network, co-ordination center and information platform. Its membership is comprised of the national Central Offices. Practice Firms that wish to engage in international trade are members of EUROPEN through their national central offices. The organization’s responsibilities and duties include:

- Coordinating the work which is necessary for the practice firms market to function
- Helping set up Practice Firms and Central Offices in other countries
- Monitoring, together with the member Central Offices, the educational system, the economy, and the legal regulations in member countries and disseminating this information
- Promoting the network and Practice Firm concepts
- Fund Raising for the network
- Developing common world-wide standards
- Publishing the *EUROPEN Bulletin* to inform Central Offices, Practice Firms, trainers, and other interested parties on developments in the practice enterprises market
- Offering a clearing house service that allows Central Offices to send their Practice Firms data to a server and at the same time to receive all the updated Practice Firm data from all other countries (international bank transfers are also done automatically via this server)

The EUROPEN Practice Firm as a model for an Entrepreneurial Electronics Technician’s Program

More Diligence is Required. More detailed information is needed before an informed judgement can be made on whether it is advisable to link the ETC in some way to EUROOPEN or to use the basic EUROOPEN framework but adapt to fit more closely with ETC goals, objectives, and pedagogy. Though even in the latter case, a productive link to EUROOPEN might be possible.

There is already a EUROOPEN U.S. presence. A Practice Firm network and Central Office was established in 1996 in New York City. The network, which was created and sponsored by the Board of Education of New York, began with seven practice firms but planned to quickly expand. In this regard, if the ETC is interested in assessing the applicability and potential value of the EUROOPEN practice firm network as an entrepreneurial training approach for electronics technicians, it might want to begin by contacting EUROOPEN to

- gather information on lessons learned and on possible links between ETC initiatives and EUROOPEN, especially the U.S. Central Office;
- determine if its Practice Firm networks are already using “world-wide” skill standards for electronic technicians ;
- determine what electronics firms and companies that require electronics components as inputs are already trading within EUROOPEN’s group of over 2,500 Practice Firms; and
- explore the EUROOPEN approach (if any) to the business start-up process.

EUROOPEN: Apparent Disadvantages as an ETC Model or Partner

At first blush, from the ETC perspective, the EUROOPEN practice firm network appears to have two disadvantages.

- Because EUROOPEN practice firms “shadow” real mentor firms, there appears to be little emphasis placed on the business start-up process. While there is certainly some organizational work involved, for the most part it appears that EUROOPEN firms begin as fully functional companies so that they can operate along side their “real” mentor firms.
- As evidenced in the “Outcomes” section of this document, The EUROOPEN practice firm network apparently emphasizes training and skills development in “non-manufacturing” commercial activities (marketing, purchasing, personnel, etc.)

These apparent disadvantages together suggest that a good portion of the following manufacturing entrepreneurial skills, experiences and decision-making issues would not be addressed by student/trainees in a typical EUROOPEN practice firm experience. The following is intended as a representative but not comprehensive list:

- Research and development project planning and performance
- Product and prototype design and development
- Beta testing
- Business start-up and/or product financing means and methods
- Company organization, ownership and structure alternatives
- Intellectual property management and protection
- Key personnel recruitment
- Market analysis
- Plant and equipment investment decisions (including lease/buy)
- Initial price-points analysis and pricing strategies
- Production and quality control development and management

- Establishing initial distribution methods and channels
- After-market service and maintenance

EUROPEN: Apparent Advantages as an ETC Model or Partner

With over 2,800 firms and at least 28,000 individual practice firm employees with salaries to spend on goods and services in this “market,” EUROPEN could be a valuable resource to support a project to plan and launch a business that involves electronics technicians and other students in manufacturing-related training programs. Some possibilities include:

- Within the ETC it might be feasible for electronics technicians students/trainees to go through the process of starting practice firms and then to trade within the EUROPEN organization either as a supplier of electronic parts, components and equipment to other firms or as a final goods producer.
- ETC could work with EUROPEN to develop an entrepreneurial training process within the EUROPEN practice firm approach and then become a EUROPEN participant.
- ETC could build a separate practice firm network program that leans heavily on the EUROPEN model but concentrates more heavily on manufacturing entrepreneurial skills development. The network could expand nationally and then internationally (as did EUROPEN) but focus exclusively on business start-ups, early stage operations and product improvement.

Appendix C

ELC 228: Programmable Logic Controller Applications

COURSE OUTLINE

Course Description:

This project-oriented course builds on the fundamentals of PLCs learned in ELC128. New PLC concepts will be introduced and explored through designing and integrating PLC based systems in the lab. New subjects covered will include the following: analog I/O handling, PLC Networking, process control and PLC system design practices. In addition to technical knowledge, this course will introduce entrepreneurial concepts by structuring projects in a team-oriented approach with an emphasis on project management, problem solving, and effectively documenting and communicating technical information. Upon completion of the course students should be able to demonstrate an understanding of how to apply programmable logic controllers to industrial control applications, and should have a basic knowledge of the skills and practices that go into developing a technical systems integration project from concept to factory floor.

Prerequisites: ELC 128 Intro to Programmable Logic Controllers

Course Objective:

The objective of this course is to instruct the student in the implementation of programmable logic controllers as used in automation and control applications in industry today. The course will familiarize the student with advanced concepts of PLCs and programmed ladder logic. Students will learn to interface the PLC with industrial control components and apply it to industrial control problems. Additionally, students will learn to work as a team to interpret project specifications, documentation and requirements, manage project resources, as well as design and implement a working PLC based manufacturing system.

Course Hours:

Lecture	Lab	Credit Hours
2	6	4

Text: *Programmable Logic Controllers* by Frank D. Petruzella

Instructor: Joe Looney, Phone: (828) 452-1411 Ext. 243 Email: jlooney@haywood.cc.nc.us

PLC Design Project 1

For the first design project the students will form 3- or 4- person project teams. The teams will act as system integrators faced with the challenges of costing, scheduling, developing and delivering a PLC based manufacturing system. The instructor will act as the customer, specifying the requirements for the system, periodically reviewing the team's progress and ultimately "buying off" on the finished system and taking delivery of it.

The manufacturing system to be developed will be a continuously-running conveying system capable of sorting parts into four different categories based on size and color. The system will also use digital readouts to display the parts count for each bin. The conveyor will stop automatically when any bin becomes full. The following is an outline of planned project activities:

Phase I: Communicate Project Requirements

1. The customer, (instructor), will deliver the technical requirements and specifications for the project to the student project team.
2. The team will be given time to review the specifications and prepare questions they may have for the customer.
3. The team will meet with the customer to ask questions about the project and make sure that both have a clear understanding of the final goals and requirements of the project.

Phase II: Develop a Proposal

1. The project team will write a proposal for the customer using the following steps:
 - A. Select mechanical and electrical components for the project based on the given requirements.
 - B. Draft a rough diagram of the system.
 - C. Identify the major tasks associated with the project, estimate the man-hours for each task and put together a schedule for the project.
 - D. Estimate the cost of the project based on the components selected and the projected labor.
 - E. Combine the information compiled in steps A through D into an informal proposal and deliver to the customer.

Phase III: Determine Team Member Responsibilities

1. The project team must decide how project responsibilities will be divided among individual team members. The team members may specialize by technical discipline, (electrical, programming, mechanical, technical writing), or may choose to work together on some tasks and separately on others.

Phase IV: Fabricate the system

During the remaining phases of the project the team must try to keep the schedule they have set for themselves. Brief, weekly meetings will be held with the customer to review progress.

1. Complete any necessary design details.
2. Procure all necessary parts.
3. Build and program the system.
4. Thoroughly test the system.

Phase V: Documentation

The team must deliver documentation with finished project, including the following items:

1. Operating instructions
2. Schematic diagrams
3. Program listings

Phase VI: Deliver the System

1. Deliver the system to the customer and give an oral presentation on how the system operates.
2. Discuss problems encountered during the project. What lessons were learned? How accurate were the initial labor estimates and schedule? Would the project have been profitable or not? What would the team do differently next time?

Schedule	Topic	Text
Week 1 (Jan 11)	Review PLC fundamentals	

	(Jan 13)	Sequencing and Shifting	Chpt. 12	
Week 2	(Jan 18)	MLK Day (No Class)		
	(Jan 20)	PLC installation	Chpt. 13	
Week 3	(Jan 25)	Review Project 1 requirements, organize Lab		
	(Jan 27)	Work on Project 1 Proposal		
Week 4	(Feb 1)	Work on Project 1 Proposal		
	(Feb 3)	Deliver Proposal, Assign tasks, gather parts		
Week 5	(Feb 8)	Work on Project 1 Fabrication		
	(Feb 10)	Work on Project 1 Fabrication		
Week 6	(Feb 15)	Work on Project 1 Fabrication		
	(Feb 17)	Work on Project 1 Fabrication		
Week 7	(Feb 22)	Work on Project 1 Documentation		
	(Feb 24)	Documentation/Delivery		
Week 8	(Mar 1)	Analog Signals		Chpts.10,14
	(Mar 3)	Closed loop control	Chpt. 14	
Week 9	(Mar 8)	Review Project 2 requirements		
	(Mar 10)	Work on Project 2 Proposal		
Week 10	(Mar 15)	Work on Project 2 Proposal		
	(Mar 17)	Deliver Proposal, Assign tasks, Gather parts		
Week 11	(Mar 22)	Work on Project 2 Fabrication		
	(Mar 24)	Work on Project 2 Fabrication		
Week 12	(Mar 29)	Work on Project 2 Fabrication		
	(Mar 31)	Work on Project 2 Fabrication		
Week 13	(Apr 5)	Work on Project 2 Documentation		
	(Apr 7)	Documentation/Delivery		
Week 14	(Apr 12)	PLC Installation Practices		
	(Apr 14)	PLC Troubleshooting		
Week 15	(Apr 19)	Spring Break		
	(Apr 21)	Spring Break		
Week 16	(Apr 26)	Lab		
	(Apr 28)	Lab		
Week 17	(May 3)	Lab		
	(May 5)	Reading Day		

Appendix D

Excerpted From Technology and Innovation in Two-year Colleges: A Report to the Alfred P. Sloan Foundation

1994

**ENTREPRENEURIAL TRAINING IN RURAL AREAS WEST VIRGINIA UNIVERSITY AT
PARKERSBURG AND SOMERSET COMMUNITY COLLEGE**

West Virginia University (WVU) and Somerset Community College (SCC) in Kentucky designed a program to serve unemployed residents of their respective regions. Their original

goal was fostering new manufacturing enterprises by identifying opportunities and training entrepreneurs in these distressed counties.

Review of IPED's Goals and Objectives

The goals of the IPED project were to:

- implement a regional strategy for assisting the long-term unemployed residents of economically distressed counties—assistance focused in three areas: to identifying emerging manufacturing opportunities, forming manufacturing start-ups, and acquiring the broad range of skills required to compete and survive
- foster a community-wide climate supporting the development and growth of small to medium-sized enterprises
- create an integrated curriculum linking community need and potential with entrepreneurial training
- add cross-training and networking related to the needs of small and medium sized enterprises to the entrepreneurial training program
- test the process and determine its value after screening and selection of participants to complete the curriculum

The IPED project has faced significant challenges stemming from the ambitious nature of its original design. First, training the target population—the long-term unemployed residents of economically distressed counties—and encouraging entrepreneurship is a difficult proposition, even under the best of conditions. Further, the circumstances in these regions are not favorable to dramatic change, given the culture of dependency, the limited education of the population, inadequate public and private resources, and a stagnating economy. By selecting this population, the project began with a group that has the lowest probability of success, in circumstances that are highly unfavorable.

Another goal of this project was to promote manufacturing start-ups. New manufacturing enterprises are very difficult to initiate—they seem to need a very special set of circumstances to thrive, and experts are only beginning to understand the environments which promote success. For example, research on manufacturing indicates that close to 60 percent of new firms are formed by individuals who leave existing businesses to open their own in a similar industry or market to the one they left. In many cases, new entrepreneurs rely on their former employers to provide them with work. This very clear pattern (which has been confirmed by a number of research studies), suggests that the best way to promote manufacturing start-ups is to work carefully within the context of the existing manufacturing community.

A sophisticated manufacturing base does not exist in this region, nor does a well-developed support structure that includes industrial extension programs. Therefore, the ability to work with the particular needs of manufacturing firms is limited. In addition, WVU and SCC have limited experience with entrepreneurship programs. Therefore, this goal, too, is very ambitious and created challenges for the project.

IPED staff has been forced to reevaluate the program's objectives, revising fundamental elements of the original design—including the target population—in order to demonstrate progress in the short term and to more realistically promote strategies that are likely to create a climate supportive of the long-term vision. By linking training of the long-term unemployed to new manufacturing enterprises, the accomplishment of either goal became difficult, if not impossible. Both organizations in this project have recognized the problems created by these particular goals and have adapted their efforts as a result. The reformulated goals seem to focus on a target population comprised of individuals who are both interested in entrepreneurship and have some potential to succeed (as indicated by their own motivation and conditions). In terms of new business ventures established, the project is now focusing on new businesses generally. This is an appropriate adaptation of the original goals of the program.

It is important to state that the original goals of the program have merit and should not be ignored altogether. However, they will require a more comprehensive and long-term enterprise development strategy. To develop and implement such a strategy requires a lot of difference elements, which must be gradually pieced together. Working with the long-term unemployed to promote entrepreneurship is a mistake; but rather that it should not be the short-term priority of a project with limited resources and a short time frame for producing results. With IPED's revised goals, the very first elements are being put in place by this project. The key to success in the long term will be to continue the present efforts and as those efforts slowly take root, begin to develop the other elements necessary to achieve IPED's goals.

Project Process

The project, as implemented in Parkersburg, West Virginia and in Somerset, Kentucky, has evolved a number of processes to achieve these objectives. Some of the mechanisms have been modified from their initial conceptualization in order more effectively meet the conditions in their respective arenas.

To be specific, WVU has started a entrepreneurial training program with a group of 12 highly motivated, street smart individuals who are being trained by a talented, experienced entrepreneur who is working hard to help his students succeed. Although the profile of the students does not match the project's original goals, and the firms they have started are not manufacturing enterprises, they are engaging in new business formation. What is taking place is similar to a seedling trying to sprout, and these activities need to be encouraged. This class must be provided a great deal of assistance to help each individual succeed, and the results they achieve should be showcased to others in the region. Then these "graduates" should be networked with other interested, prospective entrepreneurs with high probabilities of success. Slowly, and over a number of years a critical mass of entrepreneurs can be developed and the culture of the region will begin to change. Eventually, opportunities for the long-term unemployed will be created. The principles and approaches of networking are extremely relevant here. The two key pieces to the IPED program are a mechanism for identifying opportunities and entrepreneurial training.

Identifying business opportunities: The design of this project includes One perspective suggests that opportunity identification is the responsibility of the entrepreneur; that it cannot and should not be separated from the function of starting a business. From this position, opportunity identification methods should be taught to entrepreneurs as a part of their training

and the responsibility then left to them. A second perspective is less limited and recognizes that there are many sources of new ideas and opportunities. This view suggests that the function of identifying an opportunity can be separated from the function of capitalizing on that opportunity. The IPED project currently separates the activities. In Parkersburg, this element has been borrowed from an existing program at West Virginia University known as the Higher Education and Economic Development (HEED) program. It involves utilizing students at the university to engage in research in order to target areas of opportunity for entrepreneurs. In Somerset, a variation of this program was used. It has been formulated as an eight-week, non-credited course that includes economic development people as well as key individuals from banks and several other institutions in the community. Each session features a guest speaker and every participant is charged with visiting at least three manufacturing companies in order to identify business opportunities.

The West Virginia HEED yielded a great deal of background information about the existing economic activity within Pleasants, Roane and Jackson counties. However, the research methodology relies largely on secondary sources of information and contacts with knowledgeable economic development staff to identify thriving businesses that could possibly form the basis for industrial expansion. Although the information developed represents a solid foundation, it may not be sufficient to help identify opportunities for new manufacturing enterprises.

The ability to identify business or market opportunities is perhaps one of the most critical components of entrepreneurship. It requires a combination of solid information about customers, markets and industries; as well as insight into new possibilities for meeting existing needs in the marketplace or even new, yet to be expressed needs. The skills and talent needed to collect information and achieve new insights is not widely distributed; this is why successful entrepreneurs are so well rewarded and highly touted. The information required to spot such opportunities is almost never found in published data. The level of insight needed often requires a solid familiarity within specific industries (thus supporting the evidence that successful entrepreneurs typically have experience in the industry in which they have started their business).

While the HEED element of this project has an appropriate set of goals, it needs to be redesigned if it is to function effectively as a method of opportunity identification. There are a number of different options. The best source of new market opportunities is usually people who are already actively involved in that industry or business. The HEED program ought to conduct primary market research by working directly with firms in industries that they have identified as having some potential. The program has identified those industries for its rural counties, but now it must move to the next level by attempting to uncover specific profitable market opportunities within those industries. There is considerable research available on this topic, as well as individual and group idea generation techniques that can be used during this process. Opportunity identification the most challenging aspect of new business development. The activity of the HEED program is very positive, but it must push beyond what it has accomplished to move to a higher level of functioning. One suggestion is that a team of people work directly with existing manufacturing firms to identify new business opportunities and well as potential entrepreneurs within their firms that could take charge of any spin-offs that result. This strategy is not without its own set of challenges: fear of competition, inability to identify

new opportunities, and a lack of talent to serve as entrepreneurs and new business owners. If this strategy is pursued these challenges would have to be addressed and overcome.

Entrepreneurial training: West Virginia initiated its first entrepreneurial training program in September 1994 using a curriculum designed by the Rural Entrepreneurship through Action Learning (REAL) program which was adapted to fit their particular circumstances. This curriculum, utilized and tested in a number of locations around the country, seems to provide a very effective platform for training. The West Virginia program is taught by a former entrepreneur and business executive named Chuck Manninen. His experience and enthusiasm are extremely important elements of the training, as indicated by the reaction he inspires in the students.

The success of the training program in West Virginia was difficult to assess at the time of the fall site visit, because it was not completed until December. However, interviews with participants and observations of the class suggest that the program is likely to achieve its modified objectives of promoting entrepreneurship in this region, but concentrated on the service sector. The fourteen participants listed as their new enterprise goals: video production and editing; a catering service; printing and office support; gourmet gift shop; parking area maintenance; timber/land management consulting; warehouse storage; and a learning center. Although none is technically classified as manufacturing (with the exception of printing), some are direct support services for manufacturing sectors.

Both Kentucky and West Virginia originally expected to charge a fee of \$2,000 per student for the entrepreneur training. In both states this fee proved too big a barrier. The West Virginia group was forced to drop the \$2,000 fee for entrepreneurship training to \$150. Its redesign of the program, as well as use of other funds to help develop the curriculum, allowed the college to offer the course at a greatly reduced price. Somerset College's inability to reduce the fee substantially—which was fixed by the university—prevented it from filling a class with participants to test the program. It should be noted that a program from Hazard County, Kentucky, which served as a model for this effort, had a similar \$2,000 fee, which was paid for out of JPTA funds, but that option was not available in Somerset or Parkersburg.

Lessons

One of the primary lessons learned by the designers of this project is that the goals and objectives of a entrepreneurial development program must be carefully selected to fit within the target region's economic and social circumstances. In general, the two program components of opportunity identification and entrepreneurial training are needed in both Kentucky and West Virginia. However, the populations to which they should be targeted and the business opportunities on which they should be focused will be highly particular to each region.

The West Virginia program has made a series of appropriate adaptations that is allowing it to respond to its region's particular conditions. A longer-term strategy for enterprise development is beginning to emerge as a result of this project; although it is not clear whether this has been recognized or explicitly articulated.

In order to promote entrepreneurship on a wide scale and, in particular, in the manufacturing sectors, a number of changes will have to occur in the region. The necessary conditions do not currently exist, but part of the infrastructure necessary to bring these changes about has been put into place as a result of this program.

If IPED is seen as the first incremental step in a long-term evolutionary strategy and further resources are invested as new stages of development are reached (for example, a critical mass of new entrepreneurs is formed), then this program has the chance to make a significant, long-term impact. The key will be to explicitly articulate the vision that already exists in some vague form and to begin to share it with others and build support. The managers of this project have expressed a clear intention to continue with both the entrepreneurial training and the HEED project, even after the support for this program is exhausted.

¹ In the context of this report, entrepreneurs are individuals who will someday start and manage their own businesses, generally after a period of working as an employee of another company.

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