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ABSTRACT

Parnell's 1985 book, "The Neglected Majority," provided a conceptual framework for tech prep initiatives. By the late 1980s, 34 states had established tech prep programs patterned loosely after Parnell's 2+2 Tech Prep Associate Degree model. The federal government became a strong supporter of tech prep through the 1990 Perkins Vocational and Applied Technology Education Act. The fundamental components of tech prep are secondary-to-postsecondary articulation, integrated and authentic core curriculum, school-to-work opportunities, inclusive educational opportunities, outcomes-focused curriculum, and collaborative implementation. Among the main emerging tech prep models are the following: (1) pre-tech prep, which encompasses all 4 years of high school plus 2 years of postsecondary tech prep; (2) adult tech prep, which is designed for adults who are enrolled in two-year colleges but who lack adequate secondary preparation; (3) integrated tech prep, in which delivery of academic and vocational education is organized around broad career clusters; (4) work-based tech prep, in which the workplace rather than the classroom is used for student learning; and (5) the tech prep baccalaureate degree, which includes 4 rather than the conventional 2 years of postsecondary tech prep. (Contains 13 references.) (MN)

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## EMERGING TECH PREP MODELS: PROMISING APPROACHES TO EDUCATIONAL REFORM

Over the past decade, countless reforms have swept the country. Common to many of these reforms is the goal of better preparing students for "responsible citizenship, further learning, and productive employment" (National Education Goals Panel, 1991). Nearly all reforms focus on increasing the rigor of traditional academic subjects, yet few of these reforms seriously consider how school-based academic knowledge is linked to life outside of school. Newmann and Wehlage (1993) claim that "[school] work has no intrinsic meaning or value to students beyond achieving success in school" even with the most innovative reform programs. Consequently, these reforms give hope for better education to only a few—those most likely to succeed no matter how their education is reformed.

Tech Prep makes a different promise. It engages students who have been neglected by our nation's system of schooling and encourages them to aspire to further education and rewarding work. A fundamental underpinning of Tech Prep is the linkage of school-based knowledge to the broader context of family, work, and civic life. Increasingly, Tech Prep is recognized as an approach that can make education fulfilling for students and teachers alike, and motivate students to pursue their education and career goals.

With the federal Tech Prep Education Act in its third year, it is time to reflect on the evolution of Tech Prep. In this edition of *Centerfocus*, public policy linked to Tech Prep is discussed, fundamental components of any Tech Prep initiative are introduced, and five new models emerging from local innovative practice are examined. This article is intended to encourage educators at all levels to examine Tech Prep and consider its potential for reform within their local settings.

### The Origins of Tech Prep

Tech Prep emerged from early efforts to reform vocational education. The roots of Tech Prep can be traced to the late 1960s when a few states began encouraging articulation between high school and community college vocational programs (Dornsife & Bragg, 1992). In the early 1970s the federal government urged state education agencies to strengthen vocational education through secondary to postsecondary articulation and better connections between academic and vocational education (Dornsife, 1992a). Possibly related to these policies, but more likely due to our nation's steady economic growth, the decade of the 1970s was a time of expansion of vocational education, particularly at the postsecondary level (Cohen & Brawer, 1989).

In 1984, the National Commission on Secondary Vocational Education proposed numerous changes in vocational education and endorsed Tech Prep as a method to achieve better coordination between secondary and postsecondary vocational education (National Commission on Secondary Vocational Education, 1984). The Commission also recommended limited forms of academic and vocational integration in secondary schools—the infusion of more practical, work-relevant applications into academic courses and of more theory and academic content into vocational courses.

**The Tech Prep Associate Degree (TPAD) Model.** Parnell's book, *The Neglected Majority* (1985), provided a vision and conceptual framework for the development of Tech Prep initiatives. Parnell advocated high quality vocational education, applied academics, strong relationships between business and education, and increased emphasis on the two-year associate degree. He argued forcefully to refocus schooling to meet the needs of the "neglected majority" of high school students who would never obtain the baccalaureate degree. The 2+2 Tech Prep Associate Degree (TPAD) model was designed primarily to meet the needs of these neglected students. Secondary programs were to include applied math and science courses, literacy courses, and tech-

nical courses connected to career clusters. Postsecondary programs were for intense and specific technical specialization in careers such as nursing, electronics, computers, business, and agriculture. This combined secondary-to-postsecondary education was to culminate with a two-year associate degree.

**Early Tech Prep Implementation.** By the late 1980s, 34 states had established Tech Prep programs patterned loosely after the TPAD model (Tri-County Technical College, 1990). Yet McKinney, Fields, Kurth, and Kelly (1988) found that only about ten percent of all programs claiming to be Tech Prep contained the essential components of the model. Most programs were traditional vocational courses articulated between the secondary and postsecondary levels, the majority of which were using time-shortened or advanced-placement articulation agreements (Dornsife, 1992b).

Although rarely in compliance with the TPAD model, Tech Prep programs were reporting successes by the late 1980s. Prominent among these were initiatives in Richmond County, North Carolina; Warwick, Rhode Island; Portland, Oregon; and Pendleton, South Carolina (Dornsife, 1992b). Enthusiasm of educators involved in these programs encouraged others to consider Tech Prep as an option for vocational education. Some even began recommending Tech Prep as an avenue to comprehensive educational reform. With awareness of Tech Prep growing nationwide and reauthorization of the federal vocational education legislation imminent, a strong push for federal endorsement was made to guide the development of new Tech Prep initiatives.

### The Federal Role in Tech Prep

In the 1990s, the federal government became a strong supporter of Tech Prep. The Carl D. Perkins Vocational and Applied Technology Education Act of 1990 (commonly known as Perkins II) supported Tech Prep in two primary ways. Most significant of the two, the Tech Prep Education Act was passed as part of Perkins II to target public policy and funding toward im-

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plementation of local 2+2 Tech Prep. Second, Perkins II allowed states to use basic grant dollars to fund Tech Prep. In a more recent development, the federal government has expanded support for Tech Prep as one of several methods of improving the nation's school-to-work transition system. Pending action by the U.S. Congress, this newest federal initiative offers the potential for spreading the Tech Prep philosophy more widely throughout the nation.

**The Tech Prep Education Act.** The Tech Prep Education Act (Title III-E) defined a Tech Prep program as a combined secondary and postsecondary education program that—

(A) leads to an associate degree or two-year certificate;

(B) provides technical preparation in at least one field of engineering technology, applied science, mechanical, industrial, or practical art or trade, or agriculture, health, or business;

(C) builds student competence in mathematics, science, and communication (including applied academics) through a sequential course of study;

(D) leads to placement in employment.

By law, all local Tech Prep consortia are charged with addressing what is commonly referred to as the seven "essential elements" of Tech Prep. These essential elements are: 1) formal, signed articulation agreements; 2) a core of required courses in mathematics, science, communications (including applied academics), and technologies in the two years of secondary school preceding graduation and two years of higher education or at least a two-year apprenticeship following secondary instruction; 3) curriculum development; 4) in-service training for teachers; 5) training for counselors; 6) equal access for special populations to the full range of Tech Prep programs; and 7) preparatory services to help all populations participate in Tech Prep.

In Fiscal Year '92, \$63 million dollars were appropriated for the Tech Prep Education Act. Since that time, \$90 million have been distributed annually to the states for local Tech Prep

implementation. These federal funds are used by the states to establish Tech Prep consortia comprised of local education agencies and public or private higher education institutions that collaboratively develop and operate the programs. The impact of the Tech Prep Education Act has been unmistakable in stimulating the development of new Tech Prep initiatives. Since 1991, 850 local consortia have received federal funding for Tech Prep (Layton & Bragg, 1992). In Fiscal Year '93, the majority of these local consortia moved from planning to implementation.

### Fundamental Components of Tech Prep

As with any educational innovation, the concept of Tech Prep is changing as it spreads throughout the country. Beyond the federal and state influence, practitioners at the local level have a great deal of autonomy to develop Tech Prep to meet the needs of their students, faculties, employers, and communities. Sometimes these local needs provide the impetus for the development of new Tech Prep models. Local pioneering Tech Prep models embody fundamental components central to the overall Tech Prep philosophy. Often these fundamental components are a dramatic departure from current educational practice. In some situations, they reinforce systemic educational reform. These six components constitute the foundation for new Tech Prep models:

1. *Secondary-to-postsecondary articulation* is essential to create smooth transitions and reduce drop-out, failure, and costly inefficiencies for students. Articulation to the postsecondary level opens doors to a wide array of career fields and enhances upward mobility for students beyond what they could expect with only a high school diploma. Eventually, through formal articulation between secondary, two-year, and four-year postsecondary education, it may be possible to eliminate the "terminal" stigma of vocational education by documenting its developmental and lifelong nature, and its connection to other aspects of the total educational system.

2. *Integrated and authentic core curriculum* ensures progressively rigorous offerings and experiences for students in academics and broad career cluster areas beginning at the secondary level (or earlier) and proceeding to the two-year postsecondary level (or beyond). Building on horizontal and vertical curriculum alignment, the content—academic, occupational, and technical—is blended or merged in Tech Prep to create a highly motivational approach to learning.

3. *School-to-work opportunities* support learning through work-based experiences and offer opportunities to learn about and explore careers. These can occur in a variety of arrangements using structured individualized career plans; work-based learning experiences such as 2+2 youth apprenticeships or cooperative education; or in-school experiences structured around career clusters. The goal of this component is to link learning in the school setting to the workplace and community.

4. *Inclusive educational opportunities* are fundamental since the Tech Prep philosophy is that education must be accessible to everyone. To ensure this, preparatory and developmental experiences must be available to accommodate individual learner needs.

5. *Outcomes-focused curriculum* ensures that the graduates of Tech Prep have the skills, knowledge, and attitudes to be successful in attaining whatever outcome they choose, whether it be a two-year or four-year college education, immediate employment, or military service. To achieve these outcomes, Tech Prep utilizes outcomes assessments that are authentic and performance-based and promotes continuous improvement as a top priority of program evaluation.

6. *Collaborative implementation* creates shared responsibilities for Tech Prep among key groups (e.g., educators, students, parents, employers, community agencies, citizens) to ensure that the curriculum is relevant and well-supported. Enhancing student learning is the central focus of all collaborative implementation efforts. The formal consortium arrangement required by the Tech Prep Act is central to providing a foundation and network for collabora-



tion. It helps to solidify ownership for Tech Prep among key groups.

These six fundamental components are consistent with the conceptual framework created for Tech Prep by early leaders and with the essential elements in the federal Tech Prep Act. Given the growing consensus around these fundamental components (and recognizing that there are many additional components needed to support a successful Tech Prep initiative), it is important to understand how these components are carried out in practice.

### Emerging Tech Prep Models

A wide array of approaches to Tech Prep have developed since passage of the federal legislation. The following discussion introduces five Tech Prep models:

- Pre-Tech Prep
- Adult Tech Prep
- Integrated Tech Prep
- Work-Based Tech Prep
- Tech Prep Baccalaureate Degree

The table summarizes how these five emerging Tech Prep models exemplify the fundamental components of Tech Prep.

**Pre-Tech Prep.** A clear mandate of the Tech Prep Act is to develop programs with a 2+2 curriculum configuration. Unfortunately this design does not reach students who are in danger of dropping out of school earlier than the 11th grade. Recognizing the importance of this issue, some local consortia have decided to begin Tech Prep-like education prior to grade 11, thereby creating a 4+2 curriculum (i.e., all four years of high school plus two years of postsecondary education).

Many local Tech Prep consortia utilizing this "preparatory" or pre-Tech Prep model have committed to vertical curriculum alignment. The model relies heavily on enhancing teaching and learning by interdisciplinary, project-based curriculum and team-centered cooperative learning strategies beginning in the middle/junior high school years and sometimes as early as elementary school. Remedial education and support services are provided to help students improve their educa-

tional achievement. Early career awareness and exploration are also important elements. For example, students begin to connect their learning with work and the community through mentoring and "job-shadowing" experiences.

A program that typifies many of these components is located in Catawba County, North Carolina. Known as Mid-Tech, this program involves approximately thirty-five middle-school students and three faculty in a two-year school-within-a-school housed at the Catawba Valley Community College. The program offers integrated curriculum across all subjects, including rotation through six career areas. The program's goals are to help above-average ability, low-achieving students gain confidence in themselves, stay motivated to achieve in school, and see the potential of future educational opportunities and careers.

**Adult Tech Prep.** The Adult Tech Prep model is designed to meet the needs of the large and growing population of adult students enrolled in two-year colleges who have not had adequate secondary preparation. In one approach, known as the "bridge" program, adult students are assessed to determine their academic competencies and then placed in applied academics courses or advanced academic and technical courses of the two-year college.

A related approach to Adult Tech Prep was developed at Black Hawk College in Moline, Illinois. In this model, adult basic education (ABE) students complete the General Educational Development (GED) and then progress into two-year college classes alongside Tech Prep high school graduates (Schaad, 1993). Key courses in the program are applied academics, computer literacy, and job readiness. To further integrate the curriculum, this Adult Tech Prep model emphasizes the SCANS (Secretary of Labor's Commission on Achieving Necessary Skills) competencies and utilizes interdisciplinary projects. Overall, the program is intended to provide adult students with the opportunity to complete the GED, progress into college with

preferred credentials, and ultimately become successfully employed.

**Integrated Tech Prep.** For the past two summers NCRVE has conducted one-week professional development institutes to assist large urban schools and two-year colleges to implement integrated Tech Prep. These institutes have involved interdisciplinary teams of urban educators from 30 major metropolitan areas across the nation, including New York City, Chicago, and Los Angeles. The plans developed by these teams specify comprehensive academic and vocational integration as the core curriculum of Tech Prep.

Career academies and occupational clusters/career paths are frequently used as the model for integrated Tech Prep. Career academies are schools-within-schools that usually include four faculty members representing the academic disciplines of math, science, and English, and a specific career field. Virtually any occupation can provide the basis for a career academy that is articulated with secondary and postsecondary institutions. In the best of situations, a consortium can implement several career academies in different occupational areas, and these academies could be accessed by students located at any of the consortium's member institutions. In addition, academy faculty teams could include academic and vocational faculty from any of the consortium's secondary or postsecondary schools, thereby facilitating student transition from school to school, or to college.

In the career path model or career cluster approach, a consortium's member institutions and their faculties organize to deliver academic and vocational education around broad career clusters. Career cluster areas such as engineering and industrial technologies, environmental and life sciences, and health and human services link diverse faculty groups within and across a consortium. At the secondary level, these career clusters provide the context for learning academic and vocational subjects and enhancing career exploration opportunities. At the postsecondary level, selection of a specialty within an occupational cluster is necessary. However, even at this level, the

provision for understanding fundamental knowledge that spans a broad career cluster area remains important.

Oregon is the first state to implement the integrated Tech Prep model statewide by institutionalizing occupational clusters/career paths. In Oregon, eight broad career cluster areas have been designated to link academic and technical subjects across the entire curriculum (e.g., science and technologies, art and communications). An intriguing aspect of Oregon's approach is the use of these broad career clusters to bring together the theory and practice inherent in occupations requiring different levels of educational preparation, ranging from high school to advanced graduate study. Students in a particular cluster such as science and technology may seek careers in a whole array of occupations (e.g., maintenance, scientist, technician, engineer). By taking this approach, Oregon hopes to dismantle existing school tracks so tightly linked to economic strata and replace them with pathways based on related career strands.

**Work-Based Tech Prep.** Since its inception, Tech Prep has been primarily a school-based—school-to-college—reform. However, recent developments in work-based learning promise to make the relationship between education and employers much stronger—in effect, moving employers from the role of advisors to fellow educators. The new School-to-Work Opportunities legislation introduced by the Clinton administration offers the potential to create formal partnerships between education and business, industry, and labor to legitimize the work-based Tech Prep model.

In work-based Tech Prep the workplace is deliberately used for student learning. These programs are formal, structured, and strategically organized by instructional staff, employers, and sometimes other community supporters to link learning in the workplace to students' school-based learning experiences. Formal instructional plans directly relate students' learning activities to their career goals. Employer-sponsored mentors and coaches are essential to the model. Many work-based Tech Prep programs also incorporate

the following strategies: wages or stipends for students, formal assessment and certification of skills based on industry standards, recognized credentials of academic and occupational mastery for completers, and incentives to encourage business to participate. Examples of work-based opportunities that can fit this Tech Prep model are postsecondary/clinical experiences, 2+2 youth apprenticeships, formal registered apprenticeships, and cooperative education.

A consortium that has woven work-based learning into Tech Prep is located in Rockford, Illinois. Begun in 1990, this consortium launched an integrated Tech Prep program with interdisciplinary teams composed of school and college personnel. A local business, industry, and labor group played an active role in designing the core curriculum. Building on these partnerships with employers and support from the U.S. Department of Labor's Bureau of Apprenticeship and Training, the consortium has enrolled a small group of high school students in youth apprenticeship programs at manufacturing sites provided by two of the sixteen firms that support the program. Eleventh grade students who complete the program receive a scholarship based on performance, and twelfth grade students are paid for four hours of their school/work day. Students who complete the course earn nearly one-quarter of the hours toward a journey person's card in a machinist occupation.

**Tech Prep Baccalaureate Degree (TPBD).** The TPBD model designates the associate degree as the preferred credential for Tech Prep. Although the Tech Prep Act endorses this requirement, it also encourages local consortia to develop programs that require the associate degree as a midpoint in ultimately attaining the baccalaureate degree. Unfortunately, most local Tech Prep consortia have had difficulty articulating Tech Prep with baccalaureate-degree programs, and universities in many states have failed to modify admission requirements or curricula. The unwavering devotion of these institutions to traditional academic preparation has made this level of articulation

nearly impossible in all but a few states. Minnesota is one of the exceptions.

The Minnesota technical college system and the University of Minnesota are developing an applied-baccalaureate program in engineering technology to create a Tech Prep Baccalaureate Degree (TPBD). Still in its infancy, this model is capturing the attention of educators because it offers hope for transforming applied-associate degree programs currently thought of as "terminal" into viable transfer programs and expanding postsecondary occupational-technical transfer programs far beyond what is available today. A key focus of TPBD is an inverted curriculum design based on an integrated curriculum involving hands-on technical courses and related academics at the technical college level, and more abstract theoretical courses and other general education requirements at the university level.

Although this curriculum approach may seem backwards to some—and is certainly contrary to the conventional wisdom of teaching theory before practice—the approach is gaining favor from such unexpected places as traditional four-year engineering curricula. In a recent article entitled "Why Integrate Design?," Peterson (1993) indicated that some engineering faculty may see the integration of theory and practice at the beginning of the curriculum as intruding upon "traditional sacred ground" (p. 28). Yet he defends the approach as a way to build upon students' previous learning experiences and facilitate cooperative learning and creative problem solving throughout the curriculum. In addition, the long tradition of four-year schools using cooperative education and professional/clinical experiences provides a logical base for providing work-based learning in the TPBD model. Use of this model in other career fields such as health, business, and agriculture—where transfer from two- to four-year college already occurs at a relatively high rate—is a logical next step for wide-scale application of the TPBD model.

*Key Features of Tech Prep Models on Six Fundamental Tech Prep Components*

<b>Tech Prep Model</b>	<b>Articulated</b>	<b>Integrated &amp; Authentic</b>	<b>School-to-Work Connected</b>	<b>Inclusive</b>	<b>Outcomes-Focused</b>	<b>Collaborative</b>
Pre-Tech Prep	Formal agreements elementary to secondary to postsecondary	<ul style="list-style-type: none"> <li>• Interdisciplinary, project-based</li> <li>• Team-centered cooperative learning</li> </ul>	<ul style="list-style-type: none"> <li>• Career awareness</li> <li>• Mentoring</li> <li>• Job shadowing</li> </ul>	All students beginning in elementary or middle/junior high	Academic achievement & continuation in school	Collaboration to align and reform curriculum
Adult Tech Prep	Transition support from GED to postsecondary	<ul style="list-style-type: none"> <li>• TPAD-type curriculum with SCANS</li> <li>• Interdisciplinary, project-based</li> </ul>	<ul style="list-style-type: none"> <li>• Supplement adults' regular employment with work-based learning</li> </ul>	Provides access so non-traditional adult students can join all others in Tech Prep	<ul style="list-style-type: none"> <li>• Program completion &amp; employment</li> <li>• Individual assessment upon entry and exit</li> </ul>	Collaboration to develop and support non-traditional adult students
Integrated Tech Prep	Formal agreements secondary to postsecondary	<ul style="list-style-type: none"> <li>• Career academies</li> <li>• Occupational clusters/career paths</li> <li>• Authentic instruction</li> </ul>	<ul style="list-style-type: none"> <li>• Career awareness and exploration</li> <li>• Internships</li> <li>• Mentoring</li> <li>• Integrated work experiences</li> </ul>	All students	<ul style="list-style-type: none"> <li>• Academic &amp; technical attainment, further education, &amp; employment</li> <li>• Authentic assessment &amp; prog. evaluation</li> </ul>	<ul style="list-style-type: none"> <li>• Interdisciplinary/stakeholder teams</li> <li>• Formal partnering with B/I/L</li> </ul>
Work-Based Tech Prep	Formal agreements secondary to postsecondary	<ul style="list-style-type: none"> <li>• Career academies</li> <li>• Occupational clusters/career paths</li> <li>• Authentic instruction</li> </ul>	<ul style="list-style-type: none"> <li>• 2+2 youth apprenticeships</li> <li>• Cooperative ed.</li> <li>• Prof./clinical experiences</li> <li>• Formal apprenticeships</li> </ul>	All students	<ul style="list-style-type: none"> <li>• Academic &amp; technical attainment, further education, &amp; employment</li> <li>• Assessment and certification of industry standards</li> </ul>	<ul style="list-style-type: none"> <li>• Interdisciplinary/stakeholder teams</li> <li>• Formal partnering &amp; financial support from B/I/L</li> </ul>
Tech Prep Baccalaureate Degree (TPBD)	Formal agreements secondary to 2-year and/or 4-year postsecondary	<ul style="list-style-type: none"> <li>• Inverted curriculum design at postsec. level</li> <li>• Cooperative learning</li> </ul>	<ul style="list-style-type: none"> <li>• Cooperative education</li> <li>• Prof./clinical experiences</li> </ul>	All students	Baccalaureate degree attainment & employment	<ul style="list-style-type: none"> <li>• Collaboration to align and reform curriculum</li> <li>• Formal partnering and support from B/I/L</li> </ul>



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## Implications for the Future

Tech Prep offers a distinct alternative to educational reforms focused exclusively on traditional academic content and school-based teaching for college-bound students. It includes students neglected by other educational reforms, engaging them in learning that is grounded in family, work, and civic life. Such fundamental components as formal articulation, integrated and authentic core curriculum, school-to-work opportunities, outcomes-focused curriculum, inclusive educational opportunities, and collaborative implementation can provide a sound basis for defining and assessing the Tech Prep models that are bound to emerge in the future. Whether it is Tech Prep for the very young, the neglected majority in high school, or non-traditional adults, or whether it is based on an integrated, work-based, or baccalaureate-focused approach, Tech Prep can be an important vehicle for reforming education. It may prove to be the "real world" reform needed to reach our nation's goal of preparing all students for responsible citizenship, further learning, and productive employment in our economy.

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