# A Working Model for Student Success: The Tennessee Technology Centers

## Preliminary Case Study

### A report commissioned by:

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***"…I want my brother to get his GED and come here. If he does, he'll be the first male in my family in five generations to get out of high school and into a college like this..."***

*Renata, Automotive Technology Student, TTC, Dickson, Tennessee*

**Introduction:** This is a report about a unique postsecondary education system, the Tennessee Technology Centers – a statewide system of 27 institutions providing a wide range of rigorous, one to two year, technical/occupational education programs at consistently high completion and placement rates in high skill and relatively high wage employment.

This is not an evaluation or formal outcomes assessment of the system or any of the individual Technology Centers.[1] Instead, this report describes how the Centers are organized, how they operate, and how they are able to achieve completion rates far higher than their counterparts among community colleges in Tennessee and around the nation.

The education model represented by the Centers contrasts sharply with how conventional postsecondary education – especially public community colleges – has been organized. This model also produces very different results, particularly in terms of the rates of student success in completing their programs. This assessment how this occurs seems particularly timely given the rising concern that community colleges, as the nation's main postsecondary vehicle for workforce education, are failing unacceptably large numbers of people who simply do not complete their programs.

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[1] Almost all the statistical references or citations in this report come from various reports of the Tennessee Higher Education Commission (the coordinating body for Tennessee higher education) and mainly the *Statutory Data Reports* and *Higher Education Fact Book, in* www.state.tn.us/thec/Legislative/Reports.html. Other sources are cited where necessary. See also, the Tennessee Board of Regents at www.tbr.state.tn.us for more information on the Centers and the Board of Regents.

A review of IPEDS data reveals that of 1,145 two-year, public postsecondary institutions in U.S., only 105 (about 9 percent) can report an average "150 percent of time" graduation rate above 50% for the last five years.[2] All twenty-seven Technology Centers are included in that group; during those five years the Technology Centers averaged above 70% completion. There is no other state postsecondary system that comes anywhere close to achieving these outcomes.

There are important lessons here, derived from consistently rigorous performance that can be traced back over several decades. Elements of this model and some of the Centers' practices offer concrete alternatives to the conventional forms of educational design and delivery that now characterize postsecondary education.

This report provides an overview of the Tennessee Technology Centers as a system and then examines four particular pieces of its highly integrated institutional framework – program structure; a competency-based, self-paced learning model; contextualized foundation skills; and supportive services. These pieces appear to be the critical underpinnings of the Centers' capacity to produce high rates of completion and placement. Throughout, the report emphasizes how these components fit together enabling the institution as a whole and the students within it to achieve rates of success found almost no where else in public postsecondary education.

To briefly summarize and preview what follows: Along critical dimensions of completion, employment, and satisfaction of students in their education, the Centers present a remarkably successful public educational institution. Our observations lead us to believe that much of the success of the Technology Center model lies in the ways its core organization allows faculty and staff to focus education and service delivery on student success. Its institutional framework of competency-based education, clock-hour format and self-paced learning facilitates this. Students are not passed from one class or instructor to another as they make their way toward completion—for the most part students have the same set of one or two instructors for the duration of their program. Students become well known to instructors because managing the mastery of competencies in a self-paced setting demands a very high level of faculty engagement. This engagement, in turn, supports a close, informed connection between students and faculty that is key to effective provision of student services--by both faculty and student service staff. The services are focused on enabling the student to complete a program and enter employment. Faculty and student services staff work together to monitor, intervene, and provide support to students; faculty and professional staff are mutually accountable for student completion and placement.

This organization of both the institution and the engagement of personnel across the institution seems to be the foundation of high rates of completion and placement in good jobs. But in addition, this institutional framework allows the instructors and staff to carry out their tasks with genuine care for students – many of whom come from generations of

[2]All Title IV-eligible institutions are required to report annually to the Integrated Postsecondary Education Data System of the Department of Education the number and percentage of first-time, full-time students who obtain a degree or certificate within 150 percent of the assumed program time.

poverty – and with considerable pride in helping these students enter and succeed in life transforming education.[3]

## Part 1: A state-wide postsecondary system for technical and occupational education: Tennessee Technology Centers

**History:** The Tennessee Technology Centers originated as secondary "Area Vocational-Technical Schools" under the State Department of Education (responsible for K-12 education) in the early 1960s. Over time they became predominately adult-serving institutions and in 1983 they were transferred to the governance of the Tennessee Board of Regents Renamed and reorganized in 1994 as the Technology Centers, 27 institutions now operate across the state offering technical and occupational education programs ranging from newer fields like health information technology and computer information technology to more traditional occupations such as welding and precision machining. The Centers are distributed more or less evenly across the state so that no student need travel far from their home community to attend a center; although in practice some students will drive considerable distances to attend a center with a specific program they want.


Originally, Tennessee constructed facilities for all the centers with a similar building design and layout of generous shop spaces and a limited number of dedicated classroom space. Most centers are still free-standing facilities though some are located nearby to or on the grounds of community colleges or larger high schools. From the beginning, the Centers were designed to focus on hands-on learning and applied skills; the Centers strive to maintain this tradition even as technology and some fields have changed dramatically and require different kinds of physical learning spaces.

[3] The summaries, observations and reporting on the Centers and all quotations or attributions come from interviews with students, faculty, administrators, members of advisory committees, and public officials collected during site visits to seven different Centers and the TTC's central office at the Tennessee Board of Regents in Nashville in March, 2010.

The Tennessee Board of Regents has oversight over the Centers, the state's 13 community colleges, and six state universities (see Map Above). Unlike some states that have integrated technical and occupational education into community colleges, Tennessee has maintained an operational distinction between technical and occupational education, represented in the Technology Centers, and two-year community colleges. The Technology Centers are the smallest component of the Board of Regents with just 7% of the state's total FTE enrollment in public postsecondary institutions, including the University of Tennessee. The state's thirteen community colleges have a far larger FTE enrollment than the Technology Centers at 51,300 and 12,900 respectively in Fall 2008. Although the Centers have features very distinct from two or four-year institutions, common governance under the Regents places the Centers firmly within the postsecondary resources and organizational framework of higher education in Tennessee.

**TTC System:** The leadership of the TTCs is at the Vice Chancellor level of the Board of Regents. The TTC system is described by its Vice Chancellor, James King, as a 'system within a system.' While the Centers are overseen by the Tennessee Board of Regents as a component of the state's higher education system, the centers also maintain a distinct mission and collective institutional identity. Operations and management of each TTC is coordinated through the vice chancellor's office and a professional staff of six focusing on finance, operations, and instruction.

A major function of the central office staff is system coordination among the centers to achieve a high level of consistency in program organization, new program approvals, content, quality control, and communications. Part of this is driven by accreditation, [4] but a larger part is driven by a long-standing culture of sustaining a single mission for technical and workforce education. The current leadership of the system encourages collaboration and communications among centers and this serves to increase their cohesiveness as an educational institution. The entire institutional staff – some 800 employees – meets together semi-annually to review curriculum, meet new staff and faculty, share instructional techniques, and review new policy and procedures.

***Tennessee Technology Center Mission:*** *The Tennessee Technology Center continues to serve as the premier provider of workforce development throughout the State of Tennessee. The Center fulfills this mission by:*

- *Providing competency-based training of the highest quality that will qualify individuals for employment and or advancement in jobs.*
- *Providing high quality training and retraining of employed workers.*
- *Providing high quality training that is economical and accessible to all residents of Tennessee, thereby contributing to economic and community development of the communities we serve.*

[4] Despite being a somewhat centralized system, each Center in the system is accredited separately by the Council on Occupational Education; itself a split-off of the Southern Association of Colleges and Schools. The Council primarily accredits proprietary colleges of technology, public colleges of technology nationally and internationally.

Faculty groups meet quarterly to share curriculum and technology. Directors meet monthly. In conjunction with the service orientation of the institutions, this vertical and horizontal communication leads to a remarkable clarity and coherence among the Centers' staff as to their purpose and measures of success. There is unanimity about the mission of the Centers in helping people get the education they need to obtain good jobs in Tennessee.

An important aspect of the Technology Center's coherence is consistency in the content and organization of the different program curricula. Center directors estimate that program content and services are about 85 percent consistent across the Centers but each Center also has program flexibility to meet local labor market and community needs. Joint faculty and administrative committees in each program area drawn from Centers across the state are responsible for maintaining program curricula content, updating and changing the curricula and professional development for faculty within programs. In most respects, the competency and curriculum development process at the Centers is not unlike the formal processes of curriculum development and curriculum updating at other postsecondary institutions. To make major changes in existing programs or to develop new programs, like health information technology, 'green' photovoltaic electronics and, and mechatronics, faculty committees from several centers will develop curriculum and update or identify new competencies. This work is vetted by employer advisory boards and academic committees, through several iterations, until it is ready for approval by the central office and submitted to the TBR and, if needed, the Council on Occupational Education.

While programs must be approved at the central office and the TBR and must meet requirements of the Council on Occupational Education's guidelines, there is considerable room for each center to offer concentrations and specialties within each general program. Some variation depends on the kinds of equipment and capacity each center maintains; other variation is due to local labor markets and employer characteristics. Adjustments to program content that do not change objectives, hours, or cost of tuition do not require approval beyond the TTC central office.

**Technology Centers and Programs:** Each Technology Center has a director, and most have an assistant director, as well as a relatively small administrative and student services staff. The Centers maintain a student to teacher ratio of around 20 to 1, although this will vary somewhat by program requirements, enrollment at any given point, and accreditation or certification requirements. Most programs at each center have one main instructor and many have one or more assistants. Health programs, however, because of their size and accreditation requirements may have several full-time and part-time instructors. Faculty, like that in many technical programs, is often drawn from industry and the professional fields; an increasing number of the faculty are themselves graduates of TTC programs.

The Centers serve a variety of populations seeking technical training and services related to career advancement in addition to those enrolling as either full-time or part-time diploma seeking students. With a reported headcount of 32,000 in 2009 and an 2009 FTE of 13,000, the Centers also serve a large number of people through training contracts with individual companies that enroll employees in short term skill improvement programs and professional certifications that are offered through the Centers; included in the overall

enrollments are non-diploma students seeking skills improvement or a professional certification and adult basic education.

Each Center is accredited by the Council on Occupational Education as a clock hour educational program, meaning that programs are measured in the overall estimated amount of time a student will spend in a whole program or total hours for program units. Clock hour accreditation enables the Centers to deliver programs in ways that are strikingly different than are typical in postsecondary education. Students enrolled full-time in a Center program attend approximately 30 hours per week, five days per week, or 432 hours in each trimester, which is the academic calendar organization for all the Centers. In general, full-time students attend programs about six hours per day each week for between 4 and 20 months depending on the total estimated clock hours for the specific program; some day part-time programs and evening programs operate about three hours per day. Most programs at the Centers are between 1292 and 2160 clock hours or three to five trimesters. In other words, attending a Center program is roughly the equivalent of holding a full-time job of going to school for the duration of the program length.

This program structure offers students an intensive experience of being in a program with other students and faculty for a large part of the day. In addition, the total number of hours spent in a program can total *far* more direct contact hours focused on a technical subject than would be experienced in an Associates degree program in a community college. This is a fundamental and significant difference between a clock hour program and conventional degree program and leads to a series of important differences in student experience. The impacts of this structure on student experience and implications for completion are discussed in greater detail in section 2.A below.

With about 13,000 FTE students enrolled in certificate or diploma programs spread across 27 centers, it is clear that centers are generally modest sized. Only eight of the centers have an FTE enrollment of greater than 500 students and the average FTE is 480 enrollments. Some of the smallest Centers, in rural areas, have as few as 200 FTE and the largest in urban areas have an FTE enrollment of just over 1,000. Center size is a function of funding, population, and labor market demand. Because some of the Centers operate in rural areas with low population and relatively few employers, their size is a reflection in part of the intent to closely match the number of graduates to existing demand for workers in a particular occupation. Directors of some smaller Centers, for example, reported that they could train many more practical nurses than at present but that there are only a limited number of jobs for LPNs in their communities. They assert that the goal of the centers is to help people obtain an education *and* a job; not only to train more LPNs.

Almost all the Centers report having more applicants than openings for popular programs in healthcare and technical fields such as industrial maintenance or computer information technology. In Shelbyville two particularly well-regarded programs—machining and computer information technology—have a combined waiting list of 300 applicants. It is not uncommon for the waiting lists of those expressing interest in enrolling for practical nursing at a medium-sized center to run to several hundred. The centers are now seeking ways to reduce the pool of people through greater selectivity.

The Centers are accredited to offer about fifty different programs that award certificates and diplomas across the state but not all programs are offered at each Center; in fact most offer just over a dozen or so. Programs at the Centers focus exclusively on technical and technology-based educational programming. The Centers do not offer liberal arts or science programming, with the exception of those science competencies required by health care programs. Several Centers have regional arrangements with either the local community college or their regional state university to offer general education courses at the Centers mainly for the convenience of students attending the community college or state university already.

In 2008, the Centers made 6,762 completion awards and 4,700, 70% of the total, were diplomas and the remaining 30% were certificates. Accreditation for diplomas requires the Centers to specify the total number of hours and competencies required to complete a program; this becomes the basis for receiving either a certificate or a diploma. Diplomas are awarded when students complete the full set of requirements and achieve passing grades and complete all the competencies specified in an entire program; certificates are awarded either for specific programs that do not grant diplomas (conventionally defined as less than 900 program hours) or a student can receive a certificate at a specific level of competency and at a specific exit points (see the discussion of program structure for more detail about exit points). Some programs, like automotive technology or cosmetology, allow a student to obtain one or more certificates at a certain number of clock hours or go on to fulfill all program requirements and receive a diploma. In this case, certificates become the equivalent of stackable credentials.

Generally, Centers offer about a dozen diploma and certificate programs with larger Centers offering a greater variety. The program mix depends on the characteristics of local employment demand and available facilities. Program content emphasis, including formal program concentrations, can vary somewhat among the Centers to reflect local the presence of major employers, input from the local Center's advisory councils composed mainly of employers, employment conditions and specific job requirements in the region as well as student choice. However, some traditional elements of academic prerogative also play here: although common text books and learning materials are suggested, faculty within a Center is free to use materials of their choosing that best, in their, view help students achieve the program competencies. Students in Drafting and Computer Aided Design Technology, at the Hohenwald Technology Center, for example, complete a basic program in drafting detail and CAD technologies and then have choices of specialties in architectural drafting, civil drafting, mechanical or structural drafting. The full program may take up to four trimesters totaling about 1728 hours. Students receive certificates in two basic areas and a diploma as the specialty area is completed. The same program at other centers has a somewhat different configuration; and although Centers offering this program all use the same basic software platforms students may also become familiar with systems in use by specific employers. Center directors and program faculty report that the flexibility of programs is important in being responsive to local labor markets and responsive to specific employers who will hire graduates.

Nearly all the centers are increasing their programming in a growing range of programs in health occupations focusing on local high demand jobs ranging from dental assistants to increasing demand for licensed practical nursing in hospitals or long term care facilities. For many years, the Technology Centers have offered practical nursing programs leading to licensure as LPNs. In 2008, just under 23% of the certificates and diplomas awarded by all the Centers went to students in Practical Nursing and the Centers produce about 95% of all practical nursing graduates in Tennessee.[5] Now as health care occupations have both increased in number and have become more specialized, the Centers have expanded their capacity and added occupational programs such as phlebotomy, medical assisting, surgical technology, etc. Several of these occupations, such as practical nursing and health information technology programs have accrediting standards that require both specific teaching practices, clinical experiences, as well as content identified in specific classes (like anatomy and physiology). This has resulted in some programs being offered on a fixed entry schedule and identification of units of study that are nearly the equivalent of distinct classes. The Centers have shown considerable adaptability in modifying its traditional program organization to meet standards that were designed around more conventional academic organization (credit hours) and class structure.

The table below, not an exhaustive list, lists those programs offered by the Centers that awarded more than 100 certificates and diplomas in 2008.[6]

**Table 1: Tennessee Technology Centers, Major Programs by Certificates and Degrees, 2008**

| Program | Certificate | Diploma | Total |
|---|---|---|---|
| Automotive Mechanics and Technology | 130 | 142 | 272 |
| Business Systems Technology | 267 | 463 | 730 |
| Computer Operations and Electronics Technology | 126 | 186 | 312 |
| Cosmetology and Aesthetician | 83 | 207 | 290 |
| Drafting and CAD Technology | 46 | 81 | 127 |
| Electronics and Electro Mechanical Technology | 77 | 104 | 181 |
| Heating Ventilation and Air Conditioning | 68 | 157 | 225 |
| Industrial Maintenance Mechanical and Electrical | 199 | 301 | 500 |
| Machine Tool Technology and Precision Metals | 159 | 173 | 332 |
| Nursing Assistant | 142 | 0 | 142 |
| Phlebotomy | 104 | 0 | 104 |
| Practical Nursing | 63 | 1324 | 1387 |
| Surgical Technology | 4 | 104 | 108 |
| Truck Driving | 83 | 224 | 307 |
| Welding, Brazing and Soldering | 133 | 149 | 282 |
| | | | |
| Source: THEC Statutory Data Report, 2009, combined placement tables. | | | |
| | | | |

[5] THEC, Statutory Data Report, 2009 and National Council of State Boards of Nursing, 2008 NCLEX Examination Statistics, Table 11.

[6] Appendix A provides a list of programs offered system-wide and gives a breakdown of certificates and diplomas and other completions in each area; this list gives a sense of the breadth of the Centers' programs and concentrations of enrollments.

**Tuition and Financing:** As the Centers transitioned from the K-12 system to postsecondary system, they began to charge tuition for programs and, once accredited and Title IV-approved, to offer financial aid. The Centers offer relatively low-cost tuition to students; tuition for each trimester of 432 hours is $800 and a majority of program tuitions are approximately $2,400 for three trimesters (12 months) with additional expenses for labs, books and materials. Tuition varies by program length and can be as high as $4,000 for some five-trimester diploma programs and as low as about $1,200 for certificate programs of less than two trimesters. Book and lab fees can increase attendance costs considerably and for some lengthy and involved programs, such as industrial maintenance, additional fees can nearly equal the tuition.

Most of the students have quite low incomes. Nearly 70% of the Center's students come from households with annual income of less than $24,000 per year and 45% report household income of less than $12,000 annually[7]. Thus, most students enrolling in full-time and part-time programs qualify for federal Pell Grants; many receive WIA support for costs of attendance.

In addition, over 70% of students attending the Centers qualify for Tennessee's Wilder-Naifeh Student Scholarships whose source is the state's lottery receipts. These grants are specifically aimed at students in the Technology Centers enrolled in full or part time program. With an upper limit of $2,000 annually, that grant alone can cover a significant amount of most tuitions. In 2008, about 11,400 students in the Centers received a Wilder-Naifeh Scholarship totaling about $12.25 million. At some Centers upwards of 90% of students receive the Wilder-Naifeh Scholarship and over 70% qualify for Pell Grants. Unlike similar grants for students in two and four year colleges, the Wilder-Naifeh grants do require students to maintain a minimum grade of 77% *and* require students to sustain a high level of attendance; this tends to encourage completion. Students who receive the Wilder Naifeh Grants tend to stay longer in their programs than non-recipients and have a higher rate of completion than non-recipients.[8] Finally, 74% of TTC students graduate with their scholarship intact; meaning they have met the grade and attendance requirements the entire time they were at the TTC.

Taken together scholarships and federal aid can often completely cover the basic costs of attendance including some costs related to attendance such as travel and childcare. This means the State of Tennessee is sustaining a commitment to offer virtually tuition-free postsecondary occupational and technical education to its poorest residents.

Interestingly, none of the Centers offer student loans for the costs of tuition or cost of attendance. One administrator described this policy as resting on the recognition that most of the students have lived with economic hardship most of their lives and that it was not in the interests of the students, the state, or the Centers to burden students with additional debt payment just as they were about to start building a career. With the availability of Pell Grants, Wilder-Naifeh Scholarships, WIA funding for supportive services, and other

[7] Tennessee Higher Education Commission, *Wilder-Naifeh Technical Skills Grant Program Report*, 2010.
[8] THEC, *Wilder-Naifeh Technical Skills Grant Program Report*, 2010.

sources of tuition support such as dislocated worker funding as well as private grants from local community foundations and funds, the Centers' financial aid staff go to extraordinary lengths to help package a full tuition and cost of attendance package for as many students as possible.

Not including these grants for tuition, the Centers' current share of the state appropriation for higher education is almost $51 million; this compares to $218 million for the state's thirteen community colleges. Relative to FTE enrollments, the Technology Centers receive an appropriation of $3,940 per FTE while the community colleges received a roughly similar $4,250. Per degree awarded, however, the Technology Centers received about $7,500 per certificate or diploma awarded in 2008/2009 and for the same period the community colleges received approximately $26,100 per degree awarded.[9] While state appropriations for the Centers have declined along with total spending for higher education in Tennessee over the last several years, there is strong legislative support for investment in the Centers and for improving the facilities. As recently as 2006, the Centers received a special appropriation of $18 million for new equipment and refurbishing labs, technology, and classrooms.

**Completion and Placement:** What makes the Centers all the more unique and especially interesting are the very high statewide completion and placement rates for graduates. For the system as a whole in 2009, the completion rate among the 9,000 enrolled students eligible to complete was 75% and the system-wide placement rate for those obtaining employment in their field of training was 83%. The Centers follow the Council on Occupational Education's definition of for placement as when a program completer obtains a job in the field for which they received training unless they enter the military or further education.

While completion and placement varies somewhat between each of the 27 centers, the range is generally between 75% and 90% for completions and between 75% and 95% for placement in a field related to the student's area of study. These rates can vary considerably because of several factors including program size (smaller programs can have relatively low or high completion rates due simply to the impact of small numbers), local employment conditions, and the nature of the programs themselves. Administrators report that placement rates, including some health care professions, have fallen over the last two years due to the downturn in employment that was felt in some fields in mid-2007.

**Table 2: 2007-2008 Overall Program Completion and Placement Rates**

| Technology Center | Calculated Enrollment* | Completed | Percent Completed | Completers Available for Placement** | Placed in Field of Training | Percent Placed |
|---|---|---|---|---|---|---|
| Athens | 159 | 145 | 91.2 | 140 | 122 | 87.1 |
| Chattanooga | 778 | 623 | 80.1 | 612 | 574 | 93.8 |
| Covington | 160 | 115 | 71.9 | 107 | 78 | 72.9 |
| Crossville | 272 | 195 | 71.7 | 190 | 139 | 73.2 |

[9] THEC, Higher Education Factbook, 2010. Pages 32, 33 and 50.

| Technology Center | Calculated Enrollment* | Completed | Percent Completed | Completers Available for Placement** | Placed in Field of Training | Percent Placed |
|---|---|---|---|---|---|---|
| Crump | 243 | 197 | 81.1 | 194 | 160 | 82.5 |
| Dickson | 433 | 267 | 61.7 | 252 | 196 | 77.8 |
| Elizabethton | 403 | 285 | 70.7 | 225 | 206 | 91.6 |
| Harriman | 163 | 107 | 65.6 | 100 | 90 | 90.0 |
| Hartsville | 170 | 126 | 74.1 | 122 | 102 | 83.6 |
| Hohenwald | 299 | 261 | 87.3 | 256 | 230 | 89.8 |
| Jacksboro | 138 | 111 | 80.4 | 104 | 86 | 82.7 |
| Jackson | 471 | 347 | 73.7 | 337 | 285 | 84.6 |
| Knoxville | 531 | 390 | 73.4 | 365 | 307 | 84.1 |
| Livingston | 282 | 217 | 77.0 | 208 | 158 | 76.0 |
| McKenzie | 227 | 156 | 68.7 | 142 | 109 | 76.8 |
| McMinnville | 188 | 150 | 79.8 | 128 | 98 | 76.6 |
| Memphis | 717 | 552 | 77.0 | 498 | 390 | 78.3 |
| Morristown | 510 | 386 | 75.7 | 363 | 336 | 92.6 |
| Murfreesboro | 293 | 208 | 71.0 | 204 | 153 | 75.0 |
| Nashville | 786 | 525 | 66.8 | 432 | 350 | 81.0 |
| Newborn | 168 | 148 | 88.1 | 135 | 107 | 79.3 |
| Oneida | 166 | 125 | 75.3 | 115 | 97 | 84.3 |
| Paris | 374 | 251 | 67.1 | 231 | 180 | 77.9 |
| Pulaski | 203 | 154 | 75.9 | 147 | 111 | 75.5 |
| Ripley | 143 | 115 | 80.4 | 107 | 94 | 87.9 |
| Shelbyville | 484 | 407 | 84.1 | 386 | 318 | 82.4 |
| Whiteville | 156 | 122 | 78.2 | 119 | 98 | 82.4 |
| Totals | 8917 | 6685 | 75.0 | 6219 | 5174 | 83.2 |
| | | | | | | |
| Source: THEC, Statutory Data Report, 2010, Table 14 | | | | | | |

*Calculated Enrollment is the difference between total enrolled during the period less students still enrolled. This is the definition developed by the Council for Occupational education.

**Completers available for placement are those that are not enlisted in the military or seeking additional education.

The Centers reported completion and placement rates are based on definitions supplied by the Council on Occupational Education and these are different than the calculations of completion rates for the state's community colleges. However, using the same IPEDS data on rates of completion for both Centers and Community Colleges comparisons of completion rates are striking. Using a five year average of first-time, full-time student completion rates, the TTCs show a completion for the Centers that range from a low of 62% in Memphis to a high of 94% in more rural McKenzie; for the community colleges the rates of completion are between 6% at Southwest Tennessee Community College and 13% at Walters State Community College.[10] In 2008, the comparable completion rate for all Centers was 70.1% and 11.1% for all community colleges in Tennessee.

[10] This is a calculation of completion rates for first-time, full-time students at 150% (three years) of time to degree in a 2 year institution averaged over five years.

Graduating students are hired into jobs that generally pay above entry-level wages for their communities. Although reliable wage data for placement is not really collected by the central office student information system, individual centers collect wages at placement reported by either students or employers. Wages at placement, see table three below for example, suggest that students enter relatively highly paid positions at above entry level wages within their fields.

A common issue among occupational and technical programs is that students, who are attending programs in order to obtain employment in the first place, are offered good jobs in their fields before graduation. Often, in community colleges, similar students often do not finish coursework or persist to graduation. At the Centers, faculty will create externships with employers and students so that the student can continue to document and achieve mastery of the competencies required in order to graduate with a diploma or certificate. Faculty is required to maintain contact with students and employers throughout the externship. Most centers provide this option to students in most programs when a student is offered the chance for employment in their field; however, the scale of usage depends on the local economy and hiring demand.

In table three, below, from the Center in Knoxville, students or employers reported the starting wages in the following selected occupational programs for students in 2008:

**Table 3: Selected Program Placement Rates and Mean Starting Wage at Placement in Knoxville, 2008.**

| Program, Knoxville | Program Placement Rate | Mean Starting Wage |
|---|---|---|
| Automotive Technology | 100% | 12.80 |
| Business Systems Technology | 95% | 10.39 |
| Cosmetology | 75% | 11.81 |
| Dental Assisting | 86% | 12.66 |
| Drafting | 78% | 11.83 |
| Heating Ventilation Air Conditioning | 67% | 15.20 |
| Industrial Electricity and Electronics | 91% | 13.11 |
| Industrial Maintenance | 78% | 17.67 |
| Medical Assisting | 90% | 10.38 |
| Practical Nursing | 94% | 16.09 |
| Precision Machine Tool Technology | 100% | 13.03 |
| Surgical Technician | 100% | 13.02 |
| Truck Driving | 85% | 15.00 |
| Welding | 87% | 13.27 |
| | | |
| *Source: TTC Knoxville, 2009.* | | |

**Educational Rigor and Quality:** High completion rates and even high placement rates are not necessarily a sufficient

*A smaller-machine shop owner in Dickson said, "Its getting harder to hire people with the skills they need to do the job…but these [Center Students in the machining program] do have them…graduates we've hired can work independently and we want to hire three more soon…"*

indicator of quality of the educational experience. Nor is program accreditation alone a sufficient guaranty of program quality. Based on two indicators, employer satisfaction and rates of licensure first-time passing, students do appear to receive a high quality education that prepares them for participation in the workforce and enables them to meet professional standards. Employers frequently and consistently provided comments like the following employer from Shelbyville: "We'll hire TTC graduates into our [parts machining company] at the same level as workers with two or three years job experience. They're that well trained and ready to work...they act like they've already been working for a while…." Another, smaller machine shop owner in Dickson said, "Its getting harder to hire people with the skills they need to do the job…but these [Center Students in the machining program] do have them…graduates we've hired can work independently and we want to hire three more soon…"

It appears that Center graduates do well in national or state certification examinations. In 2008, of those students across all centers who completed a program and sat for a licensure exam (such as LPN, ASE or welding certification) 95.5% passed the exam on the first attempt. For the 1470 practical nurses in Tennessee sitting for their licensing examination in 2008, (almost all of whom received diplomas from the Centers), the first time pass rate was 91.3 percent compared to the average 85.6 percent for all other states.[11] Only Indiana and Michigan reported a higher rate of first time graduations for states reporting more than 1,350 practical nursing candidates in 2008.

**The TTC Community: Student demographics and building a culture of achievement.** While the Centers enroll students across the state and thus with a variety of backgrounds, their most important common feature is that they are drawn from lower income families. As noted earlier, 70% of the students receiving a Wilder-Naifeh Technology Grant have family incomes of less than $24,000 a year and 45% report less than $12,000 in annual incomes. Some students who were not poor recently have become poor when they were laid off from area employers during the latest recession. Many jobs that used to employ people with relatively low levels of educational attainment (such as manufacturing assembly in automotive and appliance industries) have left Tennessee. Center staff reports that homelessness or the imminent threat of homelessness is a significant issue among students.

With the rise of significant numbers of students in dual-enrollment programs, the average age of a student is getting younger, but for the most part students are drawn from a post-high school population ranging from a few years from leaving high school with or without a diploma to those who left formal schooling decades ago. The average ages of students at the different Centers range from a low of 26 to a high of 40; the overall average age is 32 years old. In addition, more women are enrolling in Center programs; over the last ten years the proportion of females has increased from the low forty percents to nearly 50% percent in 2009.

[11] National Council of State Boards of Nursing, 2008-NCLEX Examination Statistics, 2010, Table 11. First-time US Educated Candidates Taking the NCLEX-PN Examination. (Although NCLEX reports don't identify TTCs versus others, the TTCs do produce about 95% of the practical nursing graduates in the state.)

Students tend to reflect the ethnic make up of their communities or of their socio-economic group. In Memphis, for example, 83% per cent of the total enrollments identified as African-American while just 6% did so in more suburban Shelbyville. Overall, just over 15% of the total system enrollments identified themselves as Black or Hispanic.

**Table 4: Selected Demographic Characteristics, Tennessee Technology Center Students, 2009.**

| | | | |
|---|---|---|---|
| **Family Income** | Below 12000 | 12000 to 24000 | 24000 to 36000 |
| | 45% | 24% | 12% |
| | | | |
| **Gender** | Female | Male | |
| | 49% | 51% | |
| | | | |
| **Ethnicity** | African American | Hispanic | White |
| | 14% | 1.2 | 83 |
| | | | |
| Sources: TBR, SIS reports, December 8, 2009 | | | |

Dual enrollment represents a growing source of enrollments within the Centers and can account for a significant proportion of the total enrollments at some. In Oneida/Hunstville, for example, of 553 enrollments 216 were dual enrollments from four area high schools and this center is becoming the de facto vocational arm of the high schools. Many other centers have dual enrollments of between 20 and 100 students. Some 2,000 students took advantage of the dual-enrollment opportunities in 2008, completing up to a third of the total time required to complete a TTC diploma while still in high school. In addition, dual enrollment is a bargain for both the high schools and considerably reduces the total cost of a diploma program at the Centers; Tennessee lottery proceeds fund up to $600 for each dual enrollment student. Local school systems pay for the balance of tuitions in some cases and at a few Centers the non-lottery funded costs of tuition are simply absorbed by the Center as a service to their communities.

A surprising number of Center diploma seeking students have some college or have completed an associates or higher degree at postsecondary institutions. According to TTC application information, of the 22,750 students who applied and enrolled in a Center and for whom information is reported in 2009, about 25% did not complete high school or had a GED.[12] Almost 4,000 students reported some prior postsecondary experience and another 1,250 held an associates or baccalaureate degree for a total percent of 23% with at least some college. In general, students interviewed about prior postsecondary experience felt that the Center's provided the kinds of education they were seeking. For example, a student enrolled in the electronics program in Hohenwald reported that he had gotten an AS degree in electronics from the local community college and then got a job with an

[12] Educational attainment information was not collected for another approximately 7,600 applicants enrolling in certification or short-term training programs at the Centers.

electronics company, but he said he "felt lost at work and didn't know enough to do what was expected of me on the job." He felt he was "learning a lot more here at the Center…the self-paced part can really help with comprehending the material. This is good training as opposed to college…" Appendix C shows a breakdown of prior educational attainment of applicants across different Centers by students who enrolled in full or part-time programs.

A large number of students at the Centers have backgrounds that are marked by hardship, lack of success or recent job losses and threats to whatever economic security they had. Part of the Center's challenge is to help students change self-perceptions and attitudes to begin a career or take up new directions in their lives. The Centers approach this task by creating an achievement-oriented culture that becomes a significant part of the educational experience. This culture begins with behavioral expectations – attitudes, attendance, and respectful behaviors – and extends through opportunities to join national students associations and honor societies.

*The Centers' culture of achievement, including behavioral and attendance expectations, builds a sense of community and confidence around the students that many had never experienced. Responding to questions about what made the Centers similar to what they thought of as a good college, a group of students agreed on a list of characteristics:*
*Getting a quality education People help you*
*It's serious School spirit is strong.*
*"These things make us feel like we are a part of something and are as good as other people..."*

For example, the postsecondary division of SkillsUSA, the national career and technical student association, has a strong leadership development presence in the Centers. Tennessee—largely because of the Centers--- has the largest SkillsUSA student membership in the country. Center students enter annual state and national skills competitions. In 2009, 62 Center students entered the national competition in areas ranging from cosmetology to machining and came back with 23 gold, silver, or bronze medals. In 2010, a computer information technology student from the Knoxville Center is seeking election as the SkillsUSA National Secretary. Students are nominated by their instructors for national recognition by the American Technical Education Association and this year a student from Oneida was awarded recognition as the 'Outstanding Student of the Year.' In addition, the machining program and instructor in Shelbyville received recognition as the Outstanding Program of the Year. Centers are active participants in the National Technical Honors Society and support 21 Chapters with 2700 members across the state; the national secretary of the honors society is now a massage therapy student from Chattanooga.

Students tell stories at virtually every center of how their relationships to their instructors, the delivery of the material and lessons, and the hands-on nature of learning all build their self-confidence. The stories are similar: students did not do well in prior schooling and they felt they had wasted time in their lives. Now they were regaining a grasp on their futures and themselves. "A lot of us are starting over" a student at Huntsville said, "They [the instructors] offered us the potential to prove ourselves and now we're more

confident…we thought we had the ability but had to find it…the instructors showed they have confidence in the person…"

## Part 2: Design for completion: Elements of the Technology Center approach to workforce education.

In this section, we identify four components of the Technology Center model that contribute to the extraordinarily high completion rates and high placement rates for students.

Understanding the success of the Technology Center model over the last 45 years means defining and describing parts of a highly integrated whole. A hallmark of the TTC education model is its organization around a single mission to provide high quality education in preparation for entering employment and a career. Its structure and operations are organized and tightly woven around the mission. Conventional approaches to postsecondary education can be easily described as a series of component elements—individual classes, general education, majors, credit/non-credit, academic departments, degrees, services, etc.—all of which contribute in various ways toward multiple possible outcomes. The composition of the TTC model elements responsible for producing outcomes is not so easily dissected. Nevertheless, it is important to understand key features that underpin the system's performance and provide students with education that does prepare them to enter and succeed in labor markets.

**A. Program Structure: The Delivery of Education to Students.** One immediately apparent difference between the TTC catalog and similar catalogs provided by community colleges to prospective students is size. A TTC catalog is thin; it has comparatively few pages. Most of the catalog is devoted to policies and procedures and student information and in this it is similar to two or four year college catalogs. The most striking difference between a Center catalog and that of nearly every other kind of public postsecondary institution is in the program of study descriptions: TTCs offer are no individual course descriptions, no course numbers, no credits per course, no descriptions of prerequisites, no description of core courses and no long lists of elective courses. Instead, each program in the Center catalog gives the program definition, program objectives, possible special concentrations in the programs if available, the titles of certificates and diplomas available in the program and the numbers of hours each certificate or diploma requires for completion. Almost always, each TTC program is described on a single page.

*This absence of choice in the Center students' program structure has major implications for the student experience; the first being elimination of confusion around what classes to take and in what sequence; second, there is very little choice in scheduling; and third, almost by default, the focus is on learning and completion.*

In other words, students enrolling in a TTC program enroll in a *whole* program that is fully defined in terms of content, objectives and structure. With few exceptions, again in health care or programs that have multiple concentrations, no TTC program is sub-divided into classes and no program asks students to make significant choices or to construct a course of study or create and manage a schedule of classes. Students have few decisions to make when they decide to enroll in a program at their Center; the first decision is what program to enroll in; and the only other major decision is whether to attend full-time or part-time if that option is available.

**Choice**: This absence of choice in the Center students' program has major implications for the student experience; the first being elimination of confusion around which classes to take and in what sequence; second, there is very little choice in scheduling and third, almost by default, the focus is on completion. In conventional postsecondary education, the burden of setting a schedule and constructing a path to a degree falls on individual students, even with advising assistance, and becomes a major focus of decision-making, negotiation, scheduling and rescheduling, and becomes a source of error. Moreover, this is often repeated each semester. For many students in conventional programs, the goal of obtaining a degree easily gets obscured by short term needs to determine a course schedule.

Scheduling choice in the TTC is limited to whether to take a full time or part-time program and days or evenings if available. Most of the larger Centers operate substantial evening programs so that people can work during the day and attend class at night. However, whether students enroll in either a full or part time program, they know from the beginning almost exactly how long it will take them to finish. And they know when they finish there is a very good chance they will enter employment in their field of education. So in two respects completion becomes a goal that does not recede into the future depending on scheduling classes only as far as the next semester.

**Program Intensity:** The intensity of the programs at the Centers is a distinct element of program structure and has consequences for the levels of engagement in the program and momentum toward completion. As previously mentioned, overall program length is based on total clock hours for full-time enrollment; day programs begin at 7:30 or 8:00 in the morning and run until 2:30 or 3:00 five days a week; evening programs often run three to five hours an evening up to five nights a week. The trimester system operates throughout the year and each program operates continuously all year long. Each trimester is about 432 hours over the four month session. Thus, a full-time five trimester program, or 2160 clock hours, takes 20 months to complete.

> The intensity of the program structure—a seamless learning experience, full day classes, five days per week for up to 20 months—drives program momentum toward the goals of gaining competency and achieving completion. "People struggle through these programs because they need jobs…They come here and we ask them what they want to do, not what they want to study…" *Instructor in Huntsville*.

**Open Entry/Open Exit:** With the exception of a few allied health programs and practical nursing, each program is open-entry/open-exit. New students enter a program, based on the availability of openings, at the beginning of each trimester. These students will take the

places of students who have completed the program. New students will join an existing cohort of students who are already moving through the program mastering a set of competencies that build toward a certificate or diploma. Students proceed through the learning competencies at their own pace and progress is based on grades and successfully meeting mastery requirements. Some students may progress quickly and complete a program before the estimated time to complete; some may take a little longer. Almost all, however, stay in the program at the Centers for the full estimated hours for each program.

**Faculty Engagement:** Once they are enrolled, students receive a seamless, very concentrated educational experience that is integrated around a set of educational and applied objectives. For both full and part time students, there is a great deal of contact and interaction with faculty and with other students. A cohort of full-time students and their faculty are together at least six hours a day all week long. A learning community forms around these students, including the instructor, which is an important element in supporting persistence and completion. Some of this learning community is formal. Instructors will often form teams of students who work together on specific competencies, projects or material. Senior students will be asked to help newer students, much like teaching assistants or work group supervisors. While this is discussed in greater detail in the next sections, it is only noted here that the organization of the program organically promotes the formation of communities inside these programs. These have significant impact on the student experience and in supporting momentum toward completion.

**Evaluation:** Finally, an important component of the program structure is student evaluation and grading; evaluation becomes a particularly important organizing element in open entry/open exist and self-paced programs. Evaluation contributes to maintaining program rigor as well as to undergirding the high levels of engagement between faculty and students. Evaluation is based on three elements of the curriculum: students receive grades in theory (general principles and knowledge); skills (hands on applications and demonstrations); and ethics (behavior, attitude, and attendance).[13] Feedback to the students on their progress and achieving competencies objectives provides order and helps structure what is otherwise a highly individualized program. These evaluations become part of the student record and transcript.

**B. The TTC Competency-Based Tradition:** Since its beginnings as a vocational and technical education program over forty-five years ago, the TTCs have employed a competency-based curriculum design. This tradition has evolved somewhat to meet the requirements of specific licensing and the accrediting requirements of

> Program descriptions often include the promise that students will "learn by doing" and the promise that the program will prepare students to have the right skills to succeed in the workplace and build a career; learning takes place in environments that are as closely modeled as feasible on real work environments with work environment expectations.

[13] Students receiving Wilder Naifeh Scholarships are required to maintain levels of attendance and general satisfactory progress. Too many absences can result in the loss of part or all of the scholarship and threaten the student's ability to stay in school. Once lost, the scholarships cannot be reinstated.

specific occupational fields and selective programs, like practical nursing. For the most part, however, the curricula retain a competency-based structure that blends theory and academic study, technical applications and hands-on experience.

Instruction, course materials, hands on learning, and course objectives are built around a set of competencies that students must demonstrate in order to receive a credential. Faculty committees are responsible for maintaining the currency of the curricula and the relevance of competencies to real work environments. Industry advisory groups play an active role in helping maintain the curriculum and competency relevance to local labor markets; because faculty are accountable for completion and for placement rates, they have considerable incentive to engage employers and to respond to their input.

Program competencies are sometimes prescribed through industry standards as in the Automotive Service Excellence (ASE) curriculum or the National Institute of Metalworking Skills (NIMS). The latter, for example, not only identifies specific skill standards but also supplies projects, evaluation standards and identifies competencies for different aspects of precision machining. Achieving the competencies through NIMS procedures results in additional certifications that are carrying increasing value among employers on a national level. ASE standards, for example, contain eight major competency areas in different aspects of automotive repair technology (a ninth is being added). Students successfully completing a program competencies are assessed by the instructor, demonstrate skills required in each competency area through projects, and tested for mastery knowledge through the ASE computer-based curriculum assessments. The Centers frequently utilize industry standards, trade association standards or professional association standards to inform competencies or specific skill levels for a variety of programs ranging from cosmetology to health information technology. In part, the reliance on industry standards is due to the fact that standards are often accompanied by testing and assessment materials designed to identify and assess competencies encompassed by the standards. The latter helps the instructors focus on specific, industry relevant competencies and obtain higher validity through more accurate and more transparent ways to assess for them.

Instructors are also adopting computer-based instructional materials wherever appropriate to include in program curricula. Industry developed standards and training materials now frequently offer computer-based training, materials, simulations, and texts on-line or in a computer based format. This includes technical areas such as drafting and computer-aided-design, industrial maintenance equipment, technical processes (e.g. trouble shooting and program diagnostics), program logic controllers, and procedures in healthcare fields, information technology, or technical examples such as anatomy and physiology. Centers also offer portions of program content on-line that can be accessed from home or libraries. Widespread adoption of computer-based and online resources help the programs stay current with industry standards and, in some cases, are reducing the costs of course materials for the students. Several programs at different centers are now accessing textbooks on-line, saving the students much of the costs of purchasing books.

Learning in a competency-based format is acquired and demonstrated through a combination of text-based teaching (including on-line programs), demonstrations, hands-on projects, laboratory work, and tests/assessments. The main emphasis, however, is on the demonstration of mastery through completing projects that demonstrate an accumulation of competencies or may focus on one particular skill. The progression through a program is at once highly structured in terms of achieving the competencies and, at the same, time very flexible to allow for individual learning style, prior experience and knowledge, aptitude, and pacing. Unlike conventional course-based programs, credit for prior learning or prior knowledge does not enable a student to receive credits toward a course or test out of a program element; prior knowledge does, however, allow a student to more quickly progress to the point at which they do need time to develop new competencies or renew those they need to. This embeds rewards for prior knowledge into the core practices of the programs and allows students the opportunity to spend greater amounts of time within the program on tasks that he or she needs to learn.

The lynchpin to the structure and to the flexibility is the capacity of the faculty to clearly define and communicate expectations and to manage the progress of each individual toward the competencies. This is no small task within a class of about 20 students who are of different ages, backgrounds, aptitudes and personalities and who are largely proceeding through a program at an individualized pace. Moreover, with the exception of some of the practical nursing programs and some allied health programs, the modified open entry/open exit schedule means that new students may enter a program at the beginning of each trimester and complete their program whenever they have mastered all the competencies required for a certificate or a diploma. So while class size itself may not expand beyond a set capacity of 20 or so students, there are many other sources of variation in the specific status of any given set of students. Instructors maintain detailed records on each student's entry and progress through a program and these records tend to evolve into a record of an individualized learning plan for each student in a program. Each center maintains a Student Information Management System that records progress reports, attendance and work evaluations for each student but it falls to the instructors to generate reports for each student and support each student has he or she moves through a set of competencies.

The lynchpin to the competency based program is the capacity of the faculty to … manage the progress of each individual toward the competencies. This is no small task within a class of about 20 students who are of different ages, backgrounds, aptitudes and personalities and different points in the program…."I keep notebooks on each class and each student," one instructor said. "You have to know where each person is both in the class and relative to the competencies."

Because it is self paced and most of the programs are organized so that different students in the same class will be working on different competencies, instructors must be able to know at what point each student is in their particular program, what remains for them to accomplish within a particular competency area or when to transition to a new area, and finally instructors must know how to help each student move through the program with a combination of support, instruction and learning management. In automotive programs for

example, once students learn some basic procedures and safety a class of twenty students may be working in several different competency areas simultaneously; in drafting a group of 20 students may be working in five different concentrations at the same time—the basics or one of four specialties. It is the responsibility of the instructor to lead and manage this learning. Instructors adopt various techniques for managing this. Often instructors will identify advanced students to help beginning students or students needing additional help on specific tasks. Advanced students seem to appreciate this because it recognizes their own learning, helps them apply it, and is a parallel with the work place where the emphasis is on problem solving and getting a task accomplished. As students report, they "learn better by doing. You get experience and you're not in a book all day long…"

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## C. Technology Foundations: Universal, Integrated Developmental Education

TTCs all offer a contextualized basic and applied skill development component, called Technology Foundations, that is required of all students and the content is integrated as a component of every occupational and technical program except practical nursing. *All* other students enter Technology Foundations and almost all of those students will complete the self-based computer-based curriculum. For all intents and purposes the TTCs do not offer developmental or remedial education; yet, every TTC student receives it. Technology Foundations is described by staff as a co-requisite program for every other program except practical nursing. The following discussion describes Technology Foundations and explores its significance within TTC.

In the Tennessee community colleges 64% of high school graduates enrolling as first time freshmen were placed into one or more developmental or remedial education courses prior to entering a college level program. In the fall of 2007, about 20,500 students took a developmental or remedial course in one of the 13 Tennessee community colleges; of that group 5,500 successfully completed a college level course in the fall of 2008 for a reported success rate of just under 27%. In other words, just over 73% were still in developmental education or remediation after a year or had not completed and stopped pursuing a postsecondary credential.[14]

This is a familiar story for community colleges and the figures of placement into developmental or remedial courses and the rates of student success in Tennessee are not out of line with those rates of other states. Moreover, these low rates of success in developmental education become more extreme as students included in the calculations become older and have been out of school for a significant period. For a host of reasons, few students placed in developmental or remedial education complete those courses and enter a college program.

At the TTCs, comparable rates of success are not available because developmental education and remediation is simply not offered as a set of courses to be completed before starting a program nor is there the standardized placement assessment most community

[14] THEC, *Statutory Data Report, 2010,* Table 8.

colleges are required to take as they enroll.[15] Students enrolling in the occupational programs are not given a placement test prior to acceptance in a program; instead each student is informed that Technology Foundations is a required component of their programs.

As a first step, all students except those in the practical nursing selective programs are given a short orientation to Technology Foundations when they begin a program. Within the first week of attending their program, he or she is scheduled for a pre-assessment to identify areas of strength and weakness and to determine the student's schedule for Technology Foundations work.

The untimed assessment is a KeyTrain assessment tool and all the centers use KeyTrain/WorkKeys software as the vehicle for the Foundations' curricula. Six competencies areas are assessed: applied math; reading, locating information, writing, listening, and teamwork; each component test takes about 15 to 20 minutes and students are encouraged to go as slowly as they need to. In addition, students taking the pre-test can take some time for brush up (longer preparation is available if the student wants it) and can take the pre-test a second time if not satisfied with the first results. The focus is diagnostic; staff identify where students need to begin the Foundations curriculum and how to help the student understand what they need to learn be successful both in their program of study and on the job. From the outset, in other words, the Foundations curriculum is presented as another component of the occupational and technical education program.

After the diagnostic, the Foundations instructor then sets up an individualized learning plan for the student and a schedule to attend the Foundations lab. The labs are staffed by a full-time instructor. The schedule mixes students from different programs together in the same time block; but the learning plan and applications of the KeyTrain/WorkKeys software are tailored to the program in which the student is enrolled. So, a machine tool student may be sitting beside an industrial maintenance or a cosmetology student, but their programs will be different based on their assessed skill needs and their program's content. Students are typically scheduled for 60 to 90 minutes per session two to three times per week. The lab is open to students five days a week, including some evenings, and maintains open times for all students to come in to work on their programs or to consult with the Foundations instructor.[16]

Students progress through the KeyTrain/WorkKeys curricula at their own pace. According to Technology Foundation instructors, a majority of students can complete their program in a little over the first trimester and only a handful will ever remain in the Foundation lab far into the third trimester. While progress is individualized based on a progressive mastery of competencies, the instructors will also provide additional instruction through lectures, group discussions, and exercises; this is especially the case as students move into the

[15] The Centers have only recently begun using a placement assessment (COMPASS) for applicants to the practical nursing programs and some allied health programs but this is for purposes of establishing a qualified pool of applicants not placement into remediation.
[16] Students can also use the Foundations lab for what the Centers call 'personal education development' that includes preparation for a GED and other testing or assessments such as career interest inventories.

workplace skills parts of the program in listening and teamwork skills. Although it is transparent to the student, the software is divided between foundation skills of Reading, Applied Math and Locating Information and more applied technology skills in problem solving and use of basic data and information then into topic areas such as electricity, business processes and writing, as well as more advanced observation and teamwork. Each component has five or six levels that students will master.

When students complete their Technology Foundations component they sit for the Career Readiness Certificate assessment, also an ACT product. The Center goal is to have all students achieve a silver or gold level CRC. Of the 4250 students completing Technology Foundations and a CRC this year to date, 30% (1275) have received a gold certificate, 57% (2432) a silver certificate, and 12% or 542 a bronze level.[17] Achieving a Readiness Certificate completes the Foundations components unless their program instructor determines a brush up on some specific skill or competency is needed. Students are encouraged to use the Foundation's lab and computers during open times and may consult with instructors at any time throughout their enrollment.

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There are several important elements of the Technology Foundation at the Technology Centers that stand in sharp contrast to the delivery of developmental education and remediation in community colleges. These are:

- Everyone enters the Technology Foundations components.[18] There is not a distinction between those who are well prepared for their occupational program versus those who are not quite good enough and must obtain developmental or remedial skills. This platform removes the stigma from developmental education and makes it clear that these skills are important for everyone.

- Almost no one fails to complete or achieve levels of success in Technology Foundations. Except for students with severe learning difficulties, students may work at their Foundation program until they are successful and attain the competencies that would make them successful at the top two levels of the Career Readiness Certificate.

- The Technology Foundation content is integrated into the occupational and technical program of the student. Foundation competencies are presented as parallel to both the educational program and to the skills required in the workplace. The applied nature of the instruction clearly increases the relevance of the Foundation competencies and encourages students to work hard at mastering skills

[17] Data supplied by TBR, Tennessee Technology Centers, for 2009-2010

[18] This is not the case for Practical Nursing and some allied health programs in which state licensing and particularly program accrediting bodies demand use of pre-program assessments and the regulated structures of instruction that do not allow for programs like Technology Foundations. Applicants to practical nursing programs now take COMPASS assessments and threshold scores determine whether students are included in the applicant pool. Students *not* achieving the threshold scores are running between 40 and 65 percents. Center administrators are now considering offering LPN program applicants pre-assessment workshops and brush-ups.

that they may not otherwise be interested in doing in a pure math or pure reading class.

- Technology Foundation's organization as a self-paced competency-based program also encourages students who did not do well in classroom settings or students who have not been in classroom settings for some length of time. The TTC programs are designed to develop competencies and work environment skills. People who did not finish or thrive in high school or in college seem to adapt well to Technology Foundations' learning environment and learning format. Technology Foundations not only delivers important competencies to students but it builds confidence in the students own sense of their capacity to do the work and succeed.

- The role of the Technology Foundation instructor is very important not only in Foundation instruction itself but also in the overall occupational and technical education. He or she is one of two or three instructors that the student will have for their entire program and are very much part of the learning community that form around students. So instructors build relationships with students, communicate frequently with program faculty about student progress and become an integral part of the Center's student support network. Instructors in Technology Foundations know how students are faring in their occupational programs and can coordinate Foundation learning programs with the other program instructors.

How effective and how successful are the Technology Foundation services? The TTCs do not conduct research on the Technology Foundations outcomes; nor is there a comparison between the competencies obtained through Technology Foundations curricula and that of developmental education and remediation offered by the Tennessee community colleges.[19] The fact that nearly everyone completes Technology Foundation is no guarantee that the service is accomplishing its intended goal. There are two questions here: first, do the Technology Foundation's curricula give students the competencies they need to succeed at their programs and at work? Second, is the delivery vehicle of computer-based and self-paced instruction in these skills effective in giving students the skills?

In the absence of research data, we have anecdotal data from interviews. The stories of students, observations by instructors and testimony by employers about the impact of Technology Foundations suggest that the program is *remarkably* effective and provides students with the opportunity and the encouragement to learn basic skills and basic occupational competencies that, in other settings, they may not otherwise acquire.

Over and over again in interviews, students at the Centers report that they had learned math skills, comprehension, and writing skills that they never did in high school or in colleges

[19] Articulation agreements between the TTCs and community colleges require that students coming from the TTCs take and meet the cut scores of the college's assessment for developmental education. This offers one way to compare outcomes but also begs the question of whether the college assessment accurately assesses for basic academic skills.

they attended.[20] Several students who did attend some college and left, reported that they had been placed in developmental education courses when they applied to the local state university or community college and felt the courses were either too difficult, a waste of time, or not relevant to why they applied to college in the first place; students who had gone through developmental education programs expressed a surprising amount of bitterness about their experience. Nearly all the students interviewed identified the delivery methodology of self-paced and computer-based curricula at the Centers as important in helping them understand the material, allowing them to spend as much time as needed to learn the material> Students reported that it took the pressure off learning abstract material that had confronted them in high school or in developmental education courses in college.

Program instructors also validate the effectiveness of Technology Foundations as they report watching students gain confidence and skills in areas such as measurement and written work and comprehension of texts. While most instructors in the technical and occupational programs teach mathematics and communication skills as part of their own curricula, they do not, for the most part teach basic skills or reading skills. For this, they rely on Technology Foundations and because it is offered in parallel to the occupational and technical programs, instructors observe students as they gain familiarity and confidence with the competencies of Technology Foundations. Instructors describe the close communication between themselves and their colleagues in Technology Foundations and their ability to work together to help individual students master the material and competencies.

Finally, employers report that students they hire are well prepared, have well rounded skills and ready to work independently. No employer interviewed for this study ever stated that that a TTC student they hired lacked basic skills or fundamental occupational skills. To the contrary, employers across the state uniformly reported that TTC graduates seemed to have better education and more appropriate skills than other workers they hired from other educational sources. And while it is difficult to separate what might be due to Technology Foundations and to the technical curricula, that is, in some ways, the point. Basic skill competencies are integrated into the technical program and become a component of the entire program.

Apparently, those who complete the Center's programs do have skill sets employers are looking for and, clearly in such fields as precision machining; this will, by necessity, include competencies to apply math and mathematical operations in the workplace. One hospital administrator, also in Dickson, reported that *all* of the 45 LPNs employed at her hospital were Center graduates and that hospital staff preferred to hire and work with Center graduates because they were better prepared than those from any other school or college; the same administrator echoed the machine shop owner in terms of skills and attitude toward working, "These people know that being an LPN is a hard job and you

[20] Though estimates vary, a surprising number of TTC students have some college or degree from a two or four year school. In one class of 20 surgical technician students at Shelbyville, 18 had attended a two or four year college and 8 of the 20 had received associates or bachelors degrees. This is not typical of all programs, especially those outside the health professional fields and programs such as information technology and graphics.

have to apply yourself; they're ready to do that job really well." The HR strategy of the hospital is to now hire LPNs from the Centers and quickly enter them into RN bridge programs rather than trying to hire RNs directly from other area colleges. Another hospital administrator from Hohenwald hires LPNs and allied healthcare workers from every graduating class for either a hospital or long-term care facility and reported that all the students were well prepared and understand that they were building careers; she estimated that about half the LPNs from the Center went on to enroll in RN programs. Similarly, a manager of a pipeline maintenance company also in Hohenwald has hired 10 to 15 welding, HVAC, and industrial maintenance graduates over the last few years and reported that they didn't need any other training before working productively, "you show them around a little and they are ready to go."

The chain of evidence, the stories, about Technology Foundations extends from student experience to employer assessments of the students they hire. These stories are repeated nearly verbatim from one Center location to another and by different groups related to the Centers. The links in the chain are the perceptions of skills and competencies students gain as they move from the early weeks of their program and more intensive use of Technology Foundations through their programs and into employment. Employers and graduates of the programs now working in their field of training report how well students were prepared for working. This would suggest that providing Technology Foundations as an integrated component of an occupational or technical program is effective in helping students learn and gain competence in basic developmental skills.

**D. Student Services: Embedded Case Management in the Integration of Student Support and Instruction.** Student supportive services—ranging from advising to crisis intervention-- within the Centers are decentralized and informally organized compared to more extensive and formal student services offices within other two and four year postsecondary settings. With the exceptions of formal services for veterans and people with disabilities, the Centers do not maintain formal service programs that might be found in other two and four year schools through student service offices. However, the informal organization of these belies the intensity and the quantity of supportive services delivered to students in the program. Although not formally identified as such, the Centers appear to operate an 'embedded case management system' of comprehensive student support services all focused on helping the student obtain the competencies they need to complete their programs and enter the workforce.

> When viewed as a component of the whole educational program at the Centers, student services can be understood as an '*embedded case management'* system. The faculty, staff and administration maintain a network of information and communication surrounding nearly all the students; personnel of the Centers as a *group* take responsibility for organizing and providing students services.

Students at the centers are engaged in a very demanding experience. Maintaining full participation in a program that requires attendance five days a week for six hours per day as well as sustaining family and other responsibilities places considerable stress on students. Many students are parents; many also have part-time jobs or are trying to get by for

upwards of nearly two years relying on family incomes. With a large proportion of students reporting family incomes of less that $24,000 per year, the Centers' students are vulnerable to social disruptions in their lives and a fragile infrastructure of family and social supports. The social consequences of having low-incomes cut across both rural and urban populations. Moreover, unlike most financial aid packages for students in two and four year colleges, the Wilder-Naifeh Technology Scholarships require that students maintain attendance and minimum grades; missing a high number of hours for tardiness or absences threatens a student's grant and will thus threaten the ability to complete the program. Raising a threshold for attendance, and offering programs that are almost the equivalent hours of a full-time job would, according to conventional wisdom, significantly raise the level of need for supportive services to help students meet these demands.

Yet, Centers maintain a relatively small administrative and student services staff. Administration personnel include a director, assistant director, admissions and recruitment coordinator, financial aid officer, evening coordinator, business and personnel coordinator and a student services coordinator. At one of the larger Centers in Murfreesboro the coordinator of student services is also the financial aid officer and works with one additional student support personnel who is responsible for records and various certifications that require testing schedules and monitoring. Thus it appears at first contradictory that the Centers would serve populations of lower income students and those experiencing short term income loss through unemployment and, at the same time, do not appear to maintain a significant infrastructure for providing student supportive services.

*"We know most our students are making a tremendous effort to come to class, complete the program and get a job. Part of our job is to do everything we can to make it possible for them to succeed…we come to know each one of our students and when it seems like they need help we'll help them."*

Interviews with administrators, faculty and students begin to illuminate the ways in which the Center staff do in fact deliver an extraordinary amount of supportive services to students and do create a deeply caring environment for students as they move through the programs and into employment. A typical refrain from administrators, staff and faculty at the Centers is the following*: "we know most our students are making a tremendous effort to come to class, complete the program and get a job. Part of our job is to do everything we can to make it possible for them to succeed…we come to know each one of our students and when it seems like they need help we'll try to help them."* Basically, this refrain is the organizing principle for delivery of student services at the Centers, but it translates into a far more sophisticated approach related to the structure and operations of the educational program.

The ways the services are offered follow two typical patterns: either the student asks a faculty or staff member for help or a faculty member or another student or member of the Center staff will alert the student services director that a student appears to need support or is in danger of stopping the program. Sometimes, the student's issue is addressed by the faculty member responsible for the student; this includes helping the student get to class on time or helping arrange transportation to class. Other times, a student services coordinator

(or the Center director) will work the student to find appropriate services for the students through a network of community organizations or social service providers. Depression, for example, is commonly reported as students struggle to balance hardships and completing their programs. Centers maintain close relationships with WIA One-Stop centers and access a range of supportive services and funding for students as well as training support for unemployed or dislocated workers. Discipline (including attendance) is the ultimate responsibility of the student services coordinator and the director. Often, at the Centers, transportation issues are resolved when the automotive technology program will repair a student's car at low or no cost; occasionally cars have been salvaged, repaired, and given to students who have no other source of transportation.

Financial crises for students often happen as students exhaust their Pell grant allocations. In addition to referrals to social services for emergency support or housing assistance, many of the Centers have access to local community foundations or social service funds, including churches, that can be accessed to help students through times of financial crisis or need of money for child care or medical expenses; these funds are often small but will help students gain time or the money needed to complete the program or find temporary employment. At the Huntsville Center, for example, students in financial need can access the Morgan-Scott Fund, a local family fund to support Scott County residents, for small amounts; or, for families with children in need, the faith-based Unicorn Fund will provide cash, pay for services, or provide clothing and toys to children. The student services coordinator maintains relationships with organizations, helps students apply to or contact organizations and monitors or follows up as needed.

When viewed as a component of the whole educational program at the Centers, student services can be understood as a '*embedded case management'* system. The faculty, staff and administration maintain a network of information and communication surrounding nearly every student; personnel of the Centers as a *group* are responsible for organizing and providing students services. This network of communication is integrated within the students' educational program through the sustained and intensive contact between faculty—including Technology Foundation faculty--and students. These relationships, in turn, allow the Centers as a whole to closely observe students throughout the course of their program. Finally, this network allows the Centers to focus on services specifically tailored to an individual student need that will help achieve the goals of program retention, completion, and placement.

As noted in the beginning of this report, it is important to see how the operational structures of the Centers facilitate ways of organizing and delivering student services that are fundamentally different than the organization of similar services in many conventional postsecondary programs. The provision of student services to students must be placed in the context of how programs are organized and how this organization shapes the learning environment and the educational experience of students. Four features distinguish the provision of supportive services in the Centers:

- First, because each Center's educational program structure is well-defined, the schedule and all requirements are clear, there is not a significant need for an

advising staff in a student services office to help students pick courses, explain how to read course catalogs, select prerequisites, select a major, drop or add classes, or find classes that fit with their work or family schedules. There is some academic-related advising but this mainly revolves around picking the right program, assessing career interests, and this mainly takes place during the recruitment and enrollment steps;

- Second, student supportive services are generally organized around keeping students in their program, meeting attendance requirements, and enabling them to meet the personal-life demands of attending a full-time educational program. This tends to focus services on individual student issues or individual student needs and not on offering or staffing broader service programs or categories of services.

- Third, the organization of the competency-based program itself and the relationships that result from the close and sustained contact between students, faculty and school personnel means that providing student supportive services become distributed across the entire institution. The learning community that the students enter also serves as a network of information and support about the students, their program experience, and their personal lives. All those engaged with the students—and this includes virtually all the employees of a center—become involved in either providing student support services or in guiding students to someone who knows how to get services for the students.

- Finally, clear goals of the Center are completion and placement at relatively high wages. Faculty is held accountable for rates of completion, placement, and wage rates at the point of placement. Faculty take on responsibility for assuring that students persist in their programs, meet attendance requirements, and, over the long run, seek to maintain a high quality level in graduates in order to justify a high level of wages at placement. In terms of persistence and completion, faculty assumes the role of providing student services or communicating with the student services coordinator about the student's needs.

Students report feeling cared for by faculty and staff at the Centers. As one student from Huntsville, a poor community, said, "A lot of the students here are either starting over after getting laid off or have never done much before...The teachers are great about helping you learn—more so than at other places..[They] have confidence in the person and help you find confidence and the ability to do the work...they will help you. Everybody here will keep trying to help students succeed…" The structure of the program, and in particular the sustained contact and interaction between Center staff and students, allows the faculty and staff to know the students and enables them to express caring for students and to develop a system of providing supportive services that identifies specific needs of individual students.

> Several administrators and faculty at a more rural center reported that if a student did not appear for class, they would call the student at home and "if we couldn't find them, we'd call their parents, and if we couldn't reach the parents, we know their grandparents and we'd call them…"

## Part 3. Summary: Learning from the Tennessee Technology Centers.

In previous sections, we outlined the general organization of the Tennessee Technology Centers, described key structural elements of the Centers, and described the educational culture for students. In the contexts of high completion rates, high rates of placement in relatively high wage jobs related to training, and equally high levels of employer satisfaction with graduates, the model offers up a uniquely successful postsecondary program serving a population that is rarely served well in other educational institutions.

In particular, the Centers offer practices and organizational features that sharply pose alternatives to what many have identified as institutional barriers to completion and attainment in postsecondary education. These barriers are particularly prevalent among community colleges that are now the principal avenues for obtaining technical and occupationally related education. The barriers include: the severe problems associated with remediation and developmental education; courses and program structures that are confusing to students, inefficient and discourage timely credential completion; and student services that are both hard to access and costly to offer and have an uncertain relationship to supporting persistence and completion.[21]

The focus here has been on four elements of the program structure—program structure, competency-based education, integrated developmental education through Technology Foundations, and an embedded case management system for student services—to define and describe parts of what is a tightly woven whole. Each of these components offer ways of organizing and delivering education that are also alternatives to the barriers now observed in the practices of many community colleges. The observations in this section address what we can learn from the Centers practices in each of these four areas.

However, it is also appropriate to briefly mention what was not addressed in this report. Some of these are topics that reflect change within the State's higher education system and the relationships between centers and two and four year colleges. Some areas that were not addressed in this report are:

- The growing dual enrollment programs in different centers, which have considerable potential to revive career and technical education at the high school level, also have potential to change the character of the Centers through shifting focus from adults toward a younger population.

- Articulation with community colleges is also a concern. Currently, diplomas from Technology Centers are worth thirty credits toward an Associates of Arts in Technology studies at community colleges. This is largely a symbolic gesture since the associates degrees themselves have little value and are not transferable to four

[21] See, for example, James Rosenbaum, Regina Deil-Amen and Ann E. Person, *After Admission: From College Access to College Success* for a description of how these and other barriers discourage students.

year schools. Moreover, the 31 credits are not attached to particular courses; in practice, this is not really useful articulation for students, and is mainly indicative of the ambiguous relationship between the Centers and community colleges.

- Nor did the report focus on a nagging issue for the Technology Centers as to whether or not they are or should be called colleges, and by implication, whether they should be empowered to offer associates degrees in their technical fields. The former question of whether the Centers are colleges is important to the role the Centers play in the Tennessee system of higher education. The latter question of offering associates degrees through the Centers raises a core issue about the relationships between community colleges and the Centers.

**Lessons:** What are the implications the Centers hold for other postsecondary institutions, particularly community colleges that serve a lower income population or are responsible for occupational and technical education?

***1. An overarching observation about the Centers is that the kinds of outcomes obtained by the Centers flow from an organization whose core operational principles and practices are designed to produce completion and placement in the labor force. An implication of this for educational reform is that educators must address the core operations and core organization of postsecondary institutions around alignment with completion and placement goals.***

While it is possible to identify key elements of the practices and organization of the Centers that are important in contributing to high rates of completion and placement, these elements *support* the goals and are not the fundamental reasons for successful completion or placement outcomes. The reason for the outcomes and placement rates and the ability of the Centers to sustain these rates over a long period of time is that the core operating procedures and practices are organized around those outcomes. In the Centers, the program structure and competency based model defines the core operational practices; and these tend to determine how other elements of the educational program support those practices and support the students.

This does not mean that the Centers are more like extended workforce development programs whose outcome is job placement. The Centers are clearly rigorous educational programs and the curricula's competencies are far broader than specific job skills focus found in short-term training programs. Moreover, the goal of completing a diploma and a certificate—not only job placement—is extremely important to the centers in helping students and their communities achieve a higher level of educational attainment. This is expressed in the dual objectives of completion and placement.

The implication of this for educators is that initiatives to increase the completion rates of institutions must, at some point, penetrate the core operational practices of the institutions. By core operational practices we mean the ways in which students enter, receive education,

and learn within a postsecondary setting. Some of these can be summarized in observations that the Centers:

- focus on the whole learning experience and the goals of competency and placement and not on degree attainment as the cumulative selection of a series of courses;
- take responsibility for defining a complete educational program and set of competencies that students need to have in order to be successful;
- sustain continuity through the educational experience not only through a clearly delineated program but also through sustained engagement of faculty and instruction;
- integrate all learning components required to complete an credential into a single educational path; and,
- distribute the responsibility for program completion and placement with faculty and staff.

Many initiatives now underway in community colleges address one or more of the above: changing practices in supportive services or in helping students move through developmental education courses or create smoother pathways into career programs. However, most of these remain small demonstration programs or isolated in single departments or last as long as the grant funding lasts. Few of these have had significant impact on the organization of core operations of the colleges. Despite the creativity and effectiveness of an individual demonstration or pilot project few of the colleges in which they operate have seen measureable upward movement in completion rates for significant numbers of students.

**2. Competency Based Program Design:** In the movement to create a system of community colleges in the US, vocational education at the postsecondary level was often either eliminated or merged into community colleges. Emulation of four-year colleges and accreditation requirements to create associates degrees often meant that what had been a competency based, hands-on model in trade and technical programs was reconfigured into time-based programs, credit hours and divided into separate courses. The resulting fragmentation weakened many occupational and technical programs.

Competency based designs work well in the Centers for students in occupational and technical programs and the Centers organize faculty and staff to work effectively within a competency based framework. However, aside from all the concerns among educators about accurately identifying and measuring educational competencies, few colleges are now organized to support competency-based programs—other systems ranging from student information systems to financial aid systems make it difficult to operate a competency based program or, even more so, a clock hour program. Competency-based programs for individual programs are sporadically used by some programs in some community colleges; yet many competency based programs in colleges are related to training programs and not to degree bearing programs.

***Community college occupational and technical education programs could explore integrating key elements of a competency based model and the***

***seamlessness of a clock hour structure into their existing technical degree programs.*** Some of this adaptation would involve something akin to 'reverse engineering' existing AS and AAS degrees in technical fields in order to arrive at competency based structures that would work to meet degree requirements and meet accreditation requirements for some technical fields. Some colleges now identify the competencies within a specific course but don't extend the competency model to an entire program or field of study. A blended credit-hour/competency-based model is possible, for example, in the simple redesign of degree programs to define the courses and sequence of courses that a student would take to complete a degree in, for example, graphics and computer aided design. Specifying courses and sequence for a degree gives faculty a chance to identify the specific skills needed by industry within a particular field and then, because the structure is specified, to define how the program of courses represents competencies in those areas. Some community college systems are now adopting this more structured approach in occupational and technical degree programs in career pathway models.

**3. The Center's model of integrated Technology Foundations for developmental education is highly effective.** Some educational practices, like development and remedial education, are clearly not working. The failure of large numbers of students to navigate the courses and complete developmental education and remedial education discourages thousands of potential students from entering and completing college programs. And while rigorous comparison between students who complete the Centers' Technology Foundations curricula and students who complete a sequence of developmental or remedial courses is not available, every other available indication suggests that the Technology Foundations curricula and delivery methods do deliver the basic skills competencies that students need in their technical education programs and in the workplace. Even just based on anecdotal evidence, no one makes similar claims about conventional developmental education programs.

What is very clear about Technology Foundations is that it is a strikingly different way of delivering foundation skills to students. It is aligned with program content and aligned with the student's engagement in his or her program. As compared to the conventional delivery of developmental education in community colleges, students in the Centers do not experience Technology Foundations as a barrier to program entry and almost all successfully complete the competencies identified in the Foundation sequence.

Two important features of the Center's Technology Foundations are the self-paced (with faculty support) mastery through computer-based curricula and its integration into the technical programs. The former allows customization to the needs of each student and is flexible with regards to pacing and how quickly the student can achieve competencies. The benefits of integration and contextualization of basic skills with a technical program increases the relevancy to the students, is additive to the educational program, and is consistent with the motivation for the student coming to school in the first place. Many community colleges now allow students to enter introductory program-level courses prior to completing a developmental education sequence. It would not be a great step to further integrate development education competencies into a parallel and simultaneous program.

A third important element of Technology Foundations for the students is that virtually everyone, with the exception of some selective healthcare programs, at the Centers goes through the Technology Foundations program. There is no stigma and no message that some students are not good enough to go into the technical program. Given the fact that the proportion of applicants to community colleges referred into developmental education is as high as 80 percent, it would not be a great leap to make a new form of developmental education simply part of every student's postsecondary program.

**4. The Centers build in accountability for completion and placement across the whole institution.** One of the characteristics of the Centers that supports completion and placement is that the entire institution is accountable for completion and placement. Faculty members are responsible for student completion and are principally responsible for maintaining relationships with local employers who will hire their graduates. The faculty has strong incentive to communicate with and enlist the support and engagement of student service personnel to help keep students in class and prepare them for placement in work environments. Because of their close connections to faculty and to students, the student support staff is able to concentrate on identifying and providing services that will help keep the student in a program and on the way to employment.

All this revolves around both capacity and accountability. Conventional postsecondary educational programs tend to isolate different functions from one another—instructors don't know students well and are only accountable for course delivery and maintaining a class-size; student support personnel don't often hear from instructors about students and may themselves only meet a student once or twice. Student support personnel are responsible for offering an inventory of services but not equally responsible for utilization or outcomes.

Accountability means more than just adding responsibilities to faculty duties. The capacity to affect completion and placement means enabling faculty and those in student services roles to sustain effective communication with students and to have appropriate means to support students. The capacity refers back to the ways the programs themselves are organized. Finally, the accountability of personnel also means being clear on the objectives and goals. Faculty members at the Centers are aggressive in maintaining relationships with local employers for two reasons: completion and placement. The relationships help faculty sustain their relevance to employer needs and local industry trends that will help them design effective educational experience. The relationships also mean that faculty will know how to match graduates with employers.

**Conclusions**: There is much to learn from the Tennessee Technology Centers about the organization and delivery of occupational and technical education. This report has identified four key areas that distinguish the Centers' structure and organization and the features that underlie the institution's very high rates of completion and student success. We have also observed that the Centers characteristics are highly integrated and form a cohesive approach to educational delivery; this makes definitive identification of causal effects or factors difficult. Additional data, research and analyses of these features would

be useful to more deeply explore their effectiveness and how they, or other characteristics of the Centers, contribute to student success. Our own research stops short of definitive claims; in some areas we rely on anecdotal data for our inferences.

But we should not overlook a simple, but very central, lesson from the Technology Centers: *providing high quality education and organizing educational delivery and program structure to support student completion and success in the labor market can lead to those outcomes.* Moreover, the Centers achieve these outcomes with a population of students who are very often very low-income and who have not fared well in other educational settings. This is a very important lesson in the discussion of reform in community colleges.

It is tempting to view these outcomes and see the clear positive impact of this kind of education on students and then quickly suggest that the organization and features of the Centers offer solutions to the poor rates of completion and low student success in community colleges. We believe that some of the elements of the Center's practices *could* be adopted by community colleges and *could* help create more effective pathways to completion and success. However, it is also important to use appropriate caution in advocating that practices successful in one environment be transplanted into another environment. Community colleges have multiple educational missions, different groups of students, and a wider variety of program areas than those of the Centers. It is important to take those differences into account and to consider how lessons from the Technology Centers could help support improvements in community college operations. For example, many community colleges offer degrees in the same technical and occupational areas as the Centers; could some of the practices of the Centers be easily applied in those community college programs? Similar questions could be asked in other areas of conventional community college organization like student services and program structure. The Tennessee Technology Centers offer a model of a well-defined operating system and successful set of educational practices; these may help educators in other settings find ways to significantly increase rates of completion and increase success for more of their students.

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## Appendix A: Completers by Program for Selected Programs.2007-2008 Tennessee Technology Centers

| Program | Certificates | Diplomas | Other[22] | Total |
|---|---|---|---|---|
| Adult Basic Education | 0 | 0 | 509 | 509 |
| Adv. Manufacturing Ed | 0 | 0 | 6 | 6 |
| Aesthetician | 36 | 0 | 0 | 36 |
| Aircraft Mechanics | 5 | 80 | 43 | 128 |
| Asst. Animal Lab Tech. | 3 | 10 | 0 | 13 |
| Automotive Mechanics | 14 | 19 | 8 | 41 |
| Automotive Technology | 116 | 123 | 47 | 286 |
| Barbering | 6 | 28 | 0 | 34 |
| Biomedical Electronics Technician | 4 | 0 | 0 | 4 |
| Blueprint Reading | 0 | 0 | 131 | 131 |
| Brick, Block and Stone Masonry | 10 | 10 | 13 | 33 |
| Building Construction Technology | 9 | 14 | 13 | 362 |
| Business Computers and Console Operation | 0 | 0 | 143 | 143 |
| Business Data Processing | 0 | 0 | 1 | 1 |
| Business Systems Technology | 267 | 463 | 524 | 1254 |
| Child Care | 0 | 0 | 1 | 1 |
| Childcare Guidance and Management Supervision | 12 | 34 | 29 | 75 |
| Collision Repair and Technology | 46 | 73 | 72 | 191 |
| Computer Based Graphic Design | 13 | 13 | 1 | 27 |
| Computer Electronics | 14 | 14 | 5 | 33 |
| Computer Operations Technology | 112 | 172 | 318 | 602 |
| Cosmetology | 47 | 207 | 54 | 308 |
| Data Processing | 6 | 0 | 0 | 6 |
| Dental Assistant | 0 | 0 | 82 | 82 |

[22] Other generally indicates contract training for employers at a company or companies or special program for an occupational group.

| Program | Certificates | Diplomas | Other[22] | Total |
|---|---|---|---|---|
| Dental Assisting | 0 | 74 | 43 | 117 |
| Dental Laboratory Technician | 7 | 22 | 0 | 29 |
| Diesel Powered Equipment Technician | 30 | 17 | 0 | 47 |
| Dietary Management Assistant | 2 | 0 | 0 | 2 |
| Digital Graphics | 1 | 5 | 0 | 6 |
| Drafting and CAD Technology | 46 | 81 | 177 | 304 |
| Electrical/Electronic Equipment Repair | 30 | 58 | 80 | 168 |
| Electro Mechanical Technology | 1 | 0 | 2 | 3 |
| Electronics Technology | 46 | 46 | 24 | 116 |
| Emergency Medical Technology | 0 | 0 | 24 | 24 |
| Employee Team Leadership | 0 | 0 | 2 | 2 |
| Fork Lift Operator | 0 | 0 | 125 | 125 |
| Graphic Printing and Communications | 2 | 16 | 1 | 20 |
| Hazardous Materials | 0 | 0 | 358 | 358 |
| Health Insurance Specialist | 16 | 0 | 0 | 16 |
| Heating Ventilation and Air-conditioning | 68 | 157 | 158 | 383 |
| Heavy Equipment Maintenance and Repair | 1 | 5 | 21 | 27 |
| Industrial Electricity | 21 | 75 | 10 | 106 |
| Industrial Electronics | 13 | 26 | 12 | 51 |
| Industrial Maintenance | 165 | 200 | 484 | 849 |
| Industrial Training Technology | 0 | 1 | 1676 | 1677 |
| Information Technology | 2 | 0 | 0 | 2 |
| Injection Molding | 1 | 0 | 1 | 2 |
| IV Therapy Part-time | 0 | 0 | 56 | 56 |
| Landscaping (Supplemental) | 0 | 0 | 20 | 20 |
| Machine Tool Technology | 89 | 150 | 223 | 462 |
| Material Handling | 0 | 0 | 39 | 39 |

| Program | Certificates | Diplomas | Other[22] | Total |
|---|---|---|---|---|
| Medical Coding | 0 | 0 | 125 | 125 |
| Medical Information Technology | 2 | 60 | 0 | 62 |
| Medical Office Assistant | 0 | 20 | 226 | 246 |
| Medical Terminology | 0 | 0 | 16 | 16 |
| Miscellaneous Construction Trades | 0 | 0 | 82 | 82 |
| Motorcycle Repair | 3 | 8 | 0 | 11 |
| Nursing Assistant/Assisting | 184 | 0 | 218 | 402 |
| Patient Care Technician | 5 | 8 | 0 | 13 |
| Pharmacy Technology | 0 | 65 | 0 | 65 |
| Phlebotomy | 104 | 0 | 13 | 117 |
| Practical Nursing (LPN) | 63 | 1324 | 496 | 1883 |
| Precision Metals | 15 | 16 | 19 | 50 |
| Real Estate General | 0 | 0 | 49 | 49 |
| Registered Nurse Refresher | 35 | 0 | 141 | 176 |
| Robotic Manufacturing Technology | 14 | 5 | 0 | 19 |
| Spanish for Workplace | 0 | 0 | 186 | 186 |
| Surgical Technology | 4 | 104 | 0 | 108 |
| Technology Foundations | 1 | 1 | 508 | 510 |
| Tool and Die Making | 2 | 7 | 0 | 9 |
| Trade and Industrial Supervision | 0 | 0 | 23 | 23 |
| Tree Management | 0 | 0 | 25 | 25 |
| Truck Driving (CDL) | 83 | 224 | 37 | 344 |
| Welding | 0 | 0 | 29 | 29 |
| Welding, Brazing and Soldering | 133 | 149 | 334 | 616 |
| | | | | |
| **Totals** | **1909** | **4184** | **8063** | **14157** |

Source: THEC Statutory Data Report, 2009, Table 15

## Appendix B: Placement Rates in Selected Certificate and Diploma Occupational Programs, Tennessee Technology Centers, 2007-2008.

| Occupational Program[23] | Placement[24] Range | Mean Rate Placement in Field of Training[25] |
|---|---|---|
| Automotive Technology | 62-100 | 77.2 |
| Business Systems Technology | 60-95 | 79.2 |
| Computer Operations Technology | 42-100 | 77.2 |
| Cosmetology | 42-100 | 76.8 |
| Drafting/CAD Graphics | 64-100 | 80.5 |
| Electrical and Electronic Technology | 40-100 | 86.6 |
| Heating, Ventilation and Air Conditioning | 44-100 | 77.0 |
| Industrial Maintenance | 55-100 | 84.4 |
| Precision Machining Technology | 56-100 | 86.1 |
| Allied Health Occupations[26] | 60-100 | 80.2 |
| Practical Nursing (LPN) | 65-100 | 94.2 |
| Truck Driving (CDL) | 74-100 | 76.0 |
| Welding | 60-100 | 85.6 |

**Source: THEC, Statutory Data Report 2009,Tables 15 and 16.**

[23] Selected Occupational Programs including all programs that had over 250 certificate or diploma awards in 200-2008 for all Centers.
[24] Placement in related field of training.
[25] Calculated by total number of placements across the centers reporting placements for the selected occupational program areas. Not all Centers reported programs in each area. May not include all placements in related occupational areas.
[26] Includes various health sector occupational training from Dental Assisting to Surgical Technology, includes CNA programs.

## Appendix C:

## TTC Enrollment by Previous Education, 2009

| Technology Center | Non-HS Completer * | GED | HS Graduate | Some Postsecondary | Postsecondary Graduate | Totals |
|---|---|---|---|---|---|---|
| Athens | 10 | 105 | 273 | 59 | 20 | 467 |
| Chattanooga | NA | NA | NA | NA | NA | NA |
| Covington | 28 | 57 | 166 | 55 | 12 | 318 |
| Crossville | 370 | 125 | 333 | 37 | 5 | 870 |
| Crump | 44 | 82 | 305 | 6 | 4 | 441 |
| Dickson | 35 | 143 | 705 | 196 | 79 | 1158 |
| Elizabethton | 32 | 159 | 459 | 94 | 25 | 769 |
| Harriman | 14 | 64 | 180 | 80 | 6 | 282 |
| Hartsville | 398 | 97 | 345 | 73 | 22 | 935 |
| Hohenwald | 416 | 128 | 422 | 88 | 21 | 1075 |
| Jacksboro | 17 | 61 | 157 | 64 | 33 | 322 |
| Jackson | 8 | 161 | 608 | 37 | 22 | 826 |
| Knoxville | 30 | 283 | 798 | 290 | 149 | 1550 |
| Livingston | 403 | 153 | 711 | 549 | 219 | 2035 |
| McKenzie | 42 | 111 | 324 | 134 | 50 | 661 |
| McMinnville | 311 | 93 | 278 | 215 | 59 | 956 |
| Memphis | 46 | 155 | 911 | 61 | 40 | 1213 |
| Morristown | 29 | 186 | 681 | 137 | 14 | 1047 |
| Murfreesboro | 32 | 126 | 552 | 243 | 143 | 1096 |
| Nashville | 10 | 177 | 606 | 328 | 69 | 1190 |
| Newborn | 80 | 60 | 220 | 136 | 3 | 499 |
| Oneida | 261 | 78 | 262 | 61 | 18 | 680 |
| Paris | 4 | 138 | 330 | 124 | 20 | 616 |
| Pulaski | 330 | 110 | 346 | 443 | 99 | 1328 |
| Ripley | 319 | 59 | 192 | 177 | 32 | 779 |
| Shelbyville | 38 | 163 | 621 | 210 | 58 | 1090 |
| Whiteville | 33 | 41 | 186 | 79 | 36 | 375 |
| Totals | 3,340 | 3,115 | 10,971 | 3,976 | 1,258 | 22,660 |
| % of Total | 14.7 | 13.7 | 48.4 | 17.5 | 5.5 | |

Source: TBR, Printout, 2010. Includes enrolling students who reported previous education.