



STATE OF CONNECTICUT  
STATE BOARD OF EDUCATION



TO: Clerk of the Senate  
Clerk of the House of Representatives

FROM: Stefan Pryor  
Commissioner of Education

DATE: December 2, 2013

SUBJECT: *Assuring Connecticut's Success: A Summary of Current Practices, Conditions and Forecasts in Technical Education at the Connecticut Technical High School System*

In accordance with Connecticut General Statutes Section 10-95h, enclosed is a copy of *Assuring Connecticut's Success: A Summary of Current Practices, Conditions and Forecasts in Technical Education at Connecticut Technical High School System*. Please note that by copy of this letter, I am distributing copies of this report in accordance with C.G.S. Section 11-4a.

If you have any questions or require additional copies, please contact Sarah Hemingway at (860) 713-6493. Thank you.

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Enclosure

CONNECTICUT STATE DEPARTMENT OF EDUCATION

# Connecticut Technical High School System

Assuring Connecticut's Success:

A Summary

of

Current Practices,

Conditions and Forecasts

Dr. Nivea L. Torres, Interim Superintendent of Schools  
November 15, 2013

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## **Introduction**

The Connecticut Technical High School System (CTHSS) remains committed to its century-old tradition of educating students with the highest expectations for their success. Trade technology and academic curricula are on a continuous evaluation and revision cycle to meet current and forecasted labor market and economic outlooks. Preparing students to graduate from high school both career and college-ready, and able to contribute to their communities, the CTHSS strives to meet the needs of Connecticut's 21<sup>st</sup> century workforce while furnishing the State with well informed, skilled, productive citizens.

The CTHSS includes 17 fully accredited diploma-granting high schools, regionally based in the following locations: Danbury, Bridgeport, Manchester, Danielson, New Britain, Groton, Waterbury, Norwich, Ansonia, Milford, Hartford, Middletown, Hamden, Meriden, Willimantic, Torrington, and Stamford, CT. All schools offer programs for students, grades 9 - 12, as well as programs for re-careering adults. The Stamford school, J. M. Wright Technical High School temporarily suspended its operations in 2009 and is projected to reopen in 2014 as a completely renovated school with a revised program of study.

The CTHSS also operates Bristol Technical Education Center, a non-diploma granting institution for students from regional comprehensive high schools and re-careering adults seeking trade technology skills and credentials. Further, the CTHSS operates two Aviation Maintenance Technician training facilities for adults. They are CT Aero Tech in Hartford and Stratford School for Aviation Maintenance Technicians.

As of October 1, 2013, 10,797 students (grades 9 – 12) as well as 406 adult day and evening trade technology students (including Licensed Practical Nursing adult students) are benefitting from the career and post-secondary education options afforded them by technical education programs offered by the CTHSS. The exceptional results here are due in no small measure to the dedicated academic and trade technology instructors, student support and administrative professionals who work to update the curriculum and instructional delivery, as well as their own trade technology expertise, and ensure our students' competitive edge in meeting Connecticut's labor and economic needs.

Students have the opportunity to complete their high school career, mastering relevant and updated trade technology skills, while simultaneously meeting requirements for post-secondary education and college entry. Their trade technology skills are of high quality, and with earned business and industry credentials, they are able to sit for licensure examinations, serve qualifying apprenticeships at advanced levels, and access Connecticut's job market. These trade technology skills sow the seeds for future entrepreneurial thinking in the workplace. CTHSS students graduate each year into the best of both worlds; doors opened to good jobs and post-secondary education/college entry.

## **CTHSS Board Governance**

During the 2011-12 school year, the CTHSS was under the jurisdiction of the Connecticut State Board of Education, which appointed four of its members to the CTHSS Committee, but effective July 1, 2012, in accordance with Public Act 12-116, a new 11-member Connecticut Technical High School System Board was created. The new board includes the following members: Four executives of Connecticut-based employers who shall be nominated by the Connecticut Employment and Training Commission and appointed by the Governor; five members appointed by the State Board of Education; the Commissioner of Economic and Community Development; and the Labor Commissioner. The Governor shall appoint the chairperson. The chairperson of the technical high school system board shall serve as a nonvoting ex-officio member of the State Board of Education.

The Technical High School System Board and the Commissioner of Education jointly recommend to the State Board of Education the appointment of the superintendent of schools. The technical high school system board shall offer full-time, part time and evening programs in vocational, technical and technological education and training. The board may make regulations controlling the admission of students to any such school. The Commissioner of Education, in accordance with policies established by the board, may appoint and remove members of the staffs of such schools and make rules for the management of and expend the funds provided for the support of such schools. The board may enter into cooperative arrangements with local and regional boards of education, private occupational schools, institutions of higher education, job training agencies and employers in order to provide general education, vocational, technical or technological education or work experience.

## **Current Programs: Secondary**

All CTHSS programs for grades 9 - 12 require students to meet the same comprehensive academic competencies demanded of all Connecticut students, in order to earn a high school diploma. And all CTHSS students must simultaneously complete a rigorous trade technology course of study in order to earn trade technology endorsements upon graduation. The technical programs under each career cluster have a post-exploratory three – and – a - half year program of study that incorporates all academic and technical coursework, resulting in the mastery of both theoretical content knowledge and technical performance skills. The trade technologies offered are grouped in seven career clusters as follows:

- Tourism, Hospitality and Guest Services Management
- Construction
- Manufacturing
- Transportation
- Computer Technologies
- Health Technologies
- Arts, Audio/Visual Technology and Communications

**Tourism, Hospitality and Guest Services Management** - Graduates of these programs are employed in the management, marketing and operation of restaurants, bakeries or lodging and travel-related services, personal services (hairdressing/barbering), and fashion design.

- Baking
- Culinary Arts
- Fashion Merchandising and Entrepreneurship
- Hairdressing/Barbering
- Marketing, Management and Entrepreneurship
- Tourism, Hospitality and Guest Services Management

**Construction Cluster** - Graduates are employed in residential, commercial and industrial construction areas.

- Architectural Technologies
- Carpentry
- Electrical
- Heating, Ventilation and Air Conditioning (HVAC)
- Masonry
- Plumbing and Heating
- Plumbing, Heating and Cooling

**Manufacturing Cluster** - Students in these interrelated technologies are employed in manufacturing and assembling goods, drafting and design, machining and welding/fabrication. They also pursue advanced training for production control, product and tooling design and manufacturing engineering.

- Automated Manufacturing Technology
- Computer-Aided Drafting and Design (CADD)
- Electromechanical Technology
- General Drafting and Design
- Manufacturing Technology
- Welding and Metal Fabrication

**Transportation Cluster** - Graduates apply technical knowledge and skills in diagnostics, repair and maintenance of automotive and heavy-duty engines and equipment as automotive mechanics, diesel engine repair technicians, and in collision repair and refinishing.

- Automotive Collision Repair and Refinishing Technology
- Automotive Technology
- Diesel and Heavy Duty Equipment Repair

**Computer Technology Cluster** - Graduates are employed in designing, developing, managing and supporting hardware, software, multimedia and systems integration services within high-technology industries.

- Electronics Technology
- Graphics Technology
- Information Systems Technology (IST)
- Pre-Electrical Engineering and Audio Visual Technology

**Health Technology Cluster** - Graduates are employed in health-related and early care and education occupations, as well as those in bioscience and environmental technology research. Graduates may complete competency credentials or certifications within their specialty.

- Bioscience and Environmental Technology
- Early Care and Education
- Health Technology

**The Arts, Audio/Video Technology and Communications Cluster** - Graduates are employed in planning, organizing, evaluating, creating and performing in the Arts, Media, Music and Theatre Production Technologies.

- Media Production Technology
- Music Production Technology

### **Current Programs: Adult**

CTHSS also provides career and life changing training for adult students. These programs are offered at selected school sites and may be offered as day or evening, full-time or part-time programs.

- **Licensed Practical Nurse (LPN) Program**
- **Dental Assistant**
- **Certified Nurse-Assistant (CNA)**
- **Medical Assistant**
- **Surgical Technology**
- **Aviation Maintenance Technician**
- **Adult Apprenticeship and Extension Courses**

**LPN Program** – Graduates meet CT State Nursing Board of Examiners standards as well as obtaining some of the prerequisites for Registered Nursing (RN) programs at the Connecticut Community Colleges (CCC). Graduates are eligible to sit for the CT State Board Licensure Examination. They are eligible for college credit by applying to Charter Oak State College.

Coursework in Practical Nursing, Medical-Surgical Nursing across the Life Span, Developmental Psychology across the Life Span, Fundamentals of Nursing, Pharmacology, Wellness and Health, Human Biology, Maternal to Newborn Nursing and Psychology is accompanied by clinical experiences in the care of adult patients and in the care of selected patients in any age group whose conditions are less than critical. Graduates meet Connecticut's documented high demand for Licensed Practical Nurses and earn competitive wages with strong retirement and benefits packages immediately after graduation. The average LPN in CT earns \$56,000.00 with full benefits.

In September 2012, Bullard-Havens THS, Eli Whitney THS, Vinal THS, Prince THS and Norwich THS were given full accreditation for six years by the Council on Occupational Education. In June 2012, W.F. Kaynor THS LPN program received its full accreditation.

**Dental Assistant** - Graduates are employed in dental offices and clinics performing the full range of chair side procedures, patient care and office duties. Graduates earn Infection Control (ICE) and Radiation Health & Safety (RHS) certifications prior to the start of 350 hours of clinical rotations. The program's accreditation by the American Dental Association (ADA) provides students with eligibility to take the Dental Assisting National Board General Chairside Examination upon graduation. Successful completion of this exam along with the ICE and RHS certifications earns students the title of Certified Dental Assistant (CDA).

**Certified Nurse Assistant** – Graduates are employed in many areas of Long-term Care (Geriatrics), Hospital and Home Care, Clinics, Medical Offices. CNA graduates often further their education in health and allied health-related fields. Graduates are eligible to take the written and skills examinations for entry onto the CT Nurse Aide Registry.

**Medical Assistant** - An externship experience is guaranteed and all students are placed in physician's offices, walk-in centers, hospitals or clinics for six weeks and are prepared for employment in those venues.

**Surgical Technology** - All students are placed in a six month clinical externship in area hospitals. Graduates are in high demand in:

- Hospitals: operating rooms, cardiac catheter laboratories, birthing centers, central sterile supply depts., emergency rooms, endoscopy suites
- Ambulatory Care Centers
- Medical Doctors' Offices
- Harvest Teams
- Medical-Surgical Product Development
- Laser Technology

**Aviation Maintenance Technician** - This twenty-month (2400 hours) aviation maintenance technician program enables students to develop operative skills that meet the requirements of the Federal Aviation Administration (FAA). Students venture into the actual world of aviation, the

theoretical content and practical experiences in metal work, woodwork, welding, hydraulics, electrical, electronics, painting and engine (turbine and reciprocating) overhaul. Students will become proficient in approximately 50 skilled trade areas and be able to interpret FAA regulations and manufacturer's technical specifications. Graduates enter jobs as technicians at airports and aircraft and power plant companies.

**Apprenticeship and Extension Courses** - CTHSS offers a wide range of skilled trade licensure and advanced training in the following trade areas:

- Electrical
- Heating and Cooling
- Sheet Metal
- Plumbing

Additionally, courses for multi-trades include Basic Math Computations, Blueprint reading and Building Trade Safety. Further, courses offered may include: Manufacturing, Machine Theory, Welding, Computer Numerical Controls (CNC), MasterCam, Phlebotomy, EKG Technology, and Central Sterile Supply.

### **Labor Market Projections**

In 2012, President Obama set a new goal for the country to address the failing economy and the inequality of access and quality of educational programs in preparing the nation's youth. President Obama avowed that every student in America will graduate from high school prepared both for college and a successful career. The blueprint laid out by the President "affirms the strength of the American economy is inextricably linked to the strength of America's education system" (United States Department of Education, 2012, p. i).

According to the Harvard Graduate School of education's *Pathways to Prosperity Project* report, the United States' economy will create some 47 million job openings by 2018 (Symonds, Schwartz and Ferguson, 2011). Employers need to have employees with a strong foundation in academic and technical preparation in high school and graduate from high school prepared to work. The Georgetown University Center on Education and the Workforce report, *Career Clusters: Forecasting Demand for High School through College Jobs 2008-2018* projects that 14 million job openings of the aforementioned 47 million will be filled by workers with an associate's degree or occupational certificate (Carnevale, Smith, Stone, III, Kotamraju, Steurnagel and Green, 2011.)

Jobs for workers with a high school diploma represent about 60 percent of all new and replacement jobs in the U.S. economy for high school workers between 2008 and 2018. Many of these will be in *middle-skill* occupations such as electrician and construction manager. *Middle-skill* jobs are defined as those positions in which workers are required education beyond high school but less than earning a bachelor's degree.

*Middle-skill* openings represent the replacement of retiring licensed *baby boomer* tradesmen, these fields will provide nearly eight million job openings, of which 2.7 million will require a post-secondary credential. “In fact, twenty-seven percent of people with post-secondary licenses or certificates will earn more than the average bachelor’s degree recipient (Symonds, et al., 2011, p.3).” A review of Connecticut employment data affirms the projections made by the *Pathways to Prosperity Project* and the Georgetown University Center on Education and the Workforce’s *Career Clusters: Forecasting Demand for High School through College Jobs 2008-2018* report (Symonds, et al., 2011 and Carneval et al, 2011).

Although most researchers examine projected employment growth and development through the lens of industry, it is critical to understand that “the occupational mix within each industry drives the demand for education, skills, and training” (Carnevale, et al., p. 47). The Career and Technical Education (CTE) system plays a crucial role in rebuilding America’s economy and achieving the President’s education goal. The CTHSS offers students opportunities for career awareness and preparation by providing them with the academic and technical knowledge and employability/21<sup>st</sup> Century skills necessary to be successful in post-secondary education, training, and employment. The CTHSS has effective, high-quality career and technical education programs aligned with college and career-readiness standards that meet the needs of Connecticut employers, industry, and labor. For example, CTHSS Plumbing and Heating students successfully completing the program will receive 720 hours of theory instruction and up to 1500 hours of on-the-job licensing credit. To obtain a Connecticut Plumbing Journeyman’s license, plumbers must complete 8000 hours on the job. CTHSS Plumbing and Heating graduates will start employment at a year-two apprenticeship level which is 55 percent of the Journeyman’s hourly wage. According to the Connecticut Department of Labor’s *Prevailing Wage Rates System Annual Adjusted Rates*, a Connecticut Plumbing and Heating Journeyman’s hourly rate is \$38.67 with an additional \$25.56 in fringe benefits (Connecticut Department of Labor, 2013).

Trade Reauthorization is another important process that impresses the need for the CTHSS to be in front of the current and future viability of the trades. In accordance with CGS Section 10-95i(b), the State Board of Education must evaluate each trade program in the CTHSS and consider reauthorization of each trade for a period of not more than five years. A trade program may be reauthorized following each evaluation on the basis of projected employment demand for enrolled students; consideration of the employment of graduates during the preceding five years; anticipated technological changes and 21<sup>st</sup> century trends that may impact skill employment and advancements in content knowledge training; the availability of qualified instructors; the existence of similar programs at other institutions, as well as student recruitment/interest in the trades.

As part of the evaluation, the Superintendent and the Connecticut Technical High School System Board must consider geographic differences that may make a trade program feasible at one school and not at another, and whether certain combinations of program offerings might be required. Prior to making any decision to reauthorize, the superintendent and the board must consult with the committee’s Trade Technology Advisory Committee (TTAC) evaluations for any trade being evaluated. This is done through the CTHSS staff research, awareness of and archiving of TTAC

recommendations among other sources of information including Department of Labor and Office of Workforce Competitiveness Research.

The Department of Labor (DOL) conducts comprehensive research and publishes labor market projections and economic outlooks every two years, projecting out for the next ten years (i.e. Connecticut DOL occupational projections 2008-2018). The CTHSS management and trade technology consultants work with and consult the DOL reports regularly and incorporate projections in the preparation of trade reauthorization documents and in retooling curriculum. Current study and projected employment demands in job categories associated with the trades are collected, reviewed and disseminated.

As a case in point, the most recent DOL study (2008-2018) indicates that in 2008, 34,123 jobs in Health Technology fields existed and there was a projected growth of 4,241 jobs in 2018. DOL estimates Health Technology related jobs to present approximately 1,218 new jobs per year. The CTHSS works to further that information by collecting its own graduate data approximately four months after graduation. Five years-worth of such data is used along with other TTAC trade indicators and recommendations, to make decisions for changing the curriculum, purchasing equipment, supplies, and managing shop enrollment and staffing levels, going forward.

## **Trade Credentialing**

The CTHSS has placed curriculum and the pace of instructional delivery on a cycle of continuous revision and updating. Assessments, both formative and summative, are conscientiously examined for alignment with state standards, as well as business, industry and health standards for licensure, certification and professional credentialing. Our technical programs must be kept current, and the integration of our students' academic skills with trade technology requirements must be just as current. The CTHSS has a century-old tradition of prioritizing this critical work from the ground up.

Toward that end, each trade technology in each school maintains a vitally active Trade Technology Advisory Committee (TTAC), made up of representatives of the working trades. As tradespersons themselves, these men and women are the business owners, product suppliers, contract sales, designers, inventors of new industry standards. More importantly, they are the current employers. In many cases, TTAC members are also graduates of technical high schools and volunteer their time, service and donations to support the school with which they are affiliated. Collectively, they serve as an important review team, making recommendations regarding technology shop practices, resources and procurement. They provide a fresh perspective on maintaining the delicate balance between safety and efficiency, facilities upgrades, equipment replacement or repair decisions and insuring sufficient supplies for performance and production experiences.

TTAC members are actively recruited to become reviewers and editors of our trade technology curricula & textbooks. Trade instructors and department heads discuss critical assessments with them to determine if the assessments are aligned to the curriculum, i.e. District Summative Assessments (DSA), the National Occupational Career Test Institute (NOCTI), and other written and

performance assessments used throughout grades 9 – 12. The purpose of these reviews is to ensure alignment with the trades as they exist today. This is critical work toward ensuring that CTHSS is training its students to meet the real needs of CT employers, so that they can legitimately enter the workforce, job-ready.

Working with TTAC's is vital and designed to include monthly meetings with members, visits to the shops, inspections of supplies and equipment. Further, it provides opportunities for mentorship and for students to communicate with their future employers. Twice a year, all TTAC's are brought together to consult on trade changes, new and emerging trends, and future projections for growth and jobs. Minutes of these meetings are preserved and sent to Central Office as well so that trade technology consultants, managers and the superintendent will be updated on the needs and outlook of each trade. This process is also foundational to collecting and providing data to the State Board of Education during the Trade Reauthorization process.

TTAC members are as generous with their connections, supplies, equipment and dollars as they are with their time. Often, the day after TTAC meetings, the plumbing shop will find a load of copper pipe on their loading dock, the carpentry shop will find more board lengths than they can find space to store, the electro-mechanical shop will be burgeoning with small appliances and other items for students to diagnose and repair or the manufacturing shop will be asked to accept lathes and grinding equipment that is more updated than that which they have on the shop floor. In these difficult times, their donations have made production experiences for our students a reality.

The point to be taken here is that all of the input of the TTAC members becomes a factor in our curriculum design and delivery, in our ability to place students in Work-based Learning Experiences, provide them with opportunities to observe, inspect and job shadow, and most important, present them with job prospects.

To be certain, keeping curriculum current, having an updated blueprint for teaching and learning in all trade and academic areas to discuss with the TTAC members and others, requires a high level of vigilance on the part of our trade consultants and our instructors. They must maintain strong ties to the trades they represent, as well as to the world of research and higher education to assure curriculum updates are making it into revisions in real time.

Many of our trades are incorporating model business and industry standards, certifications, levels of expertise endorsements that are standard in the working trades. All students graduating from the CTHSS receive a diploma and trade endorsement, but the majority of those students also earn additional credentials. Over the last three years, approximately 80% of the graduating students left our system eligible for either national or state certifications, credentials and/or credit towards licensed apprenticeships in their trade. (Examples of these credentials include: Culinary students earning the National Restaurant Association's ServSafe Certification; Manufacturing students graduating with the first four National Institute of Metalworking Skills (NIMS) credentials; Automotive students becoming ASE and National Automotive Tech Ed Foundation (NATEF) certified. Hours towards licensing and apprenticeship from the Connecticut Department of Labor and

Department of Public Health are included in curriculum for Carpentry, Electrical, HVAC, Plumbing, Hairdressing and Barbering). Students are earning job and income enhancing credentials in new production methods and becoming continuous improvement certified within their trades.

Transitioning our graduating students into the labor market or to meet college entry requirements demands the aforementioned work. Preparing students to meet the current and future demands of their trade technology, means that CTHSS is obligated to be part of the firsthand research and forecasting of all workforce projections.

## **Manufacturing Cluster**

The current and future trends in manufacturing will require a more efficient use of resources and materials. It will involve a process of continuous improvement in all aspects of the manufacturing environment. The idea of doing more with less will dominate the business model. A company may reduce the number of employees but require existing employees to broaden their scope of responsibilities. Successful companies will use continuous improvement practices along with flexible manufacturing systems (FMS). Flexible manufacturing systems generally utilize automated CNC machines and allow companies to quickly respond to changes in industry. Companies will have the flexibility to change product types, operations used for manufacturing, volume, capacity, and resources like time and effort.

Another important element of continuous improvement is rapid prototyping. This is a process that uses virtual three-dimensional designs created on CAD systems and transforms them into plastic or composite prototypes giving customers an accurate understanding of a product's design. Another name for this is additive manufacturing. It really opens up the design process to accurately target a customer's needs. The future of rapid prototyping will lead into rapid manufacturing where companies will respond even faster to changes in the marketplace.

The CTHSS has begun, and will over the next several years continue to incorporate the following skills and concepts relating to these trends in manufacturing into the manufacturing cluster curricula:

- Lean manufacturing principles (continuous improvement)
- Total Quality Control (TQC)
- Total Productive Maintenance (TPM)
- Computer Integrated Manufacturing (CIM)
- Just in Time (JIT) Production
- Virtual 3Dimensional simulations and web-based instruction
- Reverse engineering principles

In addition to providing support through the TTAC committee, companies must be committed to provide support in our schools through; speaking presentations, field trips, job shadowing, Work-based learning opportunities and donations of equipment and material relevant to current trends.

In the near future we will be providing opportunities for manufacturing students to earn certification in MasterCAM© and CADD students to earn SolidWorks© Associate software certifications. Curriculum revision is ongoing and striving to meet the needs of the manufacturing sector now and for the future. We are currently revising curriculum in the following areas;

- Aligning the curriculum to the Career and Technical Common Core and 21<sup>st</sup> century skills (all trades)
- Adding Lean manufacturing principles in all grade levels (MFG)
- Creating common performance assessments preparing students to achieve National Institute of Metalworking Skills (NIMS) credentials (MFG).
- Aligning the curriculum with essential math skills at all grade levels (all trades)
- Embedding STEM skills through additive manufacturing (3D printing) and engineering principles (CADD)

It is the belief of our trade and technology committees that the future of assessment in the trades/ technologies should, whenever possible, align with a national standard. The Manufacturing Technology program uses the National Institute of Metalworking Skills, Inc. (NIMS) credentialing program. Manufacturing students earn nationally recognized credentials in precision machining through this program.

#### **NIMS data:**

The CTHSS Precision Manufacturing program has aligned it's curriculum to the National Institute for Metalworking Skills skill standards and began using the standards-based competency assessments in the 2008-09 school year. The NIMS is the Nation's only American National Standards Institute accredited developer for the metalworking industry. The NIMS was established in 1995 by the metalworking trade associations to develop and maintain a globally competitive American workforce. The NIMS organization certifies individual skills against their standards and accredits programs that meet its quality requirements. There are 11 credentials which make up the NIMS Machining Level I Certificate of Merit.

During the period in which Connecticut precision manufacturing students have tested statewide against the National Standards, the Connecticut students have scored above the national average for that time.

- **2008-2009. National passing rate: 86.0. Connecticut passing rate: 90.8.**
- **2009-2010. National passing rate: 84.7 Connecticut passing rate: 91.9.**
- **2010-1011. National passing rate: 81.3. Connecticut passing rate: 87.8**
- **\*\*2011-2012. National passing rate: 81.0. Connecticut passing rate: 82.0**
- **Overall passing rates: National- 83.25. Connecticut - 88.13**

\*\*2011-2012- 139 seniors graduated and 88% (116) achieved 3 or more credentials  
44 seniors earned 4 credentials, one student earned 5 credentials

2011-2012 list of credentials

1. Machining Level I – Measurement materials and Safety **(127)**
2. Machining Level I – Job Planning, Benchwork & Layout **(118)**
3. Machining Level I – Manual Milling **(33)**
4. Machining Level I – Drill Press **(37)**
5. Machining Level I – Surface Grinding **(2)**
6. Machining Level I – Turning - Between Centers **(31)**
7. Machining Level I – Turning – Chucking **(0)**
8. Machining Level I – CNC Milling programming, setup and operation **(33)**
9. Machining Level I – CNC Turning programming, setup and operation **(22)**
10. Machining Level I – CNC Milling operator **(0)**
11. Machining Level I – CNC Turning operator **(0)**

Three (3) schools have achieved “NIMS Site accreditation”, Kaynor Tech (Waterbury), Platt Tech (Milford), and Oliver Wolcott Tech (Torrington).

Being able to implement researched based instructional tools; incorporate innovative technology; and continually monitor student performance effectively; will insure our students are well prepared to meet the challenges of next generation manufacturing -- To be the “best” technical high school students in the nation.

**Student recruitment and program expansion;**

In addition to the generous support of the State’s many manufacturing organizations and the Connecticut Business and Industry Association (CBIA), our partnership with the Connecticut Center for Advanced Technology (CCAT) continues to promote precision manufacturing as a viable career and to develop a manufacturing pipeline by recruiting young students.

CCAT works with the CTHSS and a coalition of partners through the *Connecticut Dream it! Do It! initiative* (<http://www.ctdreamitdoit.com/>). Dream It! Do It! was created in 2005 by the Manufacturing Institute, a not for profit education policy arm of the National Association of Manufacturers (NAM). *Connecticut Dream it! Do It!* focuses on enhancing Connecticut’s manufacturing workforce and industries. Engaging and recruiting middle school students into the CTHSS as well as encouraging enrolled 9<sup>th</sup> graders to select precision manufacturing as a career choice is a major goal of Dream it! Do It!

The technical system and CCAT have also developed the *Young Manufacturers Summer Academy (YMSA)* at three schools through an Inter-district grant for middle school students. The YMSA “is an experimental education program that; promotes an integrated hands-on applied technology curriculum; introduces students to the 21<sup>st</sup> century advanced manufacturing workplace; and

reduces racial, socioeconomic, and cultural barriers through a shared experience of participating in real-world education and career activities.” This program is going into its 5<sup>th</sup> year with a goal of expanding to all precision manufacturing sites. Programs like this are also critical for increasing parent’s awareness of how precision manufacturing jobs support a strong economy. These efforts have also had a direct impact on program enrollment. The manufacturing cluster trades have seen enrollment increases every year for the last five years.

Although the curriculum could now be considered up-to-date for a high school program, equipment and technology in many of our schools is 25 to 45 years old. Thanks to the support of our state legislature and the Governor, we are using bonded equipment funds not only for purchase of new CNC equipment, but also to replace worn and outdated manual equipment so students’ projects and parts can maintain precision tolerances required by the NIMS credentialing process.

To meet future trends the CTHSS will need to purchase additional CNC technology, Quality Control equipment, and CAD/CAM software. Continued funding at the state level will be essential to the success of the trades/technologies in the manufacturing cluster. The equipment listed below will be required to effectively implement instruction:

- CNC milling and turning centers (tool room and production types)
- CNC coordinate measuring machines
- CNC tooling storage to maintain organization and lean practices.
- MasterCAM© programming software
- SolidWorks© and Autodesk© 3D design software
- Web-based online instructional tools:
- Multi-material 3D rapid prototyping machines/printers
- 3D handheld scanners used for reverse engineering and design

In addition, it will be important to implement a comprehensive preventative maintenance plan for the new equipment. Our plan is utilize the existing Electro-Mechanical programs at Vinal Tech in Middletown, Platt Tech in Milford, and add one additional program at another site to maintain the equipment across the state. This plan would provide a sustainable solution to equipment maintenance and provide the students in these programs real world experience working on the latest technology.

## **Green Technologies**

The E-House, which incorporates an operating Solar PV, Solar Thermal, Weatherization and Energy Efficiency lab, are provided by a funding plan through Energize Connecticut. The plan also includes training and professional development for our instructors.

The E-House Component is comprised of a renewable energies and energy efficiency Weatherization/Building analyst lab which was designed by the Windham Technical High School Architectural Department. Twelve (12) of the eighteen (18) will be a 16’ by 20’ structure with

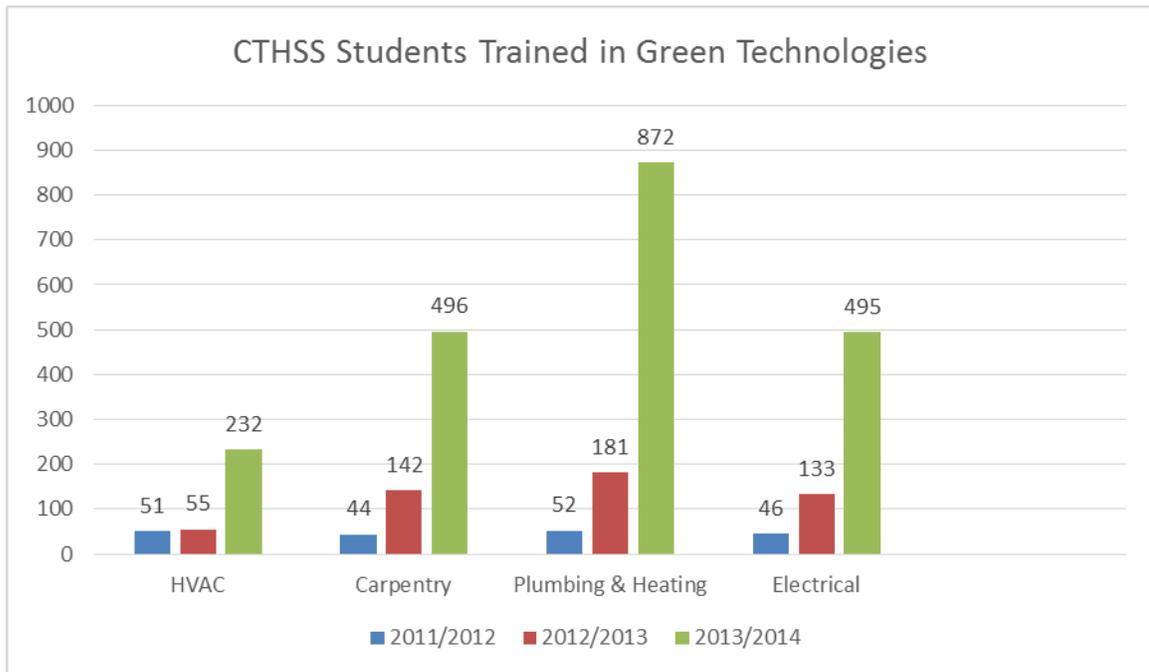
a specifically designed roof for optimum functionality of both solar thermal and PV arrays. The remaining six (6) E-Houses will be 20' x 30', and will incorporate geo-thermal technologies. The pitch of the roof is designed for optimum performance for solar renewal resources for Connecticut's Latitude. The structure also utilizes a multitude of new construction and design techniques that have energy conservation in mind. The E-House will also be somewhat of a "time capsule", demonstrating the insulation/construction practices of years past, to today's more efficient practices of design/construction. Students and visitors may view the variety of insulation and construction methods utilized through the Plexiglas wall covering installed at specific locations within the structure.

The E-House will also have a variety of lighting ranging from yesteryears' inefficient lighting to today's energy efficient light such as cfl's and led. The heating system will incorporate a 95%+ energy efficient boiler which will be connected to two stages of heat which include both Buderus flat panel radiator and fan coil unit for the first stage and a low temperature Watt's radiant heating system for the second stage. The boiler, solar thermal panels, and method of transmitting energy will be updated as new technologies become available. The domestic hot water will utilize either a two flat panel solar array or thirty tube evacuated tube solar thermal system, which will be tied into a dual coil indirect water heater. The 20' x 30' E-House will have up to four panels (depending on the system design). The hot water created by the E-House will be piped back into the Host School for usage in a **GREEN Bathroom, or other specified location**. To allow for training on heat pumps, we incorporated the use of a 26.1 SEER ductless mini-split which utilizes an environmentally friendly refrigerant. On some of the larger E-houses we will be incorporating a Space Pak high velocity system, which include energy recovery ventilators, as well as steam humidification. The lighting and power for the 16' x 20' structure (2.3 KW) will come from the nine solar PV panels located upon its roof. The 20' x 30' E-house has the potential to generate 6 KW. The electrical system will be wired back into the grid. All of the monitoring for the E-House can be accomplished via a web-based sun reports module or en-phase monitoring for the micro-inverter systems. These modules provide the opportunity for classrooms around the state, to monitor the energy created all throughout the day. This will allow for student tracking of both BTU's and Watts of energy created by both systems. The temperature of the E-House can also be controlled and monitored through the Internet via the web-based accessed thermostat. Schools at the moment that do not have the E-House located at their site will have the ability to travel to the host schools for practical hands on experience with their students. The E-House will also be able to provide both Weatherization and Building Analyst practical hands on experience. The expanded version of the E-House will also allow for Combustion Area Zone testing (CAZ).

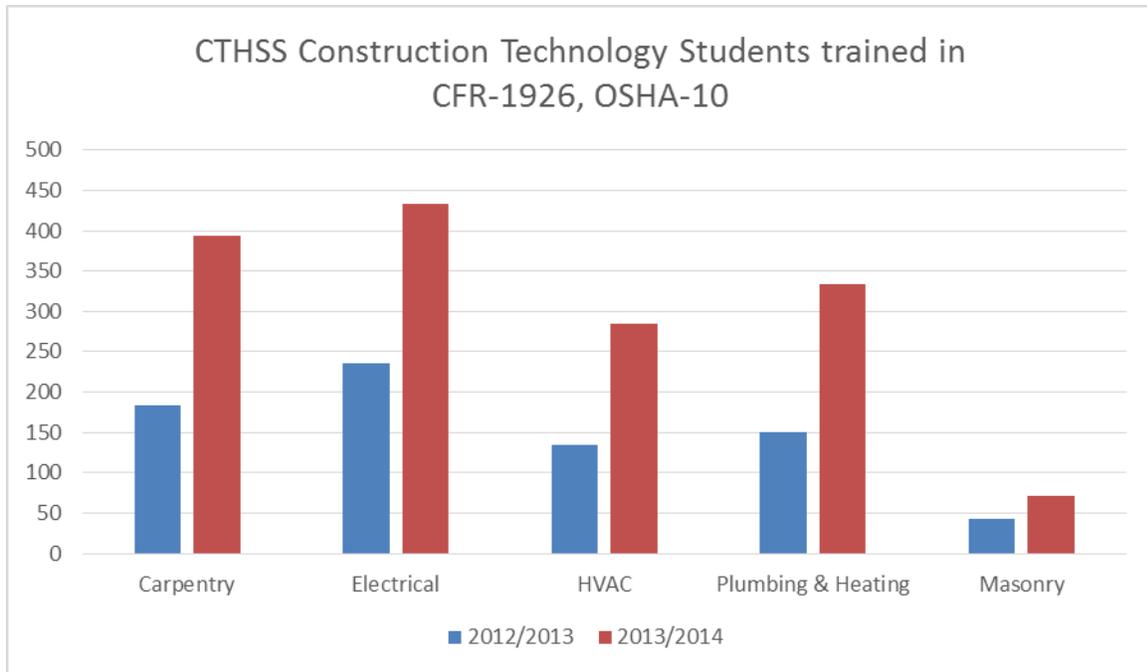
Windham THS' architectural department has provided drawings of the new 20' x 30' design. This will allow us to expand our program to offer Combustion Area Zone testing for our E-Houses for energy efficiency purposes. The separation of the mechanical room, from the main area will allow for "real world" experiments, and scenarios. We are also incorporating geo-thermal heating & cooling systems, within the expanded version of the e-house to further expose our HVAC programs with the most current technologies available. Along with the geothermal systems, we are also adding energy recovery ventilators (ERV), as well as the systems, that are currently in place in the 20' x 16' design.

**The goals of the project are the following:**

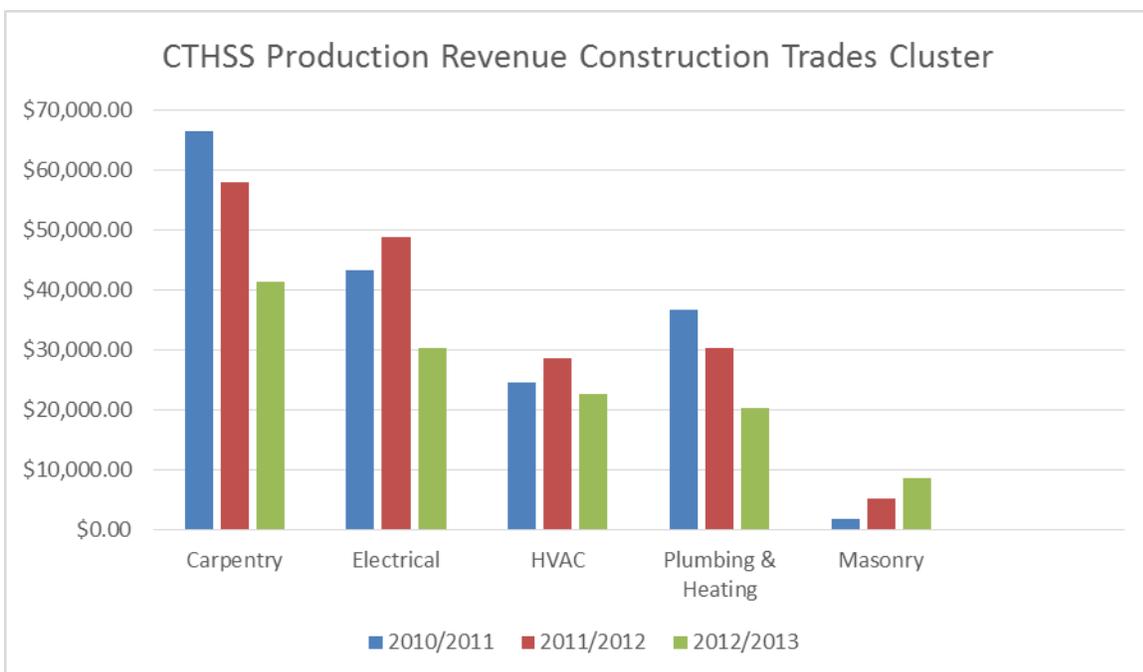
- Increase in the knowledge and awareness of clean energy, and energy efficiency technologies and its benefits to society among CT Technical High School faculty and students.
- Enable all technical high schools to offer renewable energy courses and hands-on equipment to their students that are aligned with current curriculum standards.
- Provide professional development to trade teachers in the renewable energy technologies of solar PV and solar thermal.
- Prepare students for emerging employment opportunities in renewable energy and energy efficiency fields.
- Incorporation of Geo-Thermal Heating and Cooling Systems, High Efficiency Heat pumps, Energy Recovery Ventilators, Solar PV and Solar thermal curriculum and hands-on training with all CT Technical High Schools.



**Construction Cluster students trained in OSHA 10-(Code of Federal Regulations (CFR)-1926)**



**Production Revenue for the CTHSS Construction Cluster**



## **Recommendations**

In April 2012, the United States Department of Education and the Office of Vocational and Adult Education published, *Investing in America's Future: A Blueprint for Transforming Career and Technical Education*. This document identifies four core principles that shape rigorous, relevant, and results-driven career and technical education programs (United States Department of Education, 2012, p. 2).

The CTHSS is in the process of drafting a similar blueprint as part of its strategic planning process. The purpose is to articulate a strategic plan of action for the district that builds upon existing district infrastructures; refines and expands accessibility for all CTHSS learners; and identifies the changes necessary to fully implement a college and career ready curriculum. The strategic plan will clearly define the paradigm shift that is required to revitalize the district and propel its practices to encourage innovation among CTHSS learners, teachers, school leaders, business/industry partners and families to expand and to promote program offerings for the 21<sup>st</sup> century. The four (4) core principles and corresponding strategic priorities guiding this initial proposal are *Alignment, Accountability, Collaboration* and *Innovation*.

Below are some initial recommendations:

### **Alignment:**

- Refine the district's admission policy to include the use of an entrance multiple-apptitude battery assessment that measures prospective CTHSS learner's abilities and helps predict future academic and technical success.
- Expand the district's accountability system which tracks formative, summative, state-mandated, national skill competence and industry-recognized assessments to include a data warehouse with a bank of assessment questions vetted by testing and evaluation professionals.
- Expand the number of portable, stackable credentials CTHSS learners graduate with, that are recognized by business/industry and have criterion-related validity, content validity and construct validity such as the ACT WorkKeys® job skills assessment system leading to ACT National Career Readiness Certificate (NCRC).

### **Collaboration:**

- Work alongside the Board of Regents to create a system-to-system articulation agreement that will enable a seamless transition for CTHSS students into the state community colleges and will create the first 9-14 pathway in the state.
- Explore opportunities for student internships and student teacher programs with community colleges and universities that would strengthen the relationship between these groups and also provide a resource for hiring and staffing CTHSS programs with qualified applicants.

- Continue to explore, in conjunction with the community colleges, additional portable, stackable credentials for students that would expand on the present 23 certifications/licenses for trade technologies that the CTHSS offers.
- Expand the current digital learning platform's online course offerings beyond credit recovery and alternative education program (AEP) to offer CTHSS learners multiple, varied educational opportunities for advanced study.

### **Accountability:**

- Develop a district-based postgraduate survey to track college and career data.
- Expand adult programs and services to identified populations in order to impact the state's workforce needs based on available funding.
- Expand trade technology programs to meet the DOL Projections and state workforce needs in the following areas:

Advanced Manufacturing  
Welding  
Information Technology  
Marketing, Management and Entrepreneurship  
Electro-Mechanical (Mechatronics)  
Health Technology

### **Innovation:**

- Position the CTHSS as a leading force in career and technical education at the state, national, and global level by partnering with networks and organizations that promote a vision for the United States as a global competitor.
- Develop a comprehensive public relations and marketing campaign to highlight the CTHSS accomplishments and present the system as the "pipeline" for workforce development in the state.
- Increase the knowledge and awareness of clean energy, and energy efficiency technologies and its benefits and prepare students for emerging employment opportunities in renewable energy and energy efficiency fields.

# **APPENDICES**

### Enrollment Data (Secondary and Adult)

School	Grades 9-12	Adults
A. I. Prince Technical High School	801	58
Bristol Technical Education Center	100	50
Bullard Havens Technical High School	805	32
E.C. Goodwin Technical High School	646	x
Eli Whitney Technical High School	542	54
Emmett O'Brien Technical High School	567	x
Grasso Southeastern Technical High School	535	x
H. H. Ellis Technical High School	585	x
H.C. Wilcox Technical High School	801	x
Henry Abbott Technical High School	637	x
Howell Cheney Technical High School	668	x
Norwich Technical High School	680	31
Oliver Wolcott Technical High School	647	x
Platt Technical High School	836	13
Vinal Technical High School	656	28
W.F. Kaynor Technical High School	741	39
Windham Technical High School	550	16
Connecticut Aero-Tech School	x	44
School for Aviation Maintenance Technicians	x	41
<b>District Totals</b>	<b>10797</b>	<b>406</b>

### 2012 Cohort Graduation Rates

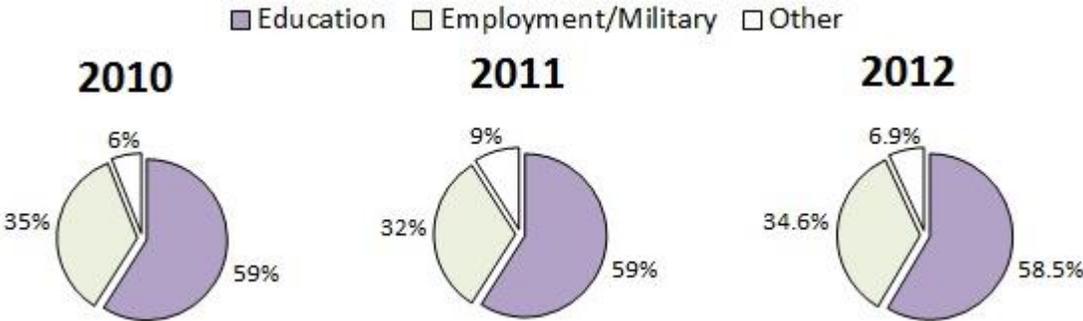
	<i>Connecticut Technical High School System</i>			<i>STATE</i>		
<b>Category</b>	<b>4-Year Rates</b>	<b>Still Enrolled</b>	<b>Other</b>	<b>4-Year Rates</b>	<b>Still Enrolled</b>	<b>Other</b>
All Students	95.9	0.3	3.8	84.8	5.4	9.8
Hispanic	95.1	0.4	4.4	68.6	9.6	21.8
Non-Hispanic	96.3	0.2	3.5	88.2	4.5	7.3
Indian or Alaska Native	93.5	0.0	6.5	84.5	4.5	11
Asian	95.2	0.0	4.8	91.9	4.1	4
Black	94.3	0.3	5.5	73.0	10.1	16.9
Hawaiian or Pacific Islander	*	*	*	95.0	5	0
White	96.8	0.2	3.0	91.3	3.3	5.4
Two or More Races	100.0	0.0	0.0	83.4	6.1	10.5
Male	96.1	0.3	3.5	81.5	7.2	11.3
Female	95.6	0.2	4.2	88.3	3.6	8.2
ELL	90.3	0.0	9.7	62.7	12.2	25.1
Non-ELL	96.2	0.3	3.5	85.9	5.1	9
Eligible For Free Lunch	95.2	0.3	4.5	66.6	10.7	22.7
Eligible For Reduced Lunch	95.2	0.0	4.8	83.5	6.3	10.1
Not Eligible For Lunch	96.8	0.3	2.8	93.1	2.9	4.0
Special Education	96.8	0.5	2.7	64.4	19.8	15.7
Non-Special Education	95.8	0.3	3.9	88.0	3.1	8.8

Data from CSDE Report/Public School Information System.

\* Only 20 Pacific Islanders students listed for entire state cohort 2012.

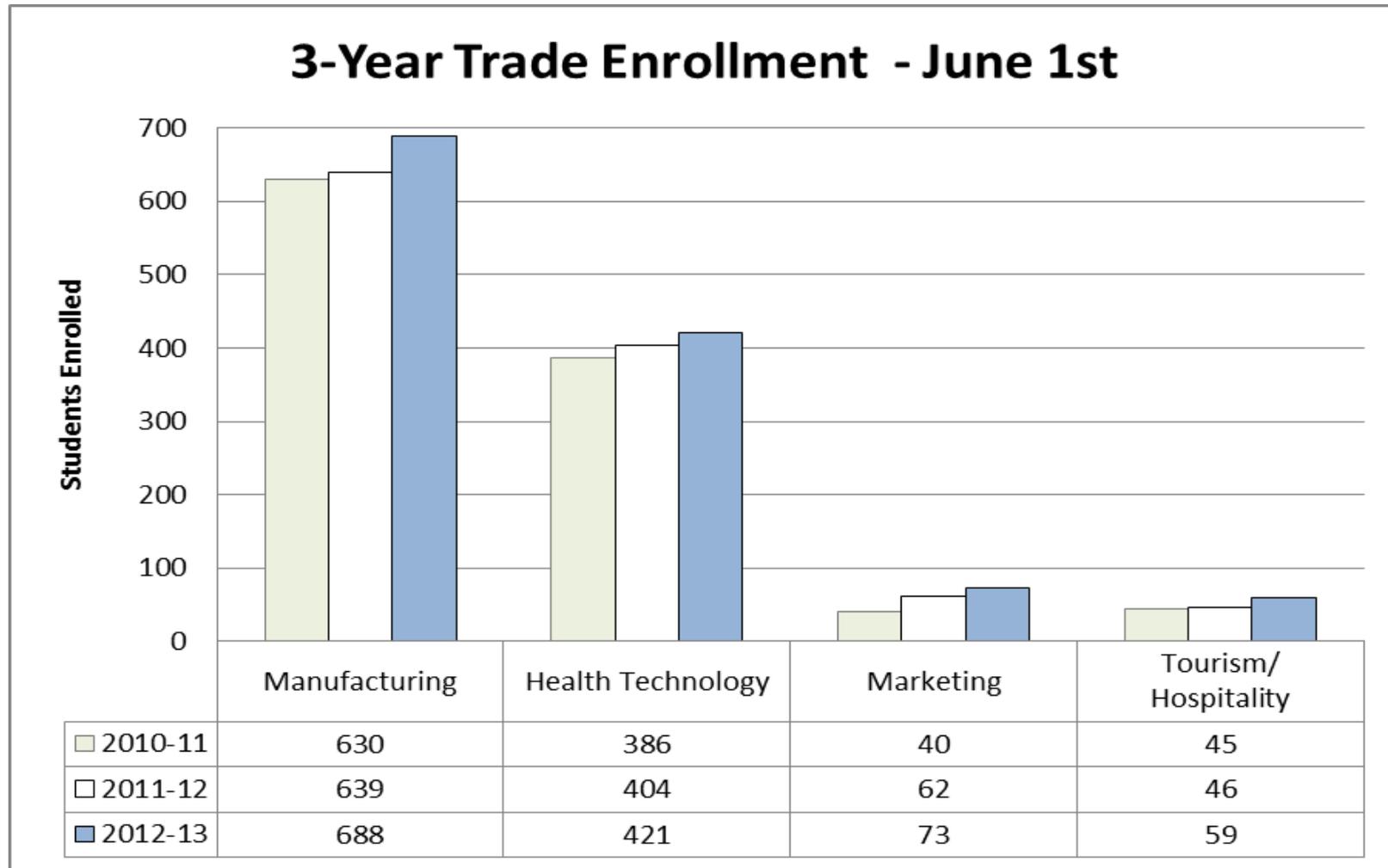
"Other" includes students who dropped out (including those who enrolled in an adult education program) OR transferred to postsecondary education OR transferred to another school district but never enrolled in that district OR have an unknown status (9.8 percent).

**Graduate Follow-up Data**



The pie graphs above show the results from three years of the CTHSS high school graduate follow-up survey. The survey captures information on what graduates are doing 4 months after graduation. Over 90% of CTHSS students enter the workforce, the armed forces or pursue education. College students that are also working are only reported in the education category so the percentage of employment may be higher. Follow-up data on adult students showed 72% (of 119 respondents in 2012) were employed.

## CTHSS Response to Fastest Growing Occupations



\*Manufacturing currently has programs at thirteen CTHSS schools. Health Technology is at seven schools, Marketing is at two schools, and Tourism, Hospitality and Guest Services Management is at one school with an additional new program at J.M. Wright in Stamford in the fall of 2014.