project IMPACT

Innovative Multi-Industry Partnership and Career Training Project
Gateway Community & Technical College

TAACCCT Round III Grant

FINAL EVALUATION REPORT

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Executive Summary

The University of Kentucky College of Department of Educational Policy Studies & Evaluation (EPE) served as third-party evaluator for Gateway Community and Technical College's (GCTC) IMPACT program, funded by a Trade Adjustment Assistance Community College Career Training (TAACCCT) grant through the United States Department of Labor. In October of 2013, Gateway Community and Technical College, a SACS- accredited college within the Kentucky Community and Technical College System, was awarded a Round 3 TAACCCT Grant under Option 2 to ***"Develop or Enhance a program of Study with innovative Strategies."*** The project, named the Innovative Multi-Industry Partnership and Career Training (IMPACT) received approval for its revised Statement of Work in the fall of 2013.

The primary goals of the IMPACT program were to enhance and accelerate career pathway preparation in logistics, manufacturing, heating & cooling and energy fields. The program provided a combination of intensive academic and career coaching in cooperation with workforce development partners, community agencies, and industry employers.

The IMPACT program included three strategies to support student success:

IMPACT Strategies
Strategy #1: Creating career pathways and developing new and enhanced curriculum and credentials to fill gaps in the following industries: Manufacturing, Utilities, Construction, and Transportation and Warehousing, with a focus on establishing stackable and latticed credentials, sequencing of academic courses, and awarding credit for prior learning.
Strategy #2: Designing and enhancing programs and delivery to meet the learning and employment needs of workers and the workforce needs of targeted industries, with a focus on integrating work based learning opportunities, providing more flexible delivery options, and creating innovative technology-enabled and online learning experiences.
Strategy #3: Transforming outreach, completion, and career support strategies to promote access and success to eligible participants, with a focus on strengthening student support services and career mapping, as well as forming new and building upon existing community and industry partnerships.

The IMPACT program strategies included three main participant groups: GCTC institutional partners and IMPACT staff; targeted students including TAACCCT eligible students, Veterans, and "other busy adults"; as well as labor market partners.

EPE worked collaboratively with the grantee college funded by TAACCCT to conduct a rigorous evaluation to measure the impact of the core strategies implemented by the grantee college. The evaluation team followed recommendations of the TAACCCT national evaluation researchers and technical advisors in development of the evaluation plan, incorporating quantitative and qualitative approaches such as

case studies, surveys, and interviews, along with non-randomized experimental design focusing on cohort comparisons using a propensity score matching design comparing IMPACT participants with a historic comparison group of students in the same program two years prior.

Results of the evaluation indicate that the grantee was successful in implementing all of the proposed strategies. In addition, the program established a number of new partnerships with employer and community stakeholders and influenced changes to referrals for work-based learning opportunities & career counseling. The IMPACT program set goals of serving 300 unique participants over the three year grant period. In all, the IMPACT program had **379 total participants**, **251 of which were new students** (non-incumbent to Gateway). As part of the grant strategies, four new stackable certificates and a new AAS degree program were approved, and fifteen courses were redesigned for online or hybrid delivery. In all, 138 program participants took courses that were newly developed through the IMPACT grant, 24 took courses that were updated using grant funding, and 104 took courses that were provided with new equipment through grant funds. Ninety-four (94) participants took at least one new eLearning course as part of their program. Ninety-six (96) took courses that were part of the accelerated credentials curriculum. 866 non-program participants also took at least one of these courses that were improved through the IMPACT grant. In addition, the IMPACT student support model was fully developed with training materials and best practice guidelines including both internal and external outreach activities.

The IMPACT program had a significant positive impact on student educational achievement. Participants in the program also experienced a modest but significant change in employment or wage increases from the comparison group. This was true for both incumbent students already matriculated in a KCTCS college and students wholly served by IMPACT. The project strategies were most influential on helping students complete their educational goals: IMPACT students took and passed more classes and were awarded more credentials that similar students in the same program prior to the grant activities.

Lessons learned from final exit interviews with staff and faculty s as well as a review of the evaluation findings with regard to impact and institutional change are as follows:

- The project strategy to collaborate with industry partners to create clear pathways through a sequential set of courses with enhanced classroom resources, flexible delivery with online and hybrid course sections, and opportunities for work-based experiences allowed students in the IMPACT programs of study to complete credentials at a higher rate than their historical peers. This strategy, requiring focused attention to the purposeful

design of credentials and direct and consistent collaboration with employers, holds promise for other areas of the KCTCS technical education.

- Qualitative data describing the positive effects of the academic advising and career counseling were supported by our quantitative analysis of student outcomes in IMPACT relative to that of students enrolled in the same programs in prior years. While requiring institutional resources to provide this personalized attention, the results indicate that students' success improves when they have "someone to talk to" in supplement to the instructional supports, especially if that assistance is offered in conjunction with work-based opportunities.
- Due to the short timespan of the grant activity, the full impact of the redesigned pathways, course improvements, and advising on employment and wage earnings is likely understated. Further research is needed to explore the ways in which industry partnerships might further increase employment and wage increases for unemployed, under-employed, and busy adults in Kentucky.
- Although the IMPACT program met its recruitment and enrollment goals, recruitment of new students was often met with difficulties due to local attitudes toward working in what is commonly misunderstood as "manufacturing". This was mitigated by building relationships with local employers and developing a bi-directional communication flows between the classroom and the workplace.

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Abbreviation Glossary

AA/AS – Associate in Arts/Associate in Science, general education transfer degree
AAS – Associate in Applied Science, terminal degree for community college technical program
ACT – American College Testing, developer of job profiles and WorkKeys test
ACR – HVAC (Air Conditioning) course prefix
AO – Accelerating Opportunities, short-term training grant preexisting at Gateway
AWS – American Welding Society, professional organization
BAS – Bachelors in Applied Science, oft degree to which to transfer AAS
BICSI – Building Industry Consulting Service International, assoc. for cabling design and installation
BPI – Building Performance Institute, Inc., certification for residential energy efficiency retrofit
BRX – Blueprint Reading course prefix
CDL – Commercial Driver's License, required to operate tow trucks, buses, and tractor trailers
CEM – Certificated Energy Manager, certificate offered through IMPACT
CIT – Computer Information Technology/Computer Literacy course prefix
CLA – Certified Logistics Associate
CLT – Certified Logistics Technician
CMM – Computer Manufacturing & Machining course prefix
CoEEC – University of Kentucky College of Education Evaluation Center, third-party evaluator
CPT – Certified Production Technician, RTF program turned into credit program for IMPACT
CRC – KCTCS Curriculum Review Committee
DOL – Department of Labor
EASY – Early Access Skills for You, Library Science and Technology skills course
eDDI – eLearning Design and Development Institute, Gateway faculty training for online courses
EET – Electrical & Engineering Technology course prefix
EGY – Energy Technology course prefix
ELT – Electrical Technology course prefix
FAM – Fundamentals of Advanced Manufacturing (used in RTF program)
FOA – Fiber Optic Association, professional society for energy technology
FPX – Fluid Power course prefix
GCTC – Gateway Community & Technical College (Gateway)
HPOG – Health Professions Opportunity Grants, part of the Affordable Care Act
HVAC – Heating, Ventilation, & Air Conditioning
IMPACT – Innovative Multi-Industry Partnership and Career Training, project name
IMT – Industrial Maintenance Technology course prefix
ISX – Industrial Safety course prefix
ITS – Information Technology Systems, as in cabling installation, see **BICSI**
KCTCS – Kentucky Community & Technical College System

LIS – Library and Information Science course prefix
LOM – Logistics course prefix
MFG – Manufacturing course prefix
MOA – Memorandum of Agreement
MSSC – Manufacturing Skill Standards Council, industry certification system
NAICS – North American Industry Classification System, Federal business classification system
NCRC – National Career Readiness Certificate, ACT certification for employability
NKIP – Northern Kentucky Industry Partnership
NKY OET – Northern Kentucky Office of Employment and Training
NKY WIB – Northern Kentucky Workforce Investment Board
NOCTI – National Occupational Competency Testing Institute
OSHA – Occupational Safety and Health Administration
PI – Principal Investigator
PLA – Prior Learning Assessment, portfolio for awarding credit for life and work experiences
PM – Project Management model, used by Gateway for IMPACT
POS – Program of Study, course plan for certificate, diploma, or degree
PPE – Personal Protective Equipment, module developed through IMPACT
PR – Public Relations, Gateway marketing office
PV – Photovoltaics, solar energy conversion method
QA – Quality Assurance, KCTCS course quality review process
QMS – Quality Management Systems course prefix
RTF – Raise the Floor, Gateway grant promoting women in manufacturing. Follows same curriculum as certified production technician, plus support services.
STEP – Gateway departmental exams for course credit, part of **PLA** development
TAACCCT – Trade Adjustment Assistance Community College and Career Training
TAA-eligible – Trade Adjustment Assistance-eligible, student eligibility for federal funds
UK – the University of Kentucky, third-party evaluator institution
VA – United States Department of Veterans Affairs (Vets)
WBL/WBE – Work-Based Learning/Experience
WIA – Workforce Investment Act, provides job training funding for eligible unemployed persons

1. Introduction

The Innovative Multi-Industry Partnership and Career Training (IMPACT) program at Gateway Community and Technical College (GCTC), one of sixteen colleges in the Kentucky Community and Technical College System (KCTCS), was designed to meet the Round 3 TAACCCT Grant under Option 2: "Develop or Enhance a Program of Study with Innovative Strategies". Based on a review of labor market needs and college strengths, the KCTCS administration chose a set of industry specific programs of study for enhancement including a new AAS degree in Supply Chain Management and four new certificates in Enhanced Machine Operation, Certified Drivers License (CDL), and Logistics as well as improvements to existing programs of study.

The intervention being evaluated for IMPACT at Gateway CTC involves the implementation of three different strategies that address the training and education needs of TAA-eligible and other adult workers, with an emphasis on veterans. These strategies are:

IMPACT Strategies
Strategy #1: Creating career pathways and developing new and enhanced curriculum and credentials to fill gaps in the following industries: Manufacturing, Utilities, Construction, and Transportation and Warehousing, with a focus on establishing stackable and latticed credentials, sequencing of academic courses, and awarding credit for prior learning.
Strategy #2: Designing and enhancing programs and delivery to meet the learning and employment needs of workers and the workforce needs of targeted industries, with a focus on integrating work based learning opportunities, providing more flexible delivery options, and creating innovative technology-enabled and online learning experiences.
Strategy #3: Transforming outreach, completion, and career support strategies to promote access and success to eligible participants, with a focus on strengthening student support services and career mapping, as well as forming new and building upon existing community and industry partnerships.

The IMPACT project involves four key evidence-based elements in its project design which include: 1) work-based training opportunities, 2) career pathways, 3) online and technology-enabled learning, and 4) strengthened student support services. The project is designed to increase Gateway's capacity to develop and expand program offerings, enhance course instruction, and reduce the gap between training and jobs that are unfilled due to a lack of skilled applicants. Building capacity in program areas is projected to result in an increased number of students who become industry certified, complete their academic program, and become employable. The evaluation design focuses on summative and formative examination of the IMPACT project success in meeting its program goals and the impact the program had on its participants.

The IMPACT program set goals of serving 300 unique participants over the three year grant period. In all, the IMPACT program had **379 total participants**, **251 of which were new students** (non-incumbent to Gateway). The program produced **125 exiters** and **175 completers**. Completers are defined as those who have both graduated and exited the program, while the exiters withdrew from the program without completing a credential. As part of the grant strategies, four new stackable certificates and a new AAS degree program were approved, and fifteen courses were redesigned for online or hybrid delivery. In all, 138 program participants took courses that were newly developed through the IMPACT grant, 24 took courses that were updated using grant funding, and 104 took courses that were provided with new equipment through grant funds. Ninety-four (94) participants took at least one new eLearning course as part of their program. Ninety-six (96) took courses that were part of the accelerated credentials curriculum. 866 non-program participants also took at least one of these courses that were improved through the IMPACT grant. In addition, the IMPACT student support model was fully developed with training materials and best practice guidelines including both internal and external outreach activities.

The following section describes findings from implementation analysis of the three innovative strategies used in IMPACT and results of the impact analysis. Section 2 details the evaluation design. Section 3 provides background on the IMPACT program and the ways in which IMPACT built upon this program in the development of the degree pathways and expanded advising model. Section 4 details the descriptive statistics of the program outcomes. Section 5 reviews the results from two non-randomized analyses of a) impact on educational outcomes and b) changes in employment status and wages relative to a historical comparison cohort of students participating in the same curricular pathways in the two years prior to the project. Section 6 concludes with a discussion of the integration of program pathways, work-based experiences, and employer engagement highlighted by the evaluation results.

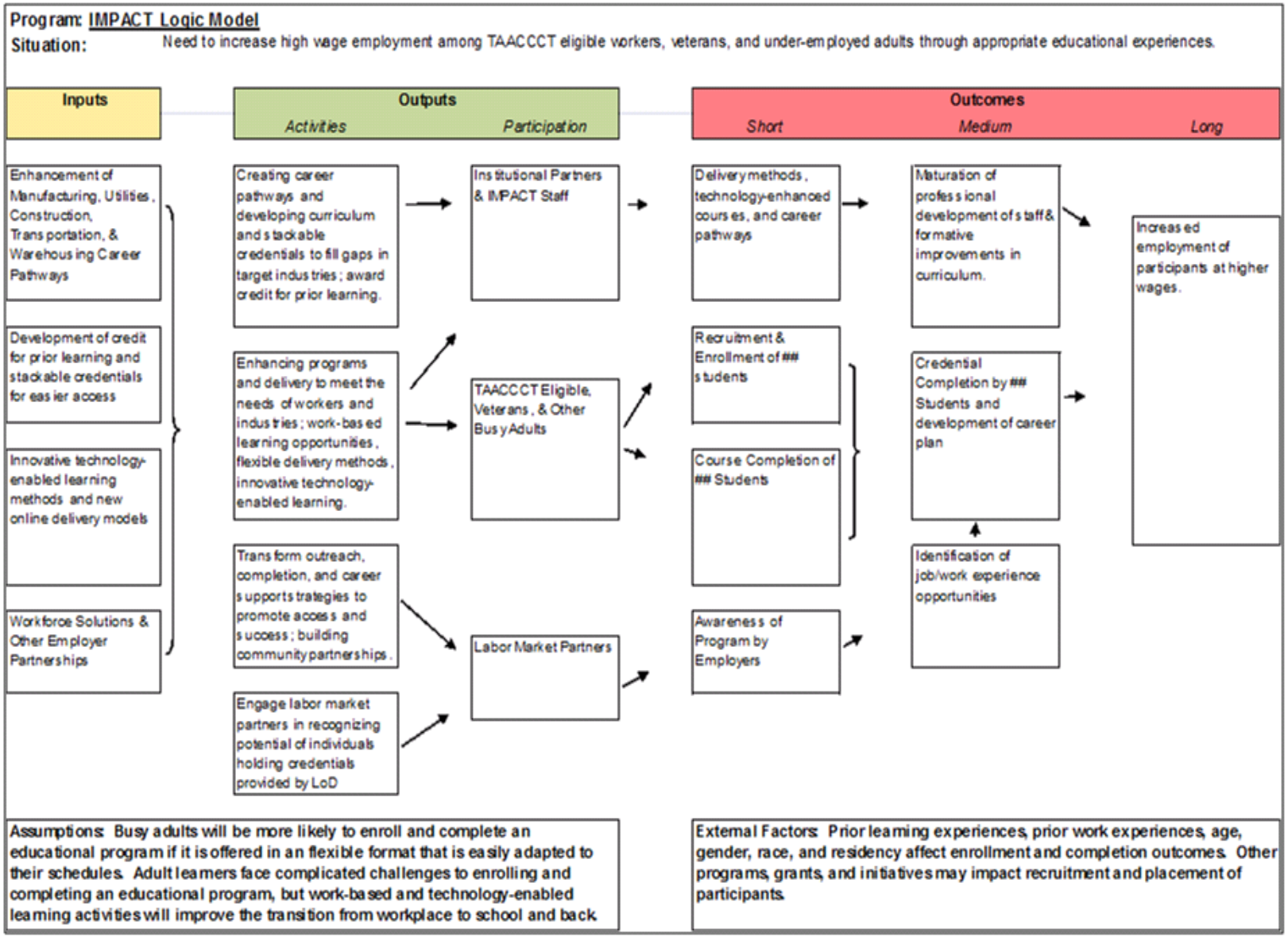
2. Evaluation Design

Implementation Analysis Design

The primary goal of this implementation evaluation was to measure how well the college's Program of Study (POS) delivery and student support strategies met the priorities reflected in the DOL grant and contributed to the vision and goals of the grantee college. The mixed method design used to assess implementation was longitudinal and comprehensive, including qualitative data that supplemented the quantitative data to link data on program implementation to student outcomes. Building from tools and templates recommended by the TAACCCT national evaluators and technical advisors, we customized templates to meet the needs of TAACCCT the grantee colleges, including tools that track the inventory grant-funded POS and core strategies, partner engagement, and partnerships.

The delivery system proposed for the project required extensive organizational change and staff development, therefore a qualitative approach using ethnographic methods of generating data was used to determine the ways that implementation unfolded within the college. Curricula and instructional techniques were documented through analysis of program materials and interviews with curriculum developers and instructors. Successes and barriers to implementation that occurred in the process were noted including ways in which the program addressed differences in student preparation as evidenced by low-test scores. The case study design included field data that was collected from multiple stakeholders on site. These stakeholder interviews allowed the evaluation team to highlight potential obstacles to implementation, and to provide place-based interpretations of operations in the varied contexts of the project, as well as contributing to the formal review of data produced by the project (Yin, 2013). The logic model in Figure 2 served as a guide for the evaluation team.

Figure 2: IMPACT Logic Model



Fieldwork was completed using the implementation questions in below as a guide for study. The methods of data collection included interviews, artifact analysis, participant observation, and an analysis of the online environments provided by the site, including program deliverables such as work-based curricular experiences, IMPACT staff and coach training materials, and documented Best Practices policies (Patton, 2002). Document analysis included curricular pathways regarding stacked credentials, job descriptions for hiring personnel, syllabi, lesson plans, student intake forms, and written records of communication between program staff, students, and external stakeholders. Changes to curriculum and course requirements or pathways were documented.

Implementation Questions
Curriculum: How was the particular curriculum selected, used, and/or created within the history of the programs of study and institutional capacity of the college and how does this compare to similar programs of study offered by other KCTCS colleges?
Delivery: How were the programs of study improved or expanded as part of the IMPACT program, how did this differ from the past, and how was this curriculum administered, especially with regard to support services, recruitment, and placement?
Recruitment and Assessment of Participants: What sources and systems were used to recruit participants (especially under-represented populations and women as these are historically male fields of work) and assess their abilities, skills, and interests relative to other programs?
Acceleration: What procedures for assignment of credit for prior experience were implemented and what obstacles were experienced in awarding credit for prior experience for these programs of study?
Placement: What kinds of career guidance were provided and through what methods relative to past efforts at GCTC and other KCTCS institutions?
Partnerships: What contributions did each of the partners (employers, workforce system, other training providers and educators, philanthropic organizations, and others as applicable) make to the program and what factors contributed to partners' involvement or lack of involvement in the program with what impact?
Institutional Capacity: To what extent has the IMPACT program increased the capacity of Gateway Community & Technical College to offer new courses, programs, and/or acceleration of study mechanisms and has this resulted in IMPACT program influenced policies and practices in other KCTCS colleges?

Interviews were conducted with project staff, instructors, partner organization staff, and a purposeful sample of participants (Miles & Huberman, 1994). All project staff and instructors were interviewed. Interview guides for initial interviews were based upon the above implementation analysis questions as appropriate. Subsequent informal interviews also followed the question guides with additional questions derived from iterative analysis of the first round of interviews, site visit data, and document analysis (Creswell, 2012). An employer engagement survey was also conducted with industry partners at the end of the grant (see Appendix B).

Site visits included attending staff meetings with project staff and interview appointments along with participant observations in classroom settings. Field settings also included "places of public talk" in which participating students, instructors, and other members of the college environment interact such as break rooms and student lounges. This allowed the evaluation team to gain an "emic" perspective of the educational environment and led to the development of further questions to ask in formal interviews (Creswell, 2012).

Finally, in an effort to explore the influence of the IMPACT program on other programs within the college and on programs offered by other KCTCS colleges, informal interviews were conducted with Gateway Community & Technical College administrators responsible for academic and student affairs in general (such as the Chief Academic Officer and Chief Student Affairs officer) as well as key informants at KCTCS system office and other KCTCS colleges that offer similar degree programs. The goal of these interviews was to understand the ways in which the project has affected institutional capacity both at the college and system levels.

This qualitative study of the development and delivery of the program allowed the evaluation team to identify ways that the implementation of the grant-funded training model presented challenges to the institution, ways that local employers and workforce development practitioners understood and interacted with the training model, and to solicit feedback from all stakeholders (workforce development, employers, college staff) on potential issues that might affect the success of the proposed program. The evaluation team participated in a TAACCCT Webinar in June, 2015 to share our implementation evaluation design and its implications for impact analysis (Jensen, 2015).

Outcome/Impact Analysis Design

Quantitative evaluation focused on several main outcomes established for the TAACCCT program. Among these we measured and evaluated the impact of the project strategies on program completion, credential attainment, placement into employment and employment retention, as well as changes in earnings for those who retained employment. Because the program primarily involves the delivery system of existing programs, we performed a non-randomized analysis of the outcomes. The existence of prior programs allowed for comparison to a historical cohort. The historical control group was desirable since students obtained the same type of training, from similar institutions and in similar location, however the treatment group participated in courses that had been enhanced by technology and also received more targeted academic and career support. A concurrent comparison group was not possible as the programs at GCTC were all part of the treatment and there were no similar programs within the same labor market for the targeted industries in the region. The program of study for the treatment group was also redesigned to focus on gaps in training for the targeted industries. Research shows that there is a gap between the demand and supply in the labor market due not necessarily to lack of job opportunities but rather due to the lack of required skills in those unemployed to fill certain jobs (ACT, Inc., 2011). The impact analysis did not include participants enrolled in the new programs in logistics or CDL as those new programs had no historical comparison cohort, nor did we include students who had not enrolled in credit bearing courses.

One of the major issues with non-randomized studies is bias. This results either from measurement errors or misclassification, or simply because the selection of the participants in the treatment group is not random. To avoid biases, there are established methodological approaches through matching and regression analysis (Alemayehu, Alvir, Jones, & Wilke, 2011). We overcame bias among the treatment and comparison groups caused by the distribution of observed covariates through the use of Propensity Score Matching (PSM) analysis. PSM is an increasingly popular method of causal inference and is easily estimated by logistic regression. The participants in the treatment and comparison groups were matched based on such variables as age, sex, Pell eligibility, and enrollment in required courses for the targeted programs of study. Once the propensity score was calculated through logistic regression, we then matched individuals in the treatment group with individuals from the comparison groups that have the same probability of participation. The PSM allowed matching not just at the mean of the variables, but also supported a balanced distribution of observed characteristics across the treatment and control groups. We used the nearest-neighbor matching procedure to select the matching individuals from the comparison group.

Outcomes/Impact Analysis Research Questions

The program evaluators addressed research questions related to the TAACCCT grant's required analysis of outcomes and program impact. We asked questions such as: did the program have an impact on the total number of participants, completion rates and earned credentials? Did participation in the program affect students' decisions to further their studies after completing the initial credential? Did participants' employability increase after program completion? Was there a positive change in earnings due to participation in

the program, and if so, what was the size of that change? We also hoped to ask if participation in the program had any impact on distance traveled to find work due to the rural nature of some of the college service area, but found little variation in students' home address outside the greater metro area of Northern Kentucky and therefore removed this question.

We evaluated the program's impact on the following outcomes: total number of participants, grant-funded program of study completion rate, program of study retention, completion of credit hours, total number of students that have earned credentials, students furthering their education after program of study completion, employability after completion, total number retained in employment after program of study completion, increase in earnings after enrollment, and the size of the change in earnings.

We anticipated that the intervention would have a positive impact on the total participants served, their completion rates, and their employment outcomes. The basis for this assumption resides in the fact that the program targets eligible workers, veterans and underemployed adults with an intrusive advising program that emphasizes skill and strategy development, courses with opportunities for work-based learning, increased program flexibility and quality due to eLearning components, and purposefully designed pathways for credentials desired in identified areas of employment. We also anticipated that the participants in the program would have better job opportunities.

In Kentucky, wage and employment data from the Department of Labor are only available through a few select government agencies. The evaluation team contracted with the Kentucky Center for Workforce Statistics (KCEWS) to complete the impact evaluation of change in employment status and change in wages. We sent the matched pairs of participants and comparison cohort students described above to KCEWS. KCEWS staff then matched these individuals with their employment records as available. Fortunately, most of the individuals in our dataset were found in the state employment database. A table was constructed showing employment status and quarterly wages (medians) at the beginning of the program and three months after separation/completion. KCEWS is not legally allowed to share individual level workforce data. These results are found in section 5.

Limitations

The Department of Labor only recognizes employment information for students employed within one quarter of completion. Thus we cannot consider students employed while still enrolled in their program of study, which may result in the misrepresentation of the impact on the employment outcome for the program.

The location of Gateway CTC on the border between Kentucky and Ohio may have lead to missing outcome data. It is likely that some students will find employment in Ohio rather than in northern Kentucky. We did not have access for employment data for students who end up living and working in Ohio, but based on student location data, there were very few students who did not have Kentucky addresses.

3. Background and Implementation

The Policy Environment in Kentucky

The Kentucky Community and Technical College System (KCTCS) offers technical education and a pathway to the baccalaureate as well as community and adult learning programs. These multiple missions shared by community colleges across the country have led to the community college being called the "contradictory college", often suffering from tensions between its "democratizing " principles and labor market demands. In Kentucky, statewide policy initiatives are attempting to clarify the role of the community college. By 2007, in keeping with the national mood for a more educated workforce, KCTCS was identified by the Council for Post-Secondary Education as a central player in the "Double the Numbers" state campaign to increase educational attainment. The push for increased post-secondary attainment in the state was driven by the recognition that not only do Kentucky youth need to aspire to post-secondary credentials in higher numbers, more Kentucky adults need to be encouraged to increase their skills to participate in the changing labor market.

Kentucky's higher education policy analysts have argued that as Kentucky's population ages, more working adults need to be brought into college alongside traditional high school graduates to increase certificate, associate and bachelor degrees statewide. Kentucky's percentage of post-secondary degree holders was roughly 48% in 2010 with plans to raise it to 53% by 2015.

In "Stronger by Degrees," the Kentucky Council on Postsecondary Education (CPE) articulated its strategic plan for 2011-15 focusing on four priority areas: efficiency/innovation, readiness, research, and student success. These goals are measured by CPE through metrics related to college readiness, degrees/credentials conferred, graduation rates and educational attainment with 2015 targets. CPE identified the sixteen colleges that make up the Kentucky Community and Technical College System as the primary institutions by which to increase college diploma, training and degree attainment and by doing so, increase the economic stability and vitality of the state.

In addition to addressing educational achievement for the commonwealth, in 2013 the Kentucky legislature established the Kentucky Center for Education and Workforce Statistics (KCEWS). "The Center has the authority to education data and workforce data from the Kentucky Department of Education (KDE), the Council on Postsecondary Education (CPE), the Educational Professional Standards Board (EPSB), the Kentucky Higher Education Assistance Authority (KHEAA), and the Kentucky Education and Workforce Development Cabinet...)" (KRS 151B.132) The resulting Kentucky Longitudinal Data System (KLDS) is a significant resource to policy makers and educational institutions in developing and assessing education and training programs. EPE partnered with KCEWS to conduct the impact evaluation for this project.

As a matter of policy, KCTCS defines certificate programs as an organized program of study consisting of courses designed to meet a defined set of competencies, resulting in a marketable skill and is applicable to the requirements of an associate degree in the same or

related field.[1]. All KCTCS credentials including those earned through online courses are stackable and build toward an associate degree. State legislation was passed in 2012 requiring articulation agreements with state baccalaureate institutions for all associates degrees including the Applied Associates Degrees (AAS) offered through IMPACT. Gateway signed an articulation agreement with Bismarck State College (North Dakota) for the A.A.S. in Energy Technologies to transfer to an online B.A.S. in Energy Management. Bismarck State College was a Round 2 TAACCCT grantee that implemented a project similar to IMPACT targeting three of the same industry sectors.

Selection of IMPACT Strategies

Active Implementation proponents identify the exploration stage as a critical first step in successful project implementation (Blase & Flixen, 2013). In the case of a funded grant, much of this exploration occurs prior to the grant award as a result of grant development; however, identifying the sources of certain strategies (or in this case, curricular pathways) provides observers insight into the logic model used to rationalize the project and identifies potential stakeholders and processes to investigate as the project unfolds. Information about the exploration stage of the IMPACT project described in this section is supported by the grant application materials and in interviews with grant writers and community partners.

In developing the strategies and interventions for the IMPACT grant project, the staff at GCTC worked closely with the Northern Kentucky Workforce Investment Board (NKY WIB). They consulted the State TAA Office to determine the areas of employment most directly impacted by foreign trade and determined that the majority of job losses could be addressed through rapid retraining for manufacturing careers. They also reviewed the educational histories of TAA eligible workers and determined that while some had a college degree, the majority had only completed high school or some college. Thus post-secondary training with support to ease the transition to college was identified as the most appropriate level of education. Furthermore, the GCTC staff also collaborated with local veteran support services to determine the extent of training needs for veterans and determined that the Northern Kentucky region has a large number of veterans in need of post-secondary education as the region has a lower rate of bachelor's degree completion than the national average.

The GCTC staff again worked with NKY WIB and Office of Employment and Training (NKY OET) to identify the in demand occupations in the Manufacturing (NAICS 31-33), Utilities (NAICS 22), Construction (NAICS 23) and Transportation and Warehousing (NAICS 48-49) economic sectors. They matched this demand with existing programs of study at GCTC and identified the need for six new credentials; two of these were credentials already offered at Gateway, but defined as needing updating. The team consulted a survey of local manufacturing companies conducted by the Northern Kentucky Industry Partnership (NKIP) in March of 2012 which confirmed that technological advances present a challenge for manufacturing employers to find employees with the appropriate skill set (*NKIP:*

[1] KCTCS Administrative Policies, *Features and Characteristics of Certificate Programs*, 4.11.2.1. http://legacy.kctcs.edu/employee/policies/volumeII/volII4-11-2.pdf .

Strategic Manufacturing Skill Business Plan, 2013). They also reviewed a survey of the energy sector conducted in spring of 2013, which indicated that a high retirement rate in the region would be a driver of hiring in that industry (*Kentucky Energy Sector: Workforce in Transition*, 2013). Finally, the college asked a major logistics employer, Verst Logistics, to sponsor a forum of employers in the spring of 2013 that identified training needs in logistics credentials, especially the CDL certification. Analysis of these industry-based assessments as well as data from the Workforce Investment Board resulted in the recommended credentials for the grant. Two of these programs were new to Gateway and one of them, the logistics degree, required approval by the KCTCS Curriculum Review Committee, a process that can and did take over a year.

A review of the literature cited in the original grant application provides evidence for the strategies adopted by the grantee for effective delivery of the programs of study: 1) Work-based experience, 2) a structured pathway mapping steps to completion, 3) accelerated opportunities for earning a credential in less than one year, and 4) credit for prior learning were identified as best practices to include in the project strategies. In addition, the design included evidence to support the efficacy of a fifth strategy; online and technology-enabled learning through hybrid courses that complement face-to-face instruction with eLearning work-based simulations (e.g. virtual welding simulator). This evidence from the field nationally was supported by local GCTC experiences with related training grants that included eLearning enhancements in health related fields.

The project highlighted the incorporation of orientation for the non-traditional learners targeted for the grant. In addition, through project management, goals were set to maximize joint efforts between academic affairs and student affairs, to incorporate student mentors and utilize embedded technological components (such as automated email reminders) to support student progress. Furthermore, conversations with GCTC administrators revealed that there was an institutional interest in breaking down barriers between student and academic affairs in order to provide seamless service for students.

The pre-existing Gateway Veterans program had a strong reputation for retaining students above that of the college at large, which made it a clear starting point identifying best practices for the grant, especially those proven effective for veterans. The Project Coordinator contacted the Gateway Veterans student support staff to explore adopting their recommendations for policies and processes of intake, retention, and placement. Advisors who were previously working with veterans were incorporated as part of the IMPACT Project Team, leveraging their experience.

Installation

Following installation of a project manager, the majority of project activities were installed during the 2013-2014 academic year. Further development of online modules for existing courses and new courses and programs were rolled out over the life of the project.

Table 3.1 Installation Schedule

Strategy #1: Create career pathways and develop new and enhanced curriculum and credentials to fill gaps in the following industries: Manufacturing, Utilities, Construction, and Transportation and Warehousing		
Activity	**Expected End Date**	**Date Completed**
Hire Career Mapping Specialist, CDL program coordinator, and adjunct faculty.	Feb-14	11/21/14
Develop, update, and disseminate career pathway maps for each identified occupation, credential, and academic program in collaboration with employers, faculty, and advisors.	Sep-16	8/5/14
Develop and offer new courses/ certificates to fill gaps in targeted industries.	Sep-16	5/15/15
Develop and implement system for awarding credit for prior learning.	Sep-16	7/30/15
Strategy #2: Design and enhance programs and delivery to meet the learning and employment needs of workers and the workforce needs of targeted industries.		
Hire Instructional Designer, Work Experience Coordinator, and Adjunct Faculty.	Dec-13	8/1/14
Develop and enhance work-based training opportunities.	Sep-16	
Meet the workforce needs of the targeted industries/employers by aligning curriculum with required job competencies and by providing students with learning environments reflective of real-world industry standards.	Sep-16	3/28/14
Provide new and enhanced delivery modes that provide accelerated, alternative scheduling, and eLearning options.	Sep-16	5/15/15
Strategy #3: Transform outreach, completion, and career support services to promote access and success to eligible participants.		
Hire Retention and Placement Specialist	Dec-13	3/28/14
Establish a comprehensive intake process that ensures a "right start" philosophy	Sep-16	7/30/14
Develop and implement a strategic marketing and outreach plan to recruit the target population	Sep-16	12/12/14
Strengthen relationships with business and industry, economic development, and community partners	Sep-16	5/16/14
Provide support services to increase completion and career placement	Sep-16	6/30/14

The Grants Office at Gateway initially used the IMPACT program and its TAACCCT grant as a laboratory for a new project management model. This model includes a Human Resources Management Plan to change the previous time frame of grant implementation, frontloading many of the tasks that they historically did at the end of the process, to assure that the grant activities followed the proposed timeline and that personnel costs were accurate. Grant team meetings became a time not only to give updates and answer questions, but also to provide input for the plan and discuss issues and new ideas for the project, to encourage collaboration. Individuals were assigned to teams, and each team had a functional manager who oversaw the grant activities in their area, including creating a sustainability plan, which may have helped with continuity when the college and the project faced leadership changes.

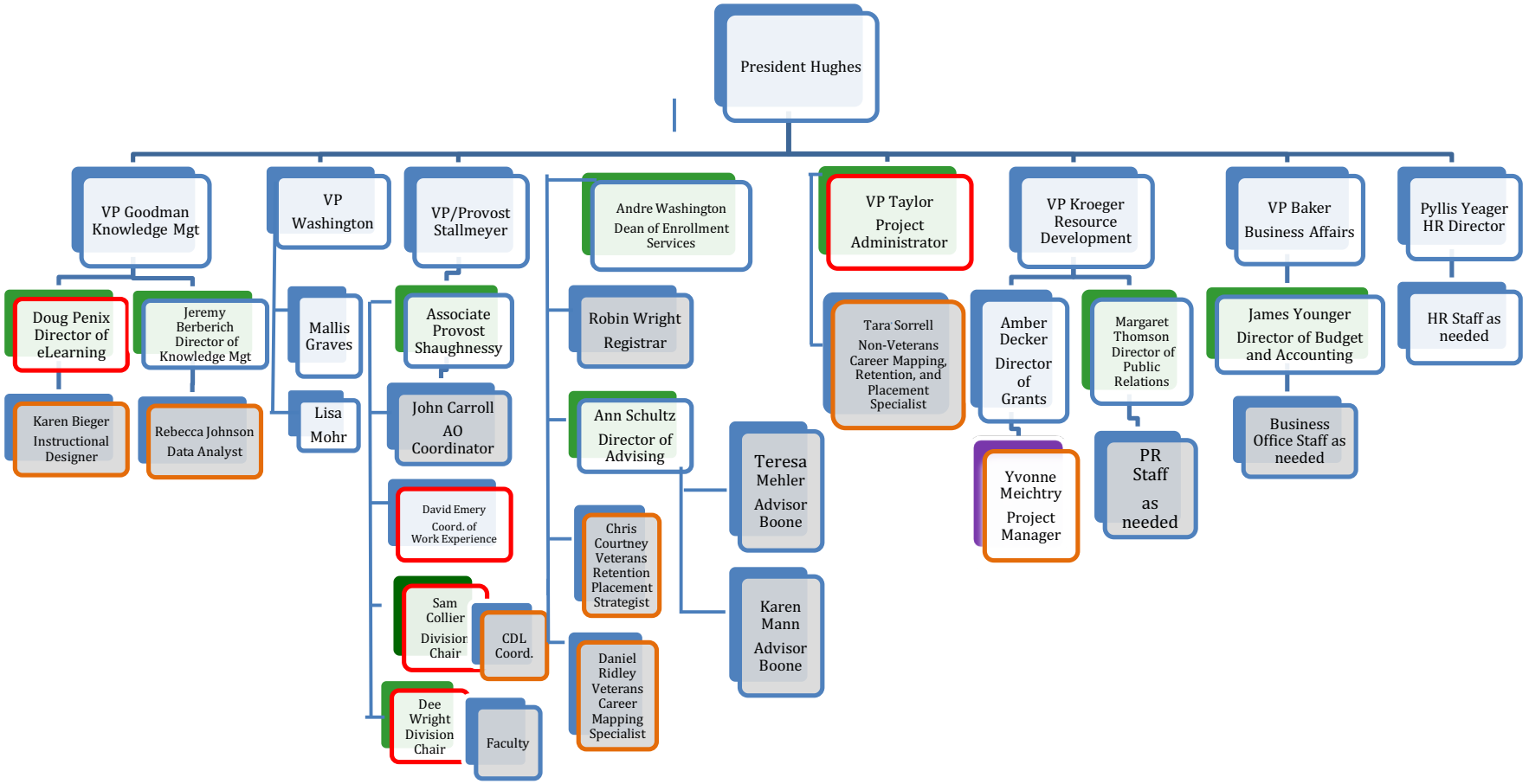
Staffing followed the project SOW with almost all positions filled within the first two semesters. The part-time CDL Program Coordinator position was difficult to fill, leading to the division chair taking on the duties in the interim until a new program coordinator was hired. Similarly, one of the welding instructors retired during the first year of the grant and finding a replacement was difficult. This difficulty in hiring instructional staff in technical education is an obstacle not restricted to Gateway. GCTC faculty described this difficulty as a national issue.

Changes to the initial grant description included combining the Career Mapping Specialist position with Retention and Placement Specialist position. During implementation, there was a reassessment of responsibilities to leverage positions that were in place and add new positions as appropriate. By using .5 effort for two experienced counselors in veteran's affairs instead of one full time position, the two veteran counselors could advise students on IMPACT programs as well as all the other programs available at GCTC. A full time recruitment, retention, and placement counselor completed the student services staff for the program to work with students from intake through program completion and job placement. Prior to the hiring, a staff member from the Kentucky Career Center came to campus once a week to assist IMPACT students with job placement.

In the fall of 2015, GCTC's President, Ed Hughes, resigned and the IMPACT project manager left for another position. The college had two interim presidents during the following year until Dr. Fernando Figueroa was hired in the summer of 2016. The data analyst, Rebecca Johnson, assumed project management. Other staff with direct contact to students, however, remained the same through out the grant period.

At the conclusion of the grant, all but three positions funded by the grant were eliminated. These include the data analyst who will continue on another grant, the Instructional Designer, also continuing on another grant; the CDL Program Coordinator, and the advisor responsible for advising Veterans. The eliminations of these positions may put the continuing strength of career counseling demonstrated by the project, especially the placement of students in co-ops and other work-based experiences at risk. GCTC infrastructure for sustaining partnerships with industry leaders and human resource professionals associated with local employers and social industries extends beyond the grant activities, however, is strong, but will require vigilance.

Figure 3.1: IMPACT Organizational Chart (July 2015)



Installation of Strategy #1: Creating Career Pathways & Curriculum

Program staff identified stacked and latticed **career pathways**, along with associated industry certifications. Programs of study were separated into five career pathways (Energy Utility and Tele-Communications, HVAC, Logistics, Computerized Manufacturing and Machining, and Advanced Manufacturing). Career pathway maps show the progression from certificate to bachelors and associated job titles and salary ranges for each (see Appendix A). Project staff collaborated with Technical Advisory Committee members (local employers) on each map to assure accuracy, and a plan is in place to revisit with employers once a year for possible revisions. These maps are used by project faculty and staff, and also distributed directly to current and potential students, for recruitment and student support (Strategy 3).

For example, employers responded to the Advanced Manufacturing career map by saying that it was accurate in its reflection of the field and subsequently reviewed Logistics, HVAC, and CMM pathways and offered advice for improvements. The Logistics Focus Group met to determine industry challenges and needs, ultimately developing the career pathway and the curriculum that was later submitted to the KCTCS for approval. The Energy and Tele-Communications Consortium also met. Meetings with employers have allowed grant staff to identify skill gaps in the targeted areas.

Two-year schedules for each program of study were developed to help in advising students. The schedules show the sequence of courses that a student must take to finish the associates on time as a full-time student, as well as what semester each course is offered. Four-year schedules for part-time students were also discussed.

Grant staff identified seven accelerated career pathways that could be completed in less-than-one to two semesters plus the CDL certification program. Gateway had previously developed five accelerated Manufacturing and Trade Technology programs through an *Accelerated Opportunities* grant funded by Jobs For the Future, but these courses were limited to the adult education benchmarks of the AO grant. Other accelerated stackable certificates under the umbrella of the Fundamental of Advanced Manufacturing were developed in partnership with a *Raise the Floor* grant funded by the MacArthur Foundation. Thus the IMPACT staff leveraged existing grant activities to increase opportunities for Gateway students to earn credentials quickly in high demand career areas.

Three new stackable Fundamentals of Advanced Manufacturing credentials were also created. One course, MFG 102, was being offered by Workforce Solutions but was translated into the regular class schedule later in 2015. A Key Train Curriculum was developed to allow participants to earn NCRC, and Work Keys employment assessments became available in the assessment center.

Table 3.2: Stacked and Latticed Career Pathways

Program of Study	Credential	Industry Certification	Career/Occupation
Computerized Manufacturing and Machining	AAS, Diploma, Certificates	NOCTI Precision Machining	Machine Maintenance Specialist, Machinists & Machine Tool Operator, Computer-Controlled Machine Tool Operator
Electrical Technology	AAS, Diploma, Certificates	-BICSI – ITS Installer I, Installer 2, Copper, Installer 2, Optical Fiber -KY Standard Journeyman Electrician -OSHA 10 and 30	Industrial Electricians, Electricians, Electrical Power Line Installers and Repairers, Electrical Installers and Repairers
Energy Technologies	AAS, Certificates	-BPI Building Analyst -BPI Building Envelope -FOA – -Fiber Outside Plant Technician -Fiber to the Home, Premise, Curb -OSHA 10 and 30	Energy Auditor, Solar/PV Installer, Telecommunications Line Installers & Repairers, Electrical Power Line Installers & Repairers
HVAC	AAS, Certificate	-KY HVAC Journeyman Mechanic License -EPA 608 Refrigeration License	HVAC Mechanics and Installers
Industrial Maintenance	AAS, Certificates	AMTEC (Effective Fall 2014)	Installation, Maintenance, and Repair, Industrial Engineering Technician, Industrial Machinery Mechanics
Manufacturing Engineering Technology	AAS, Certificates	-MSSC Certified Production Technician -NOCTI Manufacturing Level 1 **-Enhanced Operator (new)**	Engineering Technician Automated Process Technician, Production Technician, Quality Control Technician
Welding Technology	AAS, Diploma, Certificates	AWS – Entry Level Worker	Welders, Cutters, Welder Fitters, Welding, Soldering, Brazing Machine Setters
Supply Chain Management (NEW)	AAS, Certificate	-MSSC Certified Logistics Associate (new) -MSSC Certified Logistics Technician (new) -Certified Production Technician (new)	Logistics Manager, Logistics Analyst, Logistics Specialist, Front End Logistics
Commercial Driver's License (NEW)	Certificate	CDL (can be stacked on any of the above programs) (new)	Ground Transportation, Bus and Truck Driver, Commercial Vehicle Operator, Mobile Crane Operator

The Logistics Consortium, a group of employers and educational institutions guided by GCTC Workforce Solutions, collaborated to identify logistics as a high need area. They piloted a new Supply Chain Specialist offered through Workforce Solutions and recommended a new course, LOM210 Lean for Logistics. With grant support, GCTC developed three new credentials in 2015 - Certified Logistics Technician (CLT), Certified Logistics Associate (CLA), and Certified Production Technician (CPT)– that were previously offered as employer contract training through the Kentucky Career Center. Eventually, this led to the development of an AAS in Supply Chain Management. This AAS degree is currently only offered at one other colleges in KCTCS - Western Kentucky Community & Technical College - but not with this focus option, due to differences in local industry; Maysville Community & Technical College offers certificates but not the degree

Figure 3.2: Marketing Materials for new Logistics Pathway

Finally, in the last semesters of the grant, GCTC welcomed its first students into the Enhanced Operator Program. A sixteen-week program that highlights competency based learning through self-paced modules using "open-source" resources drawn from industry partners. This certificate includes fourteen hours of college credit and is stackable toward the AAS in Manufacturing Engineering Technology. Because this newest program was a result of collaborative development with the Advanced Manufacturing Workforce Development Coalition, all graduating participants receive employment interviews with employer partners.

Grant area programs were surveyed for **associated industry certifications**. Along with identifying stacked and latticed career pathways, the program is also able to indicate which industry certifications are involved with each pathway, including MSSC CLA and CLT in Logistics, MSCC CPT in Manufacturing, as well as Fiber to the Home and Building Envelope in Energy Technology. The assessment center at the college started to offer WorkKeys tests, which employees use to hire new employees. ACT job profiles were also conducted to determine competencies in the fields.

Table 3.3: Translating Non-Credit Certifications into Credentials

Workforce Solution Certification	For-Credit Course	Degree Program
MSSC Certified Production Technician	MFG 102	Manufacturing Technology
MSCC Certified Logistics Associate	LOM 100	Logistics
MSCC Certified Logistics Technician	LOM 102	Logistics
Fiber to the Home (FOA)	EGY 120	Energy Technology
Building Performance Institute Building Analyst I (BA1)	EGY 240	Energy Technology
NOCTI Precision Machining		CMM
NOCTI Manufacturing Level 1		Manufacturing Technology
ITS Installer I		Electrical Technology
Installer 2 (Copper)		Electrical Technology
Installer 2 (Optical Fiber)		Electrical Technology
KY Standard Journeyman Electrician		Electrical Technology
Commercial Driver's License (CDL)	N/A	N/A (Workforce Solutions)

The above chart identifies the ways in which Workforce Solution certifications mentioned above have been or are in the processing of being translated into credit bearing programs.

Another area of keen interest to local partners was that of CDL training. There were no CDL training programs in the Northern Kentucky region at the onset of the grant. The college initially partnered with Lake Cumberland CDL Training School to offer CDL training,

which provided the trucks and instructors. Similar to other KCTCS colleges, the CDL course was advertised through Workforce Solutions; however, its academic home was in Automotive Technology in the hopes of being developed and approved in the future as a credit bearing course which would allow veterans to use GI Bill benefits to pay for the course. The college brought this training program in-house in the Fall of 2016 including trucks, driving instructors, and practice area as part of their new Transportation Technology Center.

Prior to the grant, Gateway offered **credit for prior learning** if students passed a given test, held an industry licensure, or completed a prior learning assessment portfolio. For Project IMPACT, the existing student portfolio model was reviewed, and new best practice ideas were explored in order to develop an enhanced system of implementing Prior Learning Assessments. Independently, the Systems Office distributed a Prior Learning Handbook to the colleges, along with a list of Computer Information Technology equivalencies in April of 2014, which were then also considered for inclusion in IMPACT's PLA policy. Also to be included were preexisting memorandums with agreement (MOAs) that a few IMPACT program areas had established with local employers for awarding prior learning credit for work experience. The current PLA handbook was posted to the college website, along with a list of acceptable licensures and tests.

Installation of Strategy #2: Program Enhancements

Computerized Manufacturing and Machining equipment was installed during Year One for use in nine courses and the Virtual Simulator for four welding classes arrived at the end of the year. Equipment includes four ProtoTRAK CNCs, a Lathe, a retrofit and accessories for CMM, and two Motoman MH5LF Robot Custom Systems for Electrical Technology. Tablets for the electrical and energy programs, a 3-D printer, and scanners were also ordered and installed.

Grant staff identified courses that were already offered wholly or partially online in the target program areas, as well as courses that could be developed into either 100% online, hybrid courses, or online modules. In order to meet their goal of developing 5 eLearning curricula per year, the newly hired Instructional Designer worked with faculty to develop the online curriculum format for their content area. The faculty agree that a hybrid approach is best for these kinds of courses with the exception of enhanced manufacturing which was well received as a 100% online class with excellent flexibility for the students.

The course developer worked with two faculty members who were already in process when she was hired and found that the instructors would benefit from a group approach to developing new online learning environments. They began offering a "bootcamp" during the summer (when instructors typically have a lower teaching load) called the **eLearning Design and Development Institute (eDDI**). During intensive sessions, instructors developed the content for their courses and learn about online pedagogy and best practices. At the end of each boot camp, the instructors hand off all the course materials to the course designers and then the eLearning team develops the course in Blackboard in

such as way to meet the KCTCS Quality Matters rubric. This process follows a design template developed for a previous grant that provides continuity across courses as each course looks the same as the next one and is easy for the students to follow. With the eDDI model, course development took 6-7 months rather than over a year.

Table 3.4: Courses Developed for eLearning

Course Name	Delivery	Credits
ISX 101(Includes Personal Protection Equipment safety module)	100%	3 Credits
BRX 110	100%	2 credits
BRX 210	100%	2 credits
ACR 13	100%	3 Credits
ACR 250	100%	3 credits
ACR 270	100%	3 Credits
QMS 101	100%	3 Credits
EGY 120 (2 modules in fiberoptics)	Hybrid	4 credits
EGY 220	Hybrid	4 credits
IMT 289-capstone	100%	1 credit
EET 127 capstone course	F2F	0-3 credits
MFG 102	100%	6 credits
Creating a Resume	100%	n/a
Certified Logistics Technician (CLT)	100%	3 Credits
Certified Logistics Associate (CLA	100%	3 Credits
*Impact Instructional Designer completed both Quality Matters and Certified Technical Trainer certifications.		

The instructional designer noted that the group environment of the eDDI Boot Camp allowed the instructors to learn from each other and to recognize "what they don't know". This was an improvement over individualized consultations. In asking questions and hearing what others think, the participants tried out ideas and shared teaching experiences. Although the participants did not have a lot of knowledge about eLearning to share, the group sessions provided information to the designers and developers running the institute to understand what the instructors need to learn. It was pointed out that some of the instructors have never taken a course online and the group allowed them to get a crash course in what an online environment can be like.

The fifth module on resume development developed in 2014 was a result of lessons learned through the development of the electrical controls course, which leads to the Certificated Electrical Manager certificate. In this class Schneider Electric sent professionals to talk to the students. In addition, the Career Pathways advisor, Tara Sorrell, also visited the class to provide information on developing a resume and job hunting materials. The students were required to apply what they've learned from these class visits. In the process, the instructors noted, "It'd be nice if we had some kind of video that explains to them how to get their resume together." The instructional designer worked

with the career pathways advisor to develop an online module that effectively captures the PowerPoint slides used in the resume workshop sessions in class. This module is now available on the IMPACT website to be used in any IMPACT or Gateway course as needed. It is an integrated part of the CEM certificate, but can be added to any program of study.

Another innovative idea that came out of collaboration between designers and instructors was the development of a resource for students on Library Sciences and Technology skills called Early Access Skills for You (EASY). As part of another grant (HPOG), Gateway staff recognized that students were struggling with their CIT course (required for almost all degree programs in KCTCS). They lacked basic skills in accessing information and using technology. So the team developed EASY as a set of resources imbedded in the Blackboard shell of their course that has online tutorials and interactive lectures about LIS and Technology skills (Word, PowerPoint, operating systems). Similar to the "Start Here" Module that all the courses have as part of the eLearning design template, eventually the EASY resource will be in all their classes.

Installation of Strategy #3: Outreach, Completion & Career Support

The grant staff developed a strategic marketing and outreach plan with assistance from Gateway PR. Staff developed program materials to be passed out to students in classes within the targeted programs. Initially, a marketing plan was developed specifically for veteran students, but this was then used as a template for other IMPACT populations. The program staff also published rack cards and business cards to hand out. The IMPACT website includes links to individual program websites and contains contact information for student support staff.

Recruitment was a difficult sell for IMPACT staff due to negative perceptions in the community about manufacturing jobs. Planned outreach efforts to students included emailing undecided students about the IMPACT grant, distributing flyers to local areas to promote manufacturing jobs, informational meetings, and distributing career pathways to potential students. In addition, students who had applied to Gateway but had not yet registered were contacted for assistance. Project staff met with Florence and Covington TAA Coordinators to discuss collaboration and the process for referring TAA-eligible workers. Another source of students were those already on campus, but perhaps not knowledgeable about the IMPACT pathways. Student support staff visited classes during the first few weeks of fall classes to discuss the IMPACT grant with potential students. Direct engagement with employers (discussed in the following section) was also a good recruiting practice.

Methods of tracking how new participants and current students heard about IMPACT and career programs were put in place. The intake process was determined to be the first step of one-on-one support for IMPACT students. By May 2014, a standard intake form for the grant and tracking procedures for participants had been developed and revised for clarity. As students complete the form they were added to the IMPACT student database that tracked what services they received through the grant. The intake form also collected

contact and demographic information, veteran and disability status, current employment and income data, and program interest.

Program student support activities included an emphasis on personal contact above and beyond that typically provided by GCTC advisors. As part of recruitment, inquiries were followed up to assist with enrollment. Once enrolled, students received advising on pathways and next steps to improve continuous enrollment to completion. Career planning, including resume development and practice interviews were also provided. Pathways maps demonstrated what jobs and salaries corresponded with each credential. Grant participants also received help with finding work-based learning opportunities.

To assist with advising, two-year program schedules indicating the sequence of courses for students were produced in addition to the career pathway maps. IMPACT participants were tracked through the advising program Starfish, which contains information about their registration, courses, and credentials, and allows students to be flagged for possible retention issues. Because the student management system PeopleSoft and Starfish are both used by the college at large, students were given special IMPACT identifiers within each system that project faculty and staff could use. Project staff also created a spreadsheet reference of the non-veteran participants with their student ID, information on their program of study, credentials that they may be eligible for that semester, and whether or not they enrolled for the next semester. Due to the possible variations in treatment for each participant – i.e., receiving support services, enrolling in eLearning courses or course with new equipment, and/or participating in work-based learning – the grant staff also kept a record of which participants have received which treatments.

The IMPACT project followed GCTC **procedures for student assessment**. Incoming students whose ACT scores fell below state standards for college readiness were asked to complete additional assessments (first COMPASS and later KYOTE) to place them in developmental education courses. Students without ACT or other standardized test scores, were required to complete college assessments (first COMPASS and later KYOTE) as part of GCTC admission. GCTC follows an accelerated developmental education curriculum with co-requisite courses. The developmental education curriculum had been completely redesigned including active learning pedagogy at the time of IMPACT implementation with funding from a First in the World grant from the Department of Education. Student pursuing non-credit bearing certificate programs through Workforce Solutions were not required to complete college readiness assessments.

The IMPACT program implemented an ambitious array of activities to support a wide selection of credentials. The number of students in any one program of study was low, but the overall level of service was high with new programs experiencing strong enrollment due to the integration of industry partner feedback and participation in recruitment. This distinctive feature of the project to engage local employers in the pathway development process improved industry-based revisions to courses and programs. Work-based learning opportunities both in the classroom through enhanced classroom resources and co-op opportunities added to the students' experience.

4. Outcome Analysis

Descriptive Statistics of Student Participants

The demographics below describe the total participants that the grant served as far as information was known for them. Certain information could be taken from a student's application to KCTCS, while others were dependent upon self-reporting through the IMPACT intake form. Enrollment and course performance data for each student were verified by the evaluation team through an analysis of each student's transcript pulled directly from the college enrollment system.

Age: The average self-reported age of students in the program is 33 years old. The number of non-traditional students (defined as 25 years or older) is 269 out of 379 participants (71%).

Gender: 341 of 379 participants are self-reported as male. Ten (10) of the female participants are in the CPT program, which is the certificate of focus of the Raise the Floor program that recruits women into technical fields.

Race & Ethnicity: The majority of the participants self-reported as white/Caucasian (317 of 379); 50 students self-reported as Black or African American, two (2) reported as Asian, one (1) reported as American Indian or Alaskan Native, and nine (9) did not self-identify. Seven (7) students self-reported as being of Latino or Hispanic heritage.

Gateway's college-wide demographics for race and ethnicity are approximately 83% white/Caucasian (compare IMPACT 83.6%) and 12.5% Black or African American (compare IMPACT 13.2%). Other minorities are under-represented in the program.

Eligibility for Federal funding/programs: One hundred and two (102) participants were eligible for Pell grant funding in Fall 2016, and eighteen (18) were TAA eligible. Of those students with Veteran status, sixty-eight (68) were identified as eligible Veterans, one (1) eligible with less than 180 days services, and one (1) as another VA-eligible person.

College Readiness: According to data on students' ACT and COMPASS placement test results, 79 students tested into remedial English, 60 into remedial reading, and 94 students tested into remedial math. 115 participants have taken at least one developmental course over their entire enrollment time at KCTCS. 151 students did not have reading or writing COMPASS or ACT scores, and 153 students did not have math COMPASS test records or ACT scores which may be explained by transfer credit or other evidence of college readiness.

Courses in the IMPACT program do not have a plan for differentiated instruction as students who are not college ready (determined by ACT or COMPASS scores under

KCTCS policy); however, the IMPACT program participants who are not certified as college ready are expected to complete developmental education coursework in addition to POS courses following state guidelines for college readiness.

Enrollment and Employment Status: Enrollment data could be monitored through the student information system of KCTCS, PeopleSoft, but employment data had to be self-reported by participants. Of the 95 students that were enrolled for classes in the final semester with a known course load, 70 were enrolled full-time (at least 12 credit hours per semester) and 25 were enrolled part-time. Overall, 270 of the 379 total participants were identified as full-time students, and 264 of all participants were incumbent workers.

Enrollment in IMPACT Programs of Study and New Courses

In all, the IMPACT program had **379 total participants**, **251 of which were new students** (non-incumbent to Gateway). The program produced **125 exiters** and **175 completers**. Completers are defined as those who have both graduated and exited the program, while the exiters withdrew from the program without completing a credential.

The differences in the numbers between those reported by the grant to the Department of Labor and in Project Team meetings, and those calculated by the evaluation team are likely a result of each capturing the ever-updating data at different points in time. In the final impact analysis, we used reconciled data based on raw transcript data for both participants and the historical comparison cohort drawn directly from the college enrollment data. This reconciliation assures the quality of data used in the analysis.

The number of total participants in each POS follows below. Students are able to earn credentials in multiple areas even if they are not listed as their primary program of study.

Table 4.1: Enrollment by Program of Study and Credential

Program of Study (POS)	Credential	Total Participants
Computerized Manufacturing and Machining	**AAS, Diploma, Certificates**	**18**
	AAS/Machine Tool Tech	8
	CNC Machinist	4
	Machinist	1
	Machine Tool Operator	1
	No Sub Plan Listed	4
Commercial Driver's License	**Certificate**	**114**
Electrical Technology	**AAS, Diploma, Certificates**	**36**
	AAS Electrical Tech	12
	Construction Electrician	2

	Industrial Electrician	2
	No Sub Plan Listed	20
Energy Technologies	**AAS, Certificates**	**15**
HVAC	**AAS, Certificate**	**26**
	AAS HVAC	16
	HVAC Mechanic	1
	Domestic AC & Furnace	1
	No Sub Plan Listed	8
Industrial Maintenance	**AAS, Certificates**	**36**
	Mechanic Level 2	1
	No Sub Plan Listed	35
Logistics	**AAS, Certificate**	**7**
	Supply Chain Management	1
	CLA/CLT	6
Manufacturing Technology	**AAS, Certificates**	**87**
	AAS Manufacturing Tech	1
	Computer Aided Drafting	1
	CPT	17
	Quality Control	1
	No Sub Plan Listed	67
Fund. of Adv. Manuf. & Machining		**2**
Welding Technology	**AAS, Diploma, Certificates**	**37**
	AAS Welding Technology	9
	CNC Machinist	1
	Combination Welder	13
	ARC Welder	1
	No Sub Plan Listed	13

In all, 138 program participants took courses that were newly developed through the IMPACT grant, 24 took courses that were updated using grant funding, and 104 took courses that were provided with new equipment through grant funds. Ninety-four (94) participants took at least one new eLearning course as part of their program. Ninety-six (96) took courses that were part of the accelerated credentials curriculum. 866 non-program participants also took at least one of these courses that were improved through the IMPACT grant.

Completion of Academic Credentials (Associates, Diplomas, & Certificates)

Data from the college student management database shows that 138 participants completed 510 **for-credit** credentials in the following areas during the implementation of the IMPACT program:

Associate in Applied Science (49)
Electrical Technology (9)
Energy Technology (4)
Industrial Maintenance Technology (4)
Manufacturing Engineering Technology (15)
HVAC (1)
Supply Chain Management (1)
Welding (3)
General Occupational and Technical Studies (GOTS) (12)

Diploma (22)
Combination Welder (8)
Electrical Technology (13)
Heating, Ventilation, and Air Conditioning Mechanic (1)

Certificates (439)
ARC Welder (9)
Domestic Air Conditioner & Furnace Installer (5)
Electrical Motor Control Level 1 (7)
Electrical Motor Control Level 2 (4)
Electrician Trainee Level 1 (65)
Electrician Trainee Level 2 (11)
Energy Efficiency and Analysis (5)
Energy Efficiency Electrical Controls Technician (1)
Energy Technologies Certificate (3)
Energy Utility Technician (3)
Environmental Control System Servicer (5)
Environmental System Repair Helper (11)
Exploratory Machining (44)
Fundamentals of Adv. Manufacturing & Machining (1)
Fundamentals of Adv. Manufacturing & Mechatronics (4)
Fundamentals of Adv. Manufacturing & Quality Control (1)
Fundamentals of Mechatronics (27)
Industrial Maintenance Electrical Mechanic (37)
Industrial Maintenance Mechanic Level 1 (37)
Industrial Maintenance Mechanic Level 2 (13)
Industrial Maintenance Machinists Mechanic (16)
Industrial Maintenance Technician (1)
Integrated Manufacturing Technology (24)
Logistics Operations (1)
Machine Tool Operator 1 (8)

Machine Tool Operator 2 (4)
Manufacturing Processes and Production (10)
Operations Management (17)
Outside Plant Technician (4)
Plumber's Helper (4)
Plumber's Installer (1)
Production Line Welder (9)
Quality Control (2)
Residential Electricity Level 1 (14)
Residential Electricity Level 2 (11)
Solar/Photovoltaic Technologies (4)
Supply Chain Specialist (1)
Tack Welder (11)
Voice and Data Wiring Installer Level 1 (3)
Voice and Data Wiring Installer Level 2 (1)

Completion of Industry Certifications
102 students passed industry certification exams and received 87 CDL, 6 CLA, 9 CPT, and 3 CLT not-for-credit certifications.

Awarding of Credit for Prior Learning
Using the KCTCS policy and protocol for awarding credit for prior learning, no students had received credit for prior learning toward their degrees.

Placement in Employment & Co-ops/Apprenticeships
270 of the 379 participating students were employed during the program and therefore are considered for grant monitoring purposes as "incumbent workers." Forty (40) participants were placed in employment, and 42 incumbent workers had a wage increase. Thirty-four (34) students were placed in co-ops during their programs and 53 participated in apprenticeships.

5. Impact Analysis

Our goal in this evaluation was to assess the impacts of GCTC students' participation in the IMPACT program on educational and employment outcomes. Ideally, we would have randomly assigned students to either the IMPACT program or to continue their regular course of study. We would then be able to compare the educational and employment outcomes between groups to determine program effectiveness. However, it was not possible to randomly assign students to the IMPACT program. Therefore, we turned to alternative methods to account for selection bias resulting from program participation.

To address selection bias in non-experimental data we used propensity score matching (PSM). With this approach, we used a linear composite of carefully chosen covariates that predict selection into the IMPACT program. Specifically, we used a logistic regression analysis to predict the likelihood that a student participates in the IMPACT program as a function of the student's age, sex, race/ethnicity, Pell Grant eligibility, veteran status, part-time enrollment status, college readiness in English, math, and reading, and program of study. The fitted values from this analysis served as the probability, or propensity, that students in this sample would participate in the IMPACT program.

Comparison Groups

Prior to creating statistically comparable cohorts of participants and non-participant contemporary students through propensity-score matching, we identified a population from which to identify the sample cohort. The below charts compare the entire populations of IMPACT participants and historical cohort students who were enrolled in the IMPACT programs of study prior to the implementation of the grant.

Table 5.1 shows the recruitment of new versus incumbent KCTCS students into the IMPACT programs and into the pre-IMPACT programs. Percentages are given for a rough comparison given the difference in population size. Table 5.1 also shows the number of students enrolled for each term of full implementation of the IMPACT program and how many students earned credit in passing at least one course.

Table 5.1. Incumbent Student Status and Course Outcomes

	IMPACT Students						Historical Students			
	Fall 2014	**Spring 2015**	**Fall 2015**	**Spring 2016**	**Fall 2016**		**Fall 2012**	**Spring 2013**	**Fall 2013**	**Spring 2014**
Total Served	110	183	331	347	379		578	620	739	769
# Incumbent	21	110	183	331	347		439	578	620	739
% Incumbent	19%	60%	55%	95%	92%		76%	93%	84%	96%
Students in Courses*	183	184	160	130	95		412	407	444	404
# Earned Credit	177	175	158	128	92		367	370	405	355
% Earned Credit	97%	95%	99%	98%	97%		89%	91%	91%	88%

**Does not include students taking non-credit industrial certification courses (e.g., CDL, CPT)*

Students in KCTCS must complete a graduation application – often with an advisor signature and degree audit attached – in order to be awarded a credential, from one-course certificates to associate's degrees. As a result, many students may be eligible for a credential but may not apply for it, either because they are not aware of their eligibility, they are postponing application until the end due to financial aid concerns, or are not informed of the added value of a credential to courses taken. Table 5.2 shows the added value of the program having student support staff who were able to track student progress and actively helped students to apply for credentials as they became eligible.

Table 5.2. Credential Outcomes for Treatment and Comparison Cohorts

	IMPACT	Comparison
# Students Eligible for Credentials	174	480
% Total Students	45.9%	62.4%
# Student Awarded Credentials	138	281
% Eligible Students	79.3%	58.5%

Data Description

For the impact analysis we used data consisting of individual student demographic and academic records from Gateway Community Technical College (GCTC) and employment records from the Kentucky Center for Education and Workforce Statistics (KCEWS).

We had five academic outcomes of interest for students participating in the IMPACT program: courses taken, courses passed, earned credit, earned credential, and awarded credential. Courses taken and courses passed are continuous measures of the total number of courses taken and passed by each student. Earned credit is a binary measure of whether a student earned at least one course credit while enrolled at GCTC. Earned credential and awarded credential are also binary measures of whether a student completed enough credit hours to earn a credential or were awarded a credential while enrolled at GCTC.

We also investigated one employment outcome of interest for each student: change in quarterly wages. Change in quarterly wages is a measure of each student's difference in quarterly wages prior to program start and after program completion.[2] We only observed the difference in wages for Kentucky students[3] completing the program by the summer 2016 academic term and were employed both prior to and after program completion.

In addition to our outcomes of interest, we used several student demographic variables in our analysis. We use a continuous measure of a student's age, and binary measures of a student's sex, Pell grant eligibility status, veteran status, part-time student status. We

[2] We use prior employment data from the quarter ending within one and three months before the student's first term at GCTC. We use post-employment data from the quarter ending between three and six months after the student's last term at GCTC.
[3] 12 percent of students were from out-of-state.

recoded each student's race/ethnicity into one of three categories: White, Black/African American, or Other Race/Ethnicity.[4] We also created indictors of the student's broader program: Advanced Manufacturing, Energy/Telecom, or HVAC. We did not include measures of urbanicity of the student's home county as over 95 percent of students lived in an urban metro area.

We also created a set of academic readiness indicators in our analysis using information about a student's ACT English, math, and reading scores or a student's Compass Pre-Algebra, Algebra, reading, and English scores. The academic readiness indicators in math, reading, or English were based on a cutoff score for each test.

Sample Description

We began with information on 1,148 GCTC students. Of these students, 379 participated in the IMPACT program, while 769 served as comparison students. We used several steps along the way to pare down the analytical sample size.

First, we removed any students that did not take any for-credit courses. This removed 134 IMPACT program treatment students. Next, we removed students missing all college readiness indicators, as we would have difficulty imputing pre-treatment academic background information for these students. This step removed 81 total students (23 IMPACT and 58 comparison). Then, we removed 439 comparison students who started before the Fall 2012 term. Next, we removed 101 comparison students whose last term was after fall 2014. These individuals could have received a crossover of the treatment as the IMPACT program began. As a final step, removed any students with a recorded last term in a semester prior to their first term (16 IMPACT students, 1 comparison student).

From this process, our analytical sample consisted of 376 students: 206 IMPACT program treatment students and 170 comparison students. Within this sample, fewer than ten students had missing information for any one variable. For the three students with a missing age, we imputed the mean age of 32. For students missing reports of their race/ethnicity or college readiness, we created missing data indicators for use in our later analyses.

We provide a description of student demographic and academic background characteristics in Table 5.3. From the full analytical sample, we find that students participating in the IMPACT program are different from comparison students on several demographic and academic background covariates. Specifically, IMPACT students are slightly younger, less likely to be eligible for a Pell Grant, less likely to be a part-time student, and more likely to be college ready in English and math. Therefore, the differences in background characteristics between IMPACT and comparison students may drive any differences in educational or employment outcomes.

[4] Other race/ethnicity includes small numbers of each Latino, Asian/Pacific Islander, American Indian/Alaskan Native, and Multiracial students.

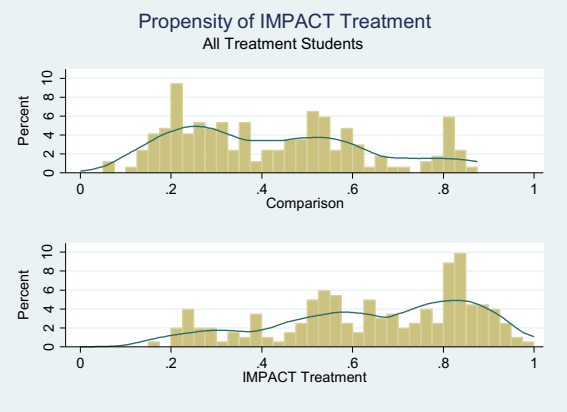
Propensity Score Matching

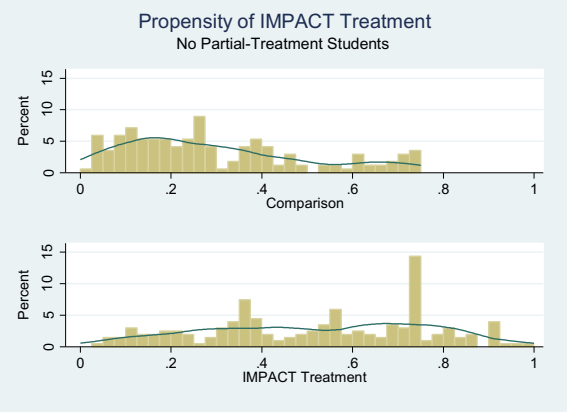
After calculating each student's propensity score, we matched IMPACT program treatment students with up to three comparison students. We specifically used caliper matching, whereby we matched treatment and comparison students that share a propensity score within ±1/4 of a standard deviation of the overall propensity score distribution. If there were no comparison students within this range, the IMPACT treatment student was left unmatched. For all descriptive and empirical analyses with the propensity score matched samples, we also constructed weights to enable us to compare equal numbers of treatment and comparison students.[5]

We conducted this matching procedure twice. First, we matched using the full analytical sample of students. Second, we matched using only those treatment students who received the "full" IMPACT treatment (i.e. students whose first term was spring 2015 or later).

The figures below display the propensities from the two matching procedures, where a value of "0" indicates a student most likely to be in the comparison group and a value of "1" indicating a student more likely to be an IMPACT participant. We observed that the distributions of the propensities for the comparison and IMPACT students are notably different from one another. These differences illustrate that the academic and demographic predictors described above help to predict selection differences between IMPACT program and comparison students. Despite the differences in these distributions, there are also large regions of common support, which allowed us to move forward with matching students who share common background characteristics via their propensity of being an IMPACT program participant.

Figure 5.1: Propensity of IMPACT Treatment





[5] Because treatment students may be matched to multiple comparison students and comparison students may be matched to more than one treatment student we must calculate weights. Each IMPACT treatment student has a weight of 1. The weight for a comparison student equals the total number of treatment students to which the comparison student is matched divided by the total number of student matches for those treatment students.

Using the matching procedure with the analytical sample of all treatment students, we matched 194 treatment students (94.2 percent) to 127 comparison students. With the sample of only the students receiving the full IMPACT program treatment, we matched 96 treatment students (85.7 percent) to 93 comparison students.

To ensure that we matched IMPACT participant students and comparison students appropriately, we examined the descriptive statistics on each of the variables used to estimate the propensity scores. These comparisons are displayed in Table 5.3. Across each of the covariates, we found no statistically significant differences between the matched IMPACT participant and comparison groups. These results suggest that we have matched students in a manner such that the IMPACT group is academically and demographically similar to the comparison group. We were then able to proceed with analyzing differences between the two groups on the primary outcomes of interest.

Table 5.3. Demographic and Academic Background Characteristics of IMPACT and Comparison Group Students

	Full Analytical Sample			PS Matched – All IMPACT			PS Matched – Full IMPACT		
	IMPACT	**Comp.**	**Diff.**	**IMPACT**	**Comp.**	**Diff.**	**IMPACT**	**Comp.**	**Diff.**
Students	206	170		194	127		96	93	
Age	30.602	33.412	-2.810**	30.881	29.862	1.019	30.614	30.934	-0.319
Female	0.083	0.041	0.041	0.077	0.082	0.005	0.083	0.121	-0.038
Black	0.063	0.118	-0.055	0.067	0.078	-0.011	0.031	0.052	-0.021
Other Race/Eth.	0.024	0.041	0.017	0.026	0.029	0.003	0.031	0.021	0.010
Pell Eligible	0.388	0.488	-0.100*	0.396	0.315	0.081	0.313	0.330	-0.017
Veteran	0.194	0.141	0.053	0.196	0.223	-0.027	0.146	0.198	-0.052
Part-Time	0.374	0.735	-0.361**	0.397	0.423	-0.026	0.427	0.434	-0.007
Coll. Ready English	0.655	0.547	0.108*	0.639	0.626	0.013	0.656	0.722	-0.066
Coll. Ready Reading	0.655	0.623	0.032	0.634	0.655	-0.021	0.677	0.739	-0.062
Coll. Ready Math	0.422	0.218	0.204**	0.402	0.451	-0.049	0.406	0.490	-0.084

*p≤0.050; **p≤0.010. Table displays the number of IMPACT and comparison students before and after propensity score matching. The raw means and proportions are reported for the full analytical sample. The weighted means and proportions of students are reported for the propensity score matched samples.

Educational Outcomes

In Table 5.4, we display the results of our analysis of educational outcomes. In Panel A, we display these findings for our analytical sample. IMPACT program students took an average of 20.4 courses and passed 18.2 of them. Meanwhile, comparison students took an average of 5.0 courses and passed 3.2. These substantial differences are statistically significant ($p<0.01$ for each). There is also a statistically significant difference between the 92.7 percent of IMPACT students and 72.6 percent of comparison students that earned credit ($p<0.01$). In terms of credentialing, 77.3 percent of IMPACT students were eligible for a credential while 61.9 percent of students were awarded a credential. This is substantially and statistically significantly larger than the 31.7 percent of comparison students earning a credential and 14.9 percent being awarded a credential ($p<0.01$ for each).

After matching students, we found markedly similar results. The pattern of results described above holds for the propensity score matched sample experiencing any IMPACT implementation exposure (Panel B of Table 1), only those students receiving the full IMPACT implementation exposure (Panel C), and only those students in advanced manufacturing programs (Panel D).

Employment Outcomes

In Table 5.5, we display the results of our analysis of employment outcomes.[6] The results in Panel A include propensity-score matched students for whom the Kentucky Center for Education and Workforce Statistics had any available employment data. Thus, the students comprising the pre- and post-GCTC enrollment periods are different from one another. Most notably, this is the case for IMPACT students, as students last enrolled at GCTC as of the fall 2016 or spring 2017 semesters do not have available wage from the quarter three months after last enrollment.

IMPACT (66.8 percent) students were more likely to be employed prior to enrollment at GCTC than comparison students (48.8 percent) ($p=0.002$). Following enrollment at GCTC, there was no statistically significant difference in employment rates between IMPACT (61.8 percent) and comparison students (55.7 percent). Of students who were unemployed at program start, 36.1 percent of IMPACT and 47.3 percent of comparison students were employed after program completion. We also report descriptive statistics for the median and mean quarterly wages of IMPACT and comparison individuals who were employed either before or after enrollment at

[6] Due to data sharing restrictions, KCEWS only provided us with aggregate descriptive information. Without the raw student-level data, we were also unable to include pre-GCTC employment data in the propensity score matching process. Under normal circumstances, we would also match students based on prior employment/unemployment status as well as prior wages before estimating pre- and post-treatment differences. Similarly, we were not able to account for prior wages or employment in a regression model to estimate outcomes, though the mean change in wages from pre- to post-periods accounts for this information. We were also unable to conduct special tests for the difference in medians between the IMPACT and comparison students.

GCTC. We did not find any statistically significant differences in wages between IMPACT and Comparison students in the pre- or post-GCTC enrollment periods.[7]

In Panel B, we display the results of the employment outcomes for matched students who were employed both prior to and after enrollment at GCTC. This panel represents a better set of estimates for comparing program effectiveness, given that the students comprising the pre- and post-GCTC enrollment periods are the same. We find no statistically significant difference in the proportion of IMPACT (25.9 percent) and comparison students (31.4 percent) who were enrolled both prior to and after enrollment at GCTC. IMPACT students had slightly lower median quarterly wages prior to enrollment ($263), with markedly higher median wages following enrollment ($1,862). The median change in quarterly wages for IMPACT students was $1,903 as compared to only $19 for comparison students. We find no statistically significant mean differences in wages between IMPACT and comparison students with respect to pre-GCTC enrollment, post-GCTC enrollment, or the change from pre- to post-GCTC enrollment.

In Panel C, we display the results of the employment outcomes the IMPACT students who experienced full exposure to the IMPACT implementation and were matched to comparison peers. This group of students were also employed both prior to and after enrollment at GCTC. We again find no statistically significant difference in the proportion of IMPACT (26.0 percent) and comparison students (30.2 percent) who were enrolled both prior to and after enrollment at GCTC. IMPACT students had lower median quarterly wages prior to enrollment ($744) and substantially higher median wages following enrollment ($3,744). The median change in quarterly wages for IMPACT students was a gain of $3,570, while the comparison students experienced a median loss of $497.

When looking at mean quarterly wages, IMPACT students ($5,330) had higher pre-GCTC wages than their comparison peers ($3,867), this was not a statistically significant difference. In the quarter three months following enrollment at GCTC, IMPACT students ($9,100) had nearly double the mean quarterly wages as comparison students ($4,413) (p=0.007). The difference in the mean change in quarterly wages between IMPACT ($3,770) and comparison ($546) students from before and after enrollment at GCTC was also statistically significant at the 5 percent significance level (p=0.029).

In Panel D, we display the results of the employment outcomes for the subset of IMPACT and matched comparison students enrolled in advanced manufacturing programs. This panel is comprised of nearly the same students as in Panel C. Thus, we observe similar outcomes for the advanced manufacturing IMPACT students

[7] We note the marked differences in the median relative to the mean quarterly wages following enrollment at GCTC. These differences are largely driven by several of the highest-weighted comparison students having high wages in the post-enrollment period, as seen in the large standard deviation in post-GCTC wages for comparison students.

relative to their advanced manufacturing comparison peers. One notable difference is that while there is a large difference in the mean change in quarterly wages between IMPACT ($3,699) and comparison ($566) advanced manufacturing students, this difference was not statistically significant at the 5 percent significance level (p=0.052).

Table 5.4 Educational Outcomes

	IMPACT	Comparison	Difference
A. All Students with Any IMPACT Implementation Exposure			
Courses Taken	20.422	4.965	15.458**
Courses Passed	18.165	3.288	14.877**
Earned Credit	0.922	0.700	0.222**
Eligible Credential	0.767	0.235	0.532**
Awarded Credential	0.612	0.076	0.536**
Number of Students	206	170	
B. Matched Students with Any IMPACT Implementation Exposure			
Courses Taken	20.566	6.387	14.174**
Courses Passed	18.320	4.891	13.429**
Earned Credit	0.927	0.726	0.201**
Eligible Credential	0.773	0.317	0.456**
Awarded Credential	0.619	0.149	0.470**
Number of Students	194	127	
C. Matched Students with Full IMPACT Implementation Exposure			
Courses Taken	21.333	6.226	15.108**
Courses Passed	19.250	4.566	14.684**
Earned Credit	0.947	0.757	0.190**
Eligible Credential	0.823	0.319	0.504**
Awarded Credential	0.656	0.139	0.517**
Number of Students	96	93	
D. Matched Advanced Manufacturing Students with Full IMPACT Implementation Exposure			
Courses Taken	20.636	6.582	14.054**
Courses Passed	18.883	4.912	13.971**
Earned Credit	0.934	0.791	0.143*
Eligible Credential	0.818	0.349	0.469**
Awarded Credential	0.649	0.161	0.488**
Number of Students	77	75	

*p≤0.05, **p≤0.01. The raw means and proportions are reported for the full analytical sample. The weighted means and proportions of students are reported for the propensity score matched samples. Panel A displays outcomes for all students with any level of exposure to the IMPACT implementation. Panel B displays outcomes for all propensity score matched students with any level of exposure to the IMPACT implementation. Panel C displays outcomes for all propensity score matched students with only a full level of exposure to the IMPACT implementation (started in spring 2015 or later). Panel D displays outcomes for all propensity score matched students with only a full level of exposure to the IMPACT implementation and who are in an advanced manufacturing program.

Table 5.5 Employment Outcomes

	IMPACT	Comparison	Difference
A. Matched Students with Any IMPACT Implementation Exposure and All Employment Data			
N (Matched to Kentucky Emp. Data)	127	193	
Prop. Employed Pre-GCTC	0.668	0.488	0.180**
Prop. Employed Post-GCTC	0.618	0.557	0.061
Prop. Unemployed Pre/Employed Post	0.361	0.473	-0.112
Median Quarterly Wage Pre-GCTC	$4,044	$2,151	$1,893
Median Quarterly Wage Post-GCTC	$6,700	$3,686	$3,014
Mean Quarterly Wage Pre-GCTC	$5,181	$5,291	-$110
	[$4,432]	[$7,122]	
Mean Quarterly Wage Post-GCTC	$6,519	$9,592	-$3,073
	[$5,314]	[$17,672]	
B. Matched Students with Any IMPACT Implementation Exposure and Employed Before and After GCTC Enrollment			
N Employed Pre- and Post-GCTC	50	61	
Prop. Employed Pre- and Post-GCTC	0.259	0.314	-0.055
Median Quarterly Wage Pre-GCTC	$3,946	$4,209	-$263
Median Quarterly Wage Post-GCTC	$6,739	$4,877	$1,862
Median Change in Quarterly Wage	$1,903	$19	$1,884
Mean Quarterly Wage Pre-GCTC	$5,045	$6,100	-$1,055
	[$4,469]	[$7,548]	
Mean Quarterly Wage Post-GCTC	$6,941	$7,476	-$535
	[$5,544]	[$9,860]	
Mean Change in Quarterly Wage	$1,896	$1,376	$520
	[$4,892]	[$7,733]	
C. Matched Students with Full IMPACT Implementation Exposure and Employed Before and After GCTC Enrollment			
N Employed Pre- and Post-GCTC	25	29	
Prop. Employed Pre- and Post-GCTC	0.260	0.302	-0.042
Median Quarterly Wage Pre-GCTC	$3,978	$4,722	-$744
Median Quarterly Wage Post-GCTC	$8,750	$4,966	$3,784
Median Change in Quarterly Wage	$3,570	-$497	$4,067

Table XX. Employment Outcomes (continued)

	IMPACT	Comparison	Difference
C. Matched Students with Full IMPACT Implementation Exposure and Employed Before and After GCTC Enrollment (continued)			
Mean Quarterly Wage Pre-GCTC	$5,330	$3,867	$1,463
	[$4,488]	[$3,668]	
Mean Quarterly Wage Post-GCTC	$9,100	$4,413	$4,687**
	[$5,729]	[$6,435]	
Mean Change in Quarterly Wage	$3,770	$546	$3,224*
	[$4,492]	[$5,831]	
D. Matched Advanced Manufacturing Students with Full IMPACT Implementation Exposure and Employed Before and After GCTC Enrollment			
N Employed Pre- and Post-GCTC	19	29	
Prop. Employed Pre- and Post-GCTC	0.247	0.345	-0.098
Median Quarterly Wage Pre-GCTC	$3,913	$4,463	-$550
Median Quarterly Wage Post-GCTC	$8,750	$5,053	$3,697
Median Change in Quarterly Wage	$3,181	-$543	$3,724
Mean Quarterly Wage Pre-GCTC	$5,128	$3,949	$1,179
	[$4,425]	[$3,707]	
Mean Quarterly Wage Post-GCTC	$8,826	$4,515	$4,311*
	[$4,450]	[$6,526]	
Mean Change in Quarterly Wage	$3,699	$566	$3,133
	[$4,175]	[$5,933]	

*p≤0.05, **p≤0.01. Employment data available for all students who were no longer enrolled at GCTC by the summer 2016 term due to available data from KCEWS. Wage data reported only for students who were employed and had quarterly wages >$0. The weighted means, standard deviations (in brackets) and proportions of students are reported for each propensity score matched sample. Z-test for difference in proportions between IMPACT participants and comparison students used for percentage of students employed. T-test for difference in means used for wages. Panel A displays outcomes for all matched students with any level of exposure to the IMPACT implementation and any employment status. Panel B displays outcomes for all matched students with any level of exposure to the IMPACT implementation and who were employed both before and after enrollment at GCTC. Panel C displays outcomes for all matched students with only a full level of exposure to the IMPACT implementation (started in spring 2015 or later) and who were employed both before and after enrollment at GCTC. Panel D displays outcomes for all matched students with only a full level of exposure to the IMPACT implementation (started in spring 2015 or later), were enrolled in an advanced manufacturing program, and who were employed both before and after enrollment at GCTC.

6. Conclusion: Partnering for Success

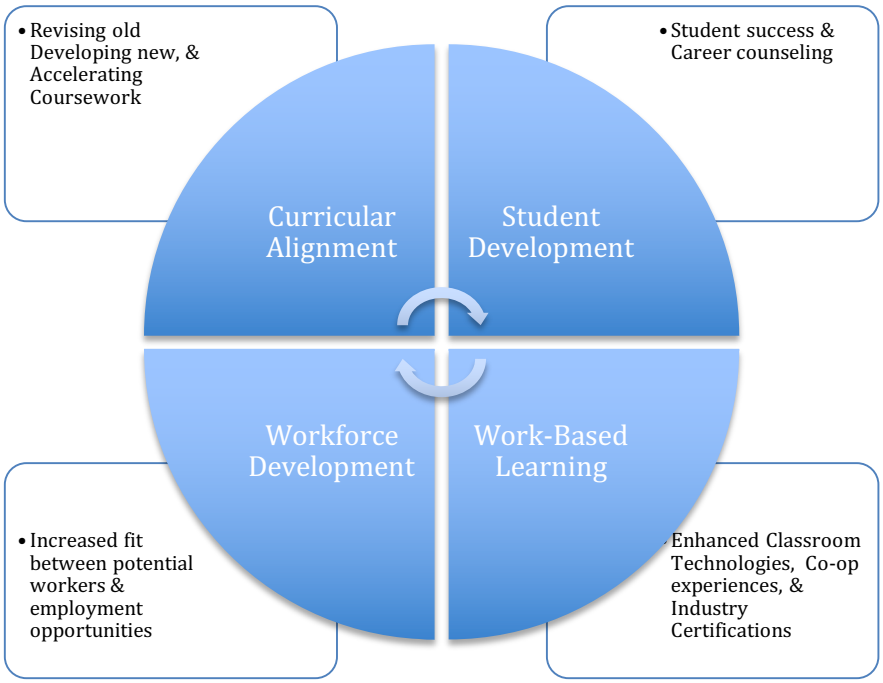
The underlying premise of the IMPACT project was that increased educational achievement and economic success can be achieved by aligning degree pathways and learning opportunities with "real world" work opportunities in collaboration with industry partners. The three strategies of the project consistently highlighted relationships among the students, the college, and industry partners. We conclude by addressing the ways in which this project demonstrates the impact of employer engagement in achieving student success and increased employment and wages.

College programs need to be "closely connected to regional labor market demands" and "sharply" focused on graduating students with the skills required for jobs in regional economies (Symonds, Schwartz, & Ferguson, 2011, p. 28). Partnerships and collaboration between institutions and employers are viewed as essential to targeting these technical skill gaps. Reforms need to be "connected and aligned as part of a clearly planned and carefully designed" system.

Experience gained through guided practice at a workplace, where customer and management expectations determine success, allows students the opportunity to demonstrate soft skills in the real world. Furthermore, in technical programs at the two-year college level, intentionally designed work-based learning opportunities that cultivate environments for practice can provide *continuous* collaboration between educators and business and industry, alleviating concerns about curricula of "low quality and relevance to the needs of those stakeholders" (Albashiry, Voogt & Pieters, 2015, p. 2). Industry stakeholders consulted in developmental stages of a new program can foster continuous, meaningful collaboration.

The three main parties involved in any work-based learning are the student, the organization or employer (with a site supervisor as a point of contact), and the educational institution (with an academic supervisor as the point of contact). An inclusive list of benefits associated with work-based learning opportunities for each party compiled by Weible (2009) describes student benefits as higher starting salaries and job satisfaction, more (and earlier) job offers, higher extrinsic success, development of communication skills, and better interviewing and networking skills. The compilation of employer benefits included an increased likelihood of filling a position with their top applicant, generation of new ideas, building partnerships with colleges, community involvement and service, and part-time help. Lastly, Weible identifies benefits for the college as improved reputation, community partnerships, external curriculum assessment, and professional input.

Figure 6.1: IMPACT Strategies



Curricular Alignment & Delivery

From the initial stages of preparing to apply for this TAACCCT grant, the GCTC staff actively engaged in working with local employers to develop the identified pathways. This engagement was demonstrated in the ways that the existing programs were revised and enhanced; however, the most marked engagement occurred with the new certifications. In survey responses, interviews, and in comments reported by staff, employers applauded the programming that directly met their needs. Additionally, where the college worked closely to understand and align with industry certifications and licensing, employers took note. Alignment of curricular delivery with industry work calendars still requires attention. Despite including online learning to meet busy adults' schedules, most F2F classes are still only offered during the day and during the regular academic year. Competency based education and just-in-time programming (such as that provided through KCTCS Learn-on-Demand) can address students' and employers' need for training to match the workplace schedules (rather than the traditional college schedules); however financial aid and accreditation issues complicate these initiatives.

Student Development

Successful completion of a well-designed curriculum takes student support. A quiet success of IMPACT can be found in its student support activities. In addition to the direct advising for students interested in work-based learning described below, the development of purposefully designed orientation sessions and proactive advising helped participants contextualize the commitment they were making to becoming

students within the larger picture of their potential as lifelong learners within the workforce, thus increasing what Drewery et al (2016) refer to as vocational self-concept. The staff and faculty institutionalized the practice of reaching out to students with encouragement and information for next steps, even if the students did not know what to ask (Bettinger, 2011; Karp, 2011) . They also pushed students to set goals. Clear advising documentation shown in the marketing materials and pathway maps helped students with this contextualization. Evidence of this support can be found in the larger number of credits and increased number of credentials earned by participants.

The student support provided by staff for successful course completion and retention at GCTC did not occur in isolation from the classroom or workplace. The IMPACT project structure of internal and external advisory committees resulted in greater awareness by all staff members of the larger picture of workforce development. Thus IMPACT faculty and staff were aware of outreach to employers and outreach staff was aware of changes or events in the classroom. Although the project had less intensive communications in the second half of the grant, feedback from outreach to the classroom was sustained. The holistic nature of the project's student service efforts, however, and the low staff to student ratios for advising and career counseling takes a great deal of institutional resources; and, most of the staff positions in this area have been removed or reassigned at the end of grant activity. Sustaining the lessons learned from the team-based project management approach used by the grant might mitigate this loss in student-centered staffing.

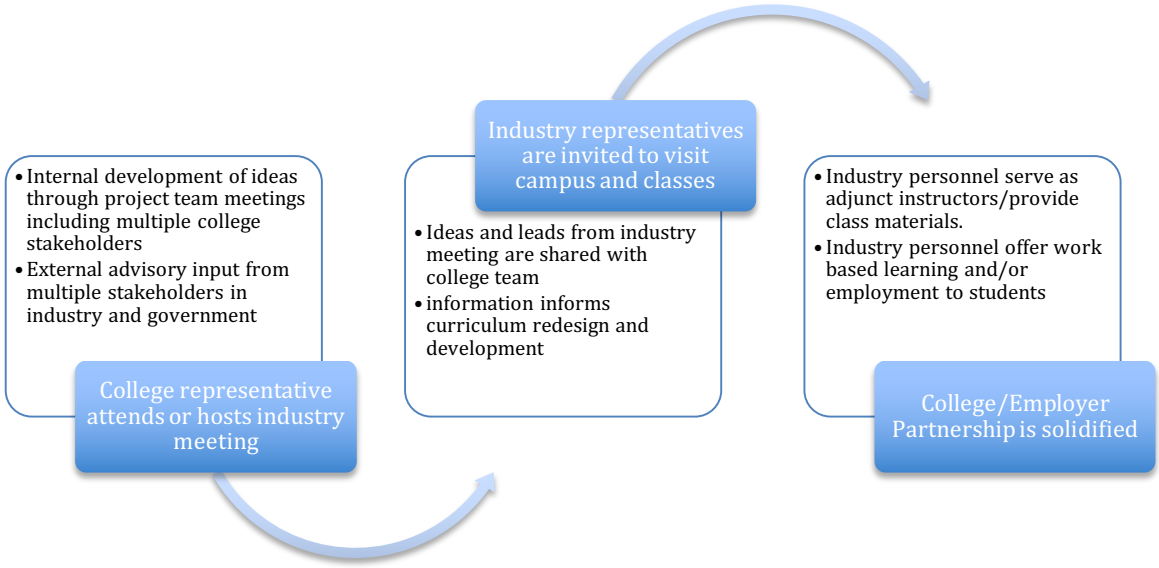
Work-Based Learning

Raising the percentage of experiential learning is one of ten goals in the KCTCS 2016-2022 strategic plan and a specific objective of the Gateway team (KCTCS, 2016). IMPACT staff repeatedly surpassed their project goal of at least three work-based learning experiences per semester in any targeted career program area. The Coordinator of Work Experience worked one-on-one with companies to get job descriptions, through emails, phone calls and meetings. He then used these job descriptions when visiting classes to recruit students to enroll in co-op experiences. The co-op program not only grew in enrollments, it also became more noticeable on campus as shown by a new award category for co-op students in the GCTC annual award event. Commenting on one of the IMPACT co-op students who won the award, a representative from Diversified Structural Composites told the staff he wished he could 3 more employees just like him!

Maximizing Partnerships

The following graphic illustrates the synergy between the internal and external stakeholders that underlies project statements such as: "Worked with Union (Int'l Brotherhood of Electrical Workers) to finalize Electrical Technology career pathway". Statements like this imply a whole series of interactions that eventually influenced student experiences. For example, as the result of ideas raised in project team meetings, a GCTC staff might attend an industry event. This action may result in the GCTC staff member inviting an employer for a campus tour. That tour may turn into a co-op experience for a student or a guest lecture. And that interaction might lead to a job placement or an agreement for an employer to offer tuition reimbursement. There are numerous examples of this synergistic process occurring within the IMPACT project. Without the infrastructure of inter-departmental team meetings and external advisory boards; however, this synergy might be lost.

Figure 6.2: Maximizing Partnerships through Internal and External Communication



Credentials and Certifications

A final piece of the IMPACT story is the relationship between academic credentials and industry certificates. A college is largely defined by the academic credentials it offers; however, community and technical colleges are also home to myriad certifications and diplomas that may or may not be credit bearing and may or may not lead to an advanced degree. The IMPACT project purposefully worked to align both non-credit opportunities as well as new and existing credentials into clear pathways to an AAS and potentially to a baccalaureate.

The process was bidirectional. What also occurred was recognition on the part of the college of the relevance of those certifications that are awarded and supported externally by the targeted industries. Industry certifications are often offered in sectors outside of post-secondary education or on-the-job (e.g. automotive certification), but certificates count (Complete College America, 2010). In some cases they are offered in partnership with college workforce development divisions, but separate from the academic enterprise. By partnering with industry to incorporate such certifications into the pathway process, GCTC provides more students entry to more advanced study and simultaneously updates the relevancy of its technical curriculum. Students also benefit from soft skill development and career planning incorporated in the pathways through student support services (Burnstein, 2014).

Thus by developing relationships with organizations such as the Northern Kentucky Industry Partnership to identify the target areas for development in this grant and then continuing to nurture relationships with other area organizations such as the tri-state Partners for a Competitive Workforce, the grant team worked to maximize opportunities for its students. Industry specific partnerships such as that with the Supply Chain Council and the International Brotherhood of Electrical Workers led to finely tuned and accelerated academic pathways to careers including co-op experiences and employer support of tuition for incumbent workers.

Sustainability

Relationships take time. High contact student services require intensive staffing. Consistent and sustained outreach to a wide variety of employers in a diverse array of industries also requires an investment in human resources. Project IMPACT demonstrates that **a team approach** that creates a synergy between internal and external stakeholders is beneficial to student outcomes. Sustaining this institutional infrastructure for employer engagement and work-based learning opportunities is strongly recommended. Furthermore, the college must be vigilant to sustain the relevancy of the enhanced curriculum and continue to seek ways to provide competency based programming that meets students and employers scheduling needs. Sustaining processes for capturing student enrollment and employment data as well as continuing to solicit feedback from employers will assist the college in monitoring the efficacy of these programs in the future.

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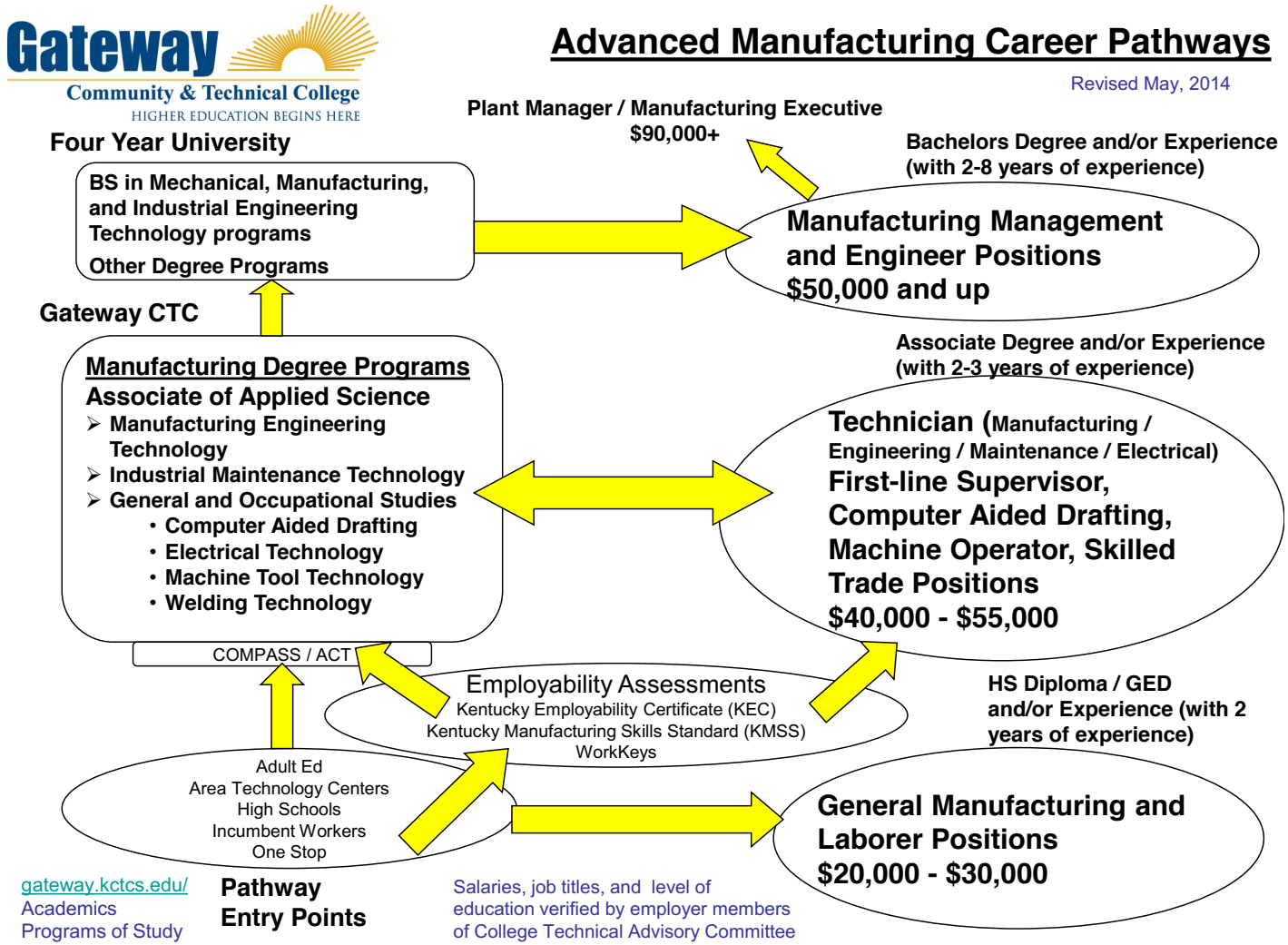
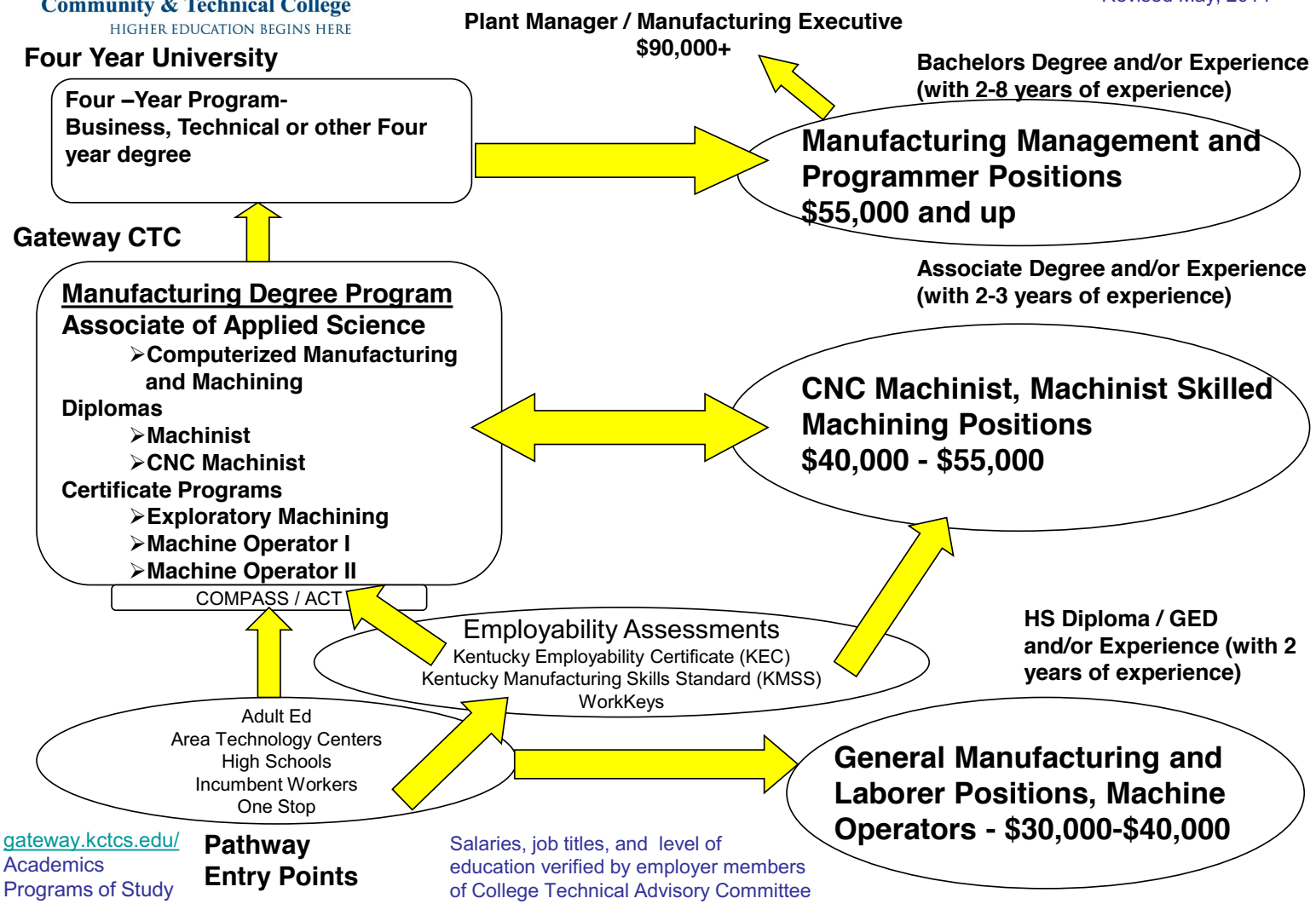
Appendix A: Pathways Maps



Gateway Community & Technical College
HIGHER EDUCATION BEGINS HERE

Computerized MFG and Machining Careers Pathway

Revised May, 2014



gateway.kctcs.edu/
Academics
Programs of Study

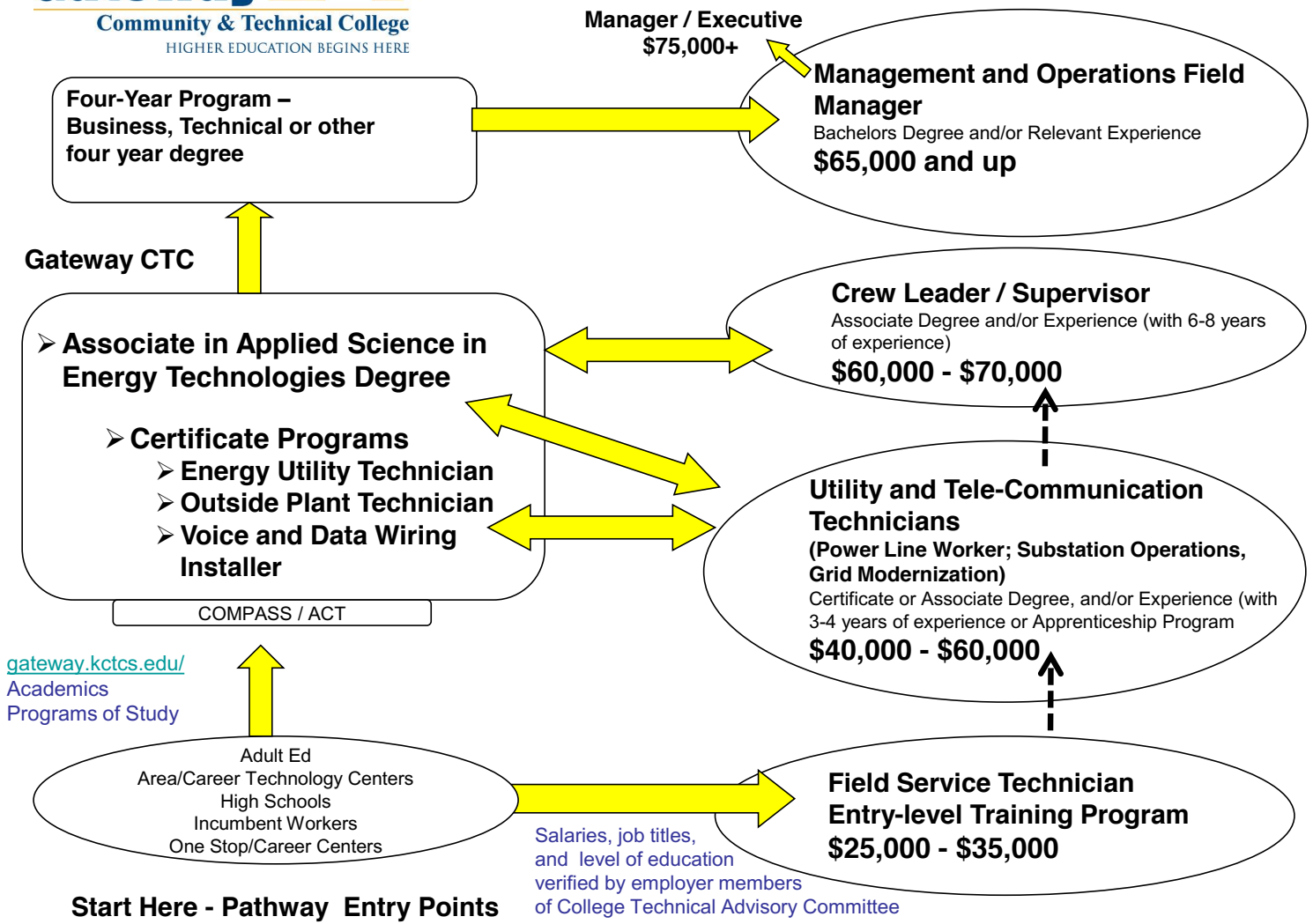
Pathway Entry Points

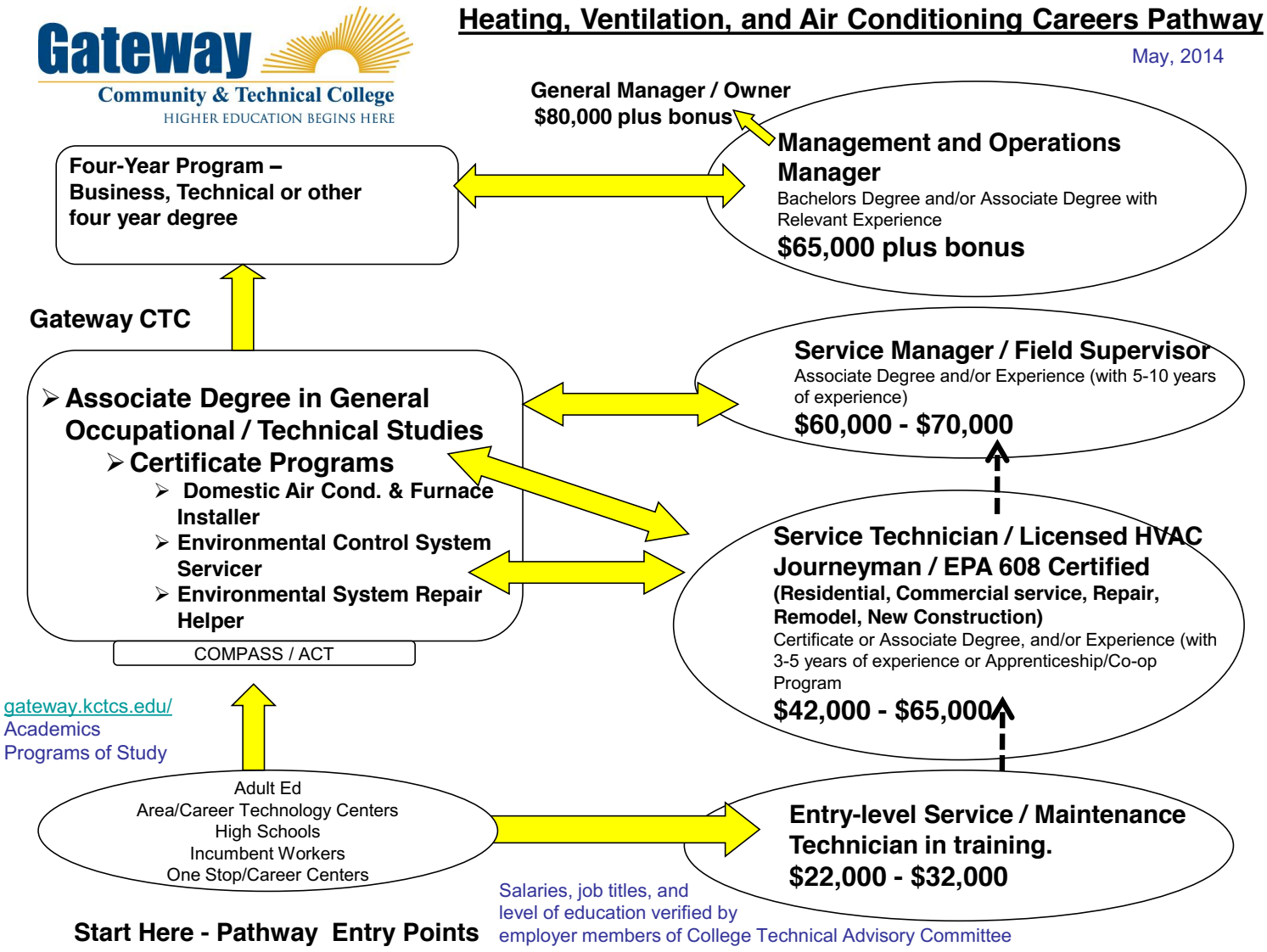
Salaries, job titles, and level of education verified by employer members of College Technical Advisory Committee

Gateway Community & Technical College
HIGHER EDUCATION BEGINS HERE

Energy Utility and Tele-Communications Careers Pathway

March, 2014

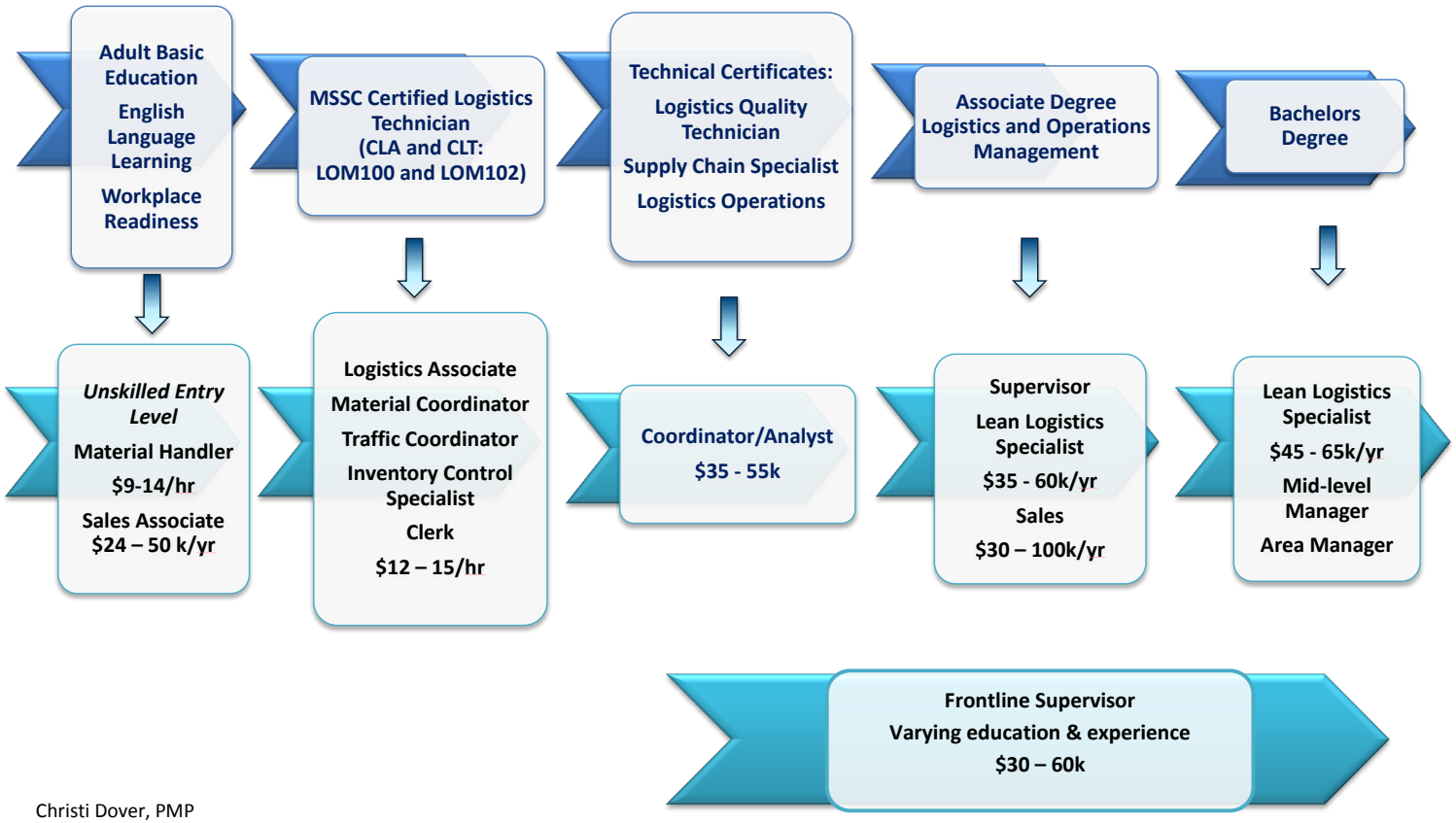



Gateway
Community & Technical College
HIGHER EDUCATION BEGINS HERE
Heating, Ventilation, and Air Conditioning Careers Pathway
May, 2014
General Manager / Owner
$80,000 plus bonus
Management and Operations Manager
Bachelors Degree and/or Associate Degree with Relevant Experience
$65,000 plus bonus
Four-Year Program – Business, Technical or other four year degree
Gateway CTC
Service Manager / Field Supervisor
Associate Degree and/or Experience (with 5-10 years of experience)
$60,000 - $70,000
Associate Degree in General Occupational / Technical Studies
Certificate Programs
Domestic Air Cond. & Furnace Installer
Environmental Control System Servicer
Environmental System Repair Helper
COMPASS / ACT
Service Technician / Licensed HVAC Journeyman / EPA 608 Certified
(Residential, Commercial service, Repair, Remodel, New Construction)
Certificate or Associate Degree, and/or Experience (with 3-5 years of experience or Apprenticeship/Co-op Program
$42,000 - $65,000
gateway.kctcs.edu/
Academics
Programs of Study
Adult Ed
Area/Career Technology Centers
High Schools
Incumbent Workers
One Stop/Career Centers
Entry-level Service / Maintenance Technician in training.
$22,000 - $32,000
Start Here - Pathway Entry Points
Salaries, job titles, and level of education verified by employer members of College Technical Advisory Committee

Gateway Community & Technical College | WORKFORCE SOLUTIONS
CUSTOMIZED EMPLOYEE TRAINING

Logistics Career Pathway Map

Spring 2014



Christi Dover, PMP
April 2014

Appendix B: Employer Engagement Survey

Q4 Thank you for agreeing to take part in this employer engagement survey. The purpose of this survey is to evaluate college-employer partnerships that have developed since the implementation of the Gateway IMPACT program, funded by a TAACCCT (Trade Adjustment Assistance Community College and Career Training) grant awarded to Gateway Community & Technical College by the U.S. Department of Labor. This survey will ask for information about what contact you have had with Gateway, as well as inquire about your own employment needs, as a way to determine what has already been accomplished through your partnership and what still can be enhanced in the program to best meet your needs in the labor market.If you have any questions about this survey, you may contact the evaluator, Dr. Jane Jensen, at jjensen@uky.edu.

Q3 Employment Industry Needs of Company: (check all that apply)

- ❑ Logistics/Shipping (1)
- ❑ Electrical Technology (2)
- ❑ Welding (3)
- ❑ Energy Technology (4)
- ❑ Communications Technology (5)
- ❑ Computerized Machining (6)
- ❑ HVAC (7)
- ❑ Industrial Maintenance (8)
- ❑ Manufacturing Engineering (9)
- ❑ CDL (10)

Q35 The following questions specifically refer to your partnership with the college.

Q39 What type of contact have you had with Gateway Community & Technical College in the past six (6) months regarding the IMPACT Advanced Manufacturing program?

	Never (1)	1-2 times (2)	3-4 times (3)	5+ times (4)
I talked to staff and faculty about courses offered (1)	❍	❍	❍	❍
Program staff visited my office or business (2)	❍	❍	❍	❍
I invited staff and faculty to talk to my employees (3)	❍	❍	❍	❍
I talked to staff and faculty about job opportunities in my company (4)	❍	❍	❍	❍
I called or emailed staff and faculty to get more information (5)	❍	❍	❍	❍
I received information about the program to share with my employees (6)	❍	❍	❍	❍
Staff and faculty called or emailed me (7)	❍	❍	❍	❍

Q33 Which of the following is true of your company's relationship with Gateway?

- ❑ Hired students (1)
- ❑ Provided co-ops/apprenticeships for students (2)
- ❑ Spoken to students in classrooms (3)
- ❑ Visited the Gateway campus (4)

Q34 How familiar are you with the following programs at Gateway?

	Not Familiar (1)	Somewhat Familiar (2)	Very Familiar (3)	Not Applicable to my Company (4)
Manufacturing Engineering Technology (1)	❍	❍	❍	❍
Welding Technology (2)	❍	❍	❍	❍
Computerized Manufacturing and Machining (3)	❍	❍	❍	❍
HVAC (4)	❍	❍	❍	❍
Industrial Maintenance (5)	❍	❍	❍	❍
Energy Technologies (6)	❍	❍	❍	❍
Electrical Technology (7)	❍	❍	❍	❍
CDL (8)	❍	❍	❍	❍
Supply Chain Management (9)	❍	❍	❍	❍

Q41 Please indicate whether you agree or disagree with the following statements:

	Strongly Disagree (1)	Disagree (2)	Neither Agree nor Disagree (3)	Agree (4)	Strongly Agree (5)
Gateway meets employer needs in Kentucky. (1)	❍	❍	❍	❍	❍
In looking for new employees, I would contact Gateway for student referrals. (2)	❍	❍	❍	❍	❍
I would contact Gateway for training opportunities for my current employees. (3)	❍	❍	❍	❍	❍
I would like the opportunity to talk to students in the classroom about job opportunities. (4)	❍	❍	❍	❍	❍
I am interested in working with Gateway to provide co-ops and apprenticeships to students. (5)	❍	❍	❍	❍	❍
I am familiar with the programs offered at Gateway. (6)	❍	❍	❍	❍	❍

Q29 What classes, certifications, or courses would you like to see Gateway Community & Technical College provide?

Q6 Addressing on-going (short-term) recruitment for your company. Your answers to the following will help to determine to what extent the programs at Gateway match your current workforce needs.

Q5 Please list the MOST critical job position that you have an on-going need to hire. (Job Title, Duties)

Q7 What is the level of this position? (check all that apply)
- ❑ Co-op/Apprentice (1)
- ❑ Entry (2)
- ❑ Office (3)
- ❑ Professional (4)
- ❑ Mid-Level (5)
- ❑ Management (6)
- ❑ N/A (7)

Q8 Is this position: (check all that apply)
- ❑ Full time (1)
- ❑ Part time (2)
- ❑ Temporary (3)
- ❑ On-Call (4)
- ❑ N/A (5)
- ❑ Other: (please specify) (6) _____

Q9 Please list the skills needed for this position.

Q10 Please list the certifications and/or affiliations needed for this position. (Certificate, Associates, Bachelors; NOCTI Precision Machining, CDL, BICSI - ITS Installer I, Installer 2, Copper, Optical Fiber, KY Standard Journeyman Electrician, OSHA 10 and 30, KY HVAC Journeyman, BPI Building Analyst/Building Envelope, FOA, Fiber Outside Plant, Fiber to the Home, MSSC CLA and CLT, MSSC CPT, NOCTI Manufacturing, AWS)

Q11 Are you currently hiring for this position?
- ❍ Yes (1)
- ❍ No (2)

Q12 If No, why not?
- ❑ In process of posting position (1)
- ❑ No qualified applicants (2)
- ❑ Waiting for funding (3)
- ❑ Other: (please specify) (4) _____

Q13 Do you have a SECOND MOST critical job position that you have an on-going need to hire?

- ❍ Yes (1)
- ❍ No (2)

Q15 Please list the SECOND MOST critical job position that you have an on-going need to hire. (Job Title, Duties)

Q16 What is the level of this position? (check all that apply)

- ❑ Co-op/Apprentice (1)
- ❑ Entry (2)
- ❑ Office (3)
- ❑ Professional (4)
- ❑ Mid-Level (5)
- ❑ Management (6)
- ❑ N/A (7)

Q17 Is this position: (check all that apply)

- ❑ Full time (1)
- ❑ Part time (2)
- ❑ Temporary (3)
- ❑ On-Call (4)
- ❑ N/A (5)
- ❑ Other: (please specify) (6) _____

Q19 Please list the certifications and/or affiliations needed for this position. (Certificate, Associates, Bachelors; NOCTI Precision Machining, CDL, BICSI - ITS Installer I, Installer 2, Copper, Optical Fiber, KY Standard Journeyman Electrician, OSHA 10 and 30, KY HVAC Journeyman, BPI Building Analyst/Building Envelope, FOA, Fiber Outside Plant, Fiber to the Home, MSSC CLA and CLT, MSSC CPT, NOCTI Manufacturing, AWS)

Q18 Please list the skills needed for this position.

Q20 Are you currently hiring for this position?

- ❍ Yes (1)
- ❍ No (2)

Q21 If No, why not?

- ❑ In process of posting position (1)
- ❑ No qualified applicants (2)
- ❑ Waiting for funding (3)
- ❑ Other: (please specify) (4) _____

Q22 Anticipated (long term) job postings at your company in the next two to five years. These questions will allow the evaluation team to formulate longer-term recommendations for their program.

Q23 What anticipated job positions will you need in the next two (2) to five (5) years? (Job Title, Duties)

Q24 What skills will be required? (Job duties, special training, etc.)

Q25 What certifications and/or affiliations will be needed for this position? (Certificate, Associates, Bachelors; NOCTI Precision Machining, CDL, BICSI - ITS Installer I, Installer 2, Copper, Optical Fiber, KY Standard Journeyman Electrician, OSHA 10 and 30, KY HVAC Journeyman, BPI Building Analyst/Building Envelope, FOA, Fiber Outside Plant, Fiber to the Home, MSSC CLA and CLT, MSSC CPT, NOCTI Manufacturing, AWS)

Q26 Do you see any persistent skills gaps in the workforce?

- ❍ Yes (1)
- ❍ No (2)

Q27 If you answered "Yes", what are the gaps and for what position?

Q28 What are your workforce skills and/or training needs?

- ❑ Professional development courses (1)
- ❑ Certifications (2)
- ❑ Certificate degrees (3)
- ❑ Associates degrees (4)
- ❑ Bachelor degree or higher (5)
- ❑ Licensure (6)
- ❑ Continuing education credits (7)
- ❑ Other: (please specify) (8) _____

Q37 Thank you for completing the survey. May we contact you after this survey for additional follow up or to schedule a focus group with your company? If so, please provide your email address and/or phone number below.

Email (1)

Phone (2)

Q34 If you have any additional comments, please enter them below.

Appendix C: New Supply Chain Management Credentials

Supply Chain Management

Student Name _____

Enrollment Date _____ **Academic Year** _____

Emplid _____ **Scores:** **Math** _____
Reading _____
Writing _____

CERTIFICATE – SUPPLY CHAIN MANAGEMENT: 15 Total Credit Hours

	Required Scores: Pre-Alg-none / Reading-70 / Writing–none	Cr Hr	Grade
	CIT 105 Introduction to Computers (or OST 105) *Prereq: RDG 20 or Consent of Instructor*	3	
	LOM 100 Introduction to Logistics Management *No prerequisite*	3	
	LOM 102 Supply Chain Management *Prereq: LOM 100*	3	
	LOM 210 Lean for Logistics *Prereq or Coreq: LOM 100*	3	
	OST 235 Business Communications Technology (or COM 252) *Prereq: (ENG 101 or OST 108) and (CIT 105 or OST 105)*	3	

CERTIFICATE – LOGISTICS QUALITY TECHNICIAN: 21 Total Credit Hours

	Required Scores: Pre-Alg - none / Reading - 80 / Writing – 64	Cr Hr	Grade
	CIT 105 Introduction to Computers (or OST 105) *Prereq: RDG 20 or Consent of Instructor*	3	
	LOM 100 Introduction to Logistics Management *No prerequisite*	3	
	LOM 102 Supply Chain Management *Prereq: LOM 100*	3	
	LOM 210 Lean for Logistics *Prereq or Coreq: LOM 100*	3	
	OST 235 Business Communications Technology (or COM 252) *Prereq: (ENG 101 or OST 108) and (CIT 105 or OST 105)*	3	
	QMS 101 Introduction to Quality Systems *No prerequisite*	3	
	QMS 251 Strategic Quality Planning *Prereq: QMS 101 or Consent of Instructor*	3	

CERTIFICATE – LOGISTICS OPERATIONS: 21 Total Credit Hours

	Required Scores: Algebra – 42 / Reading – 80 / Writing - 64	Cr Hr	Grade
	BAS 289 Operations Management *Prereq: BAS 160 or Consent of Instructor*	3	
	CIT 105 Introduction to Computers (or OST 105) *Prereq: RDG 20 or Consent of Instructor*	3	
	LOM 100 Introduction to Logistics Management *No prerequisite*	3	
	LOM 102 Supply Chain Management *Prereq: LOM 100*	3	
	LOM 210 Lean for Logistics *Prereq or Coreq: LOM 100*	3	
	OST 235 Business Communications Technology (or COM 252) *Prereq: (ENG 101 or OST 108) and (CIT 105 or OST 105)*	3	
	QMS 212 Project Management *Prereq: QMS 101 or Consent of Instructor*	3	

College Success Courses As Needed: *It is strongly recommended that students complete a college success course. If a student is advised into two or three developmental education courses, it is strongly recommended they enroll in the 3 credit hour college success course.*

	College Success Courses	Cr Hr
	GEN 100 Introduction to College *No prerequisite*	1
	GEN 102 Foundations of Learning *No prerequisite*	3

Developmental Courses: *Once students complete and pass a developmental course with a grade of 'C' or higher, they have the option of retesting or moving into the next level of developmental. Once students have completed and passed ALL levels of developmentals, they can be placed into General Education courses, including College Algebra, and are not required to retest.*

	Developmental Math		Cr Hr
	MT 010 – KYAE Math *Compass score 0-23 in Pre-Algebra*		0
	MT 50 – Developmental Math Workshop **MAT 65 – Basic Algebra** *Compass score 24-41 in Pre-Algebra* (or MAT 55)	AND	1-2 3
	MAT 65 – Basic Algebra *Compass score 16-30 in Algebra*		3
	MAT 85 – Intermediate Algebra *Compass score 31-35 in Algebra*		3
	MAT 100 – College Algebra Workshop *Compass score 36-49 in Algebra / ACT 19-21 - enroll concurrent in College Algebra (MAT 150)*		2
	Developmental Writing		
	EN 010 – KYAE English *Compass score 26-38*		0
	ENG 100 – English Workshop **ENG 101 – Writing I** *Compass score 39-73* (or ENC 91)	AND	2 3
	Developmental Reading		
	RD 010 – KYAE Reading *Compass score 49-69*		0
	RDG 100 – Reading Workshop **Pre-Selected General Education Course** *Compass score 70-82* (or RDG 30)	AND	2 3
	RDG 41 – Reading Laboratory *Compass score 83-84*		1

Supply Chain Management
REVISED 6/11/2015