WEST VIRGINIA *BRIDGING THE GAP*

TAACCCT ROUND 3
FINAL EVALUATION REPORT

SEPTEMBER 30, 2017

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THANK YOU

To the leadership of the *Bridging the Gap* project for your support and active engagement throughout the evaluation.

- Jim Skidmore, *Bridging the Gap* Consortium Grant Project Director
- Heather Raines, *Bridging the Gap* Consortium Operations and Communications Coordinator
- Mark Julian, TAACCCT Director of Workforce and Economic Development
- Briana Cicero-Johns, TAACCCT Data and Policy Analyst
- Susan Kuhn, Grant Finance Manager

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To Workforce West Virginia and the West Virginia Higher Education Policy Commission for providing data for the Impact Evaluation.

To the U.S. Department of Labor for financing this project and evaluation.

EXECUTIVE SUMMARY

WV BTG

Awarded in 2013, Bridgemont Community and Technical College (now BridgeValley Community and Technical College (CTC) – lead institution for the consortium)[1] received a $25,000,000 grant to support energy, advanced manufacturing, information technology, and construction trades through career pathways, enhanced academic instruction, and student support services. The nine community and technical colleges in the *Bridging the Gap* (BTG) consortium focused on grant areas such as technical programs, learning strategies, student support services, developmental education, student recruitment, and industry sector partnerships.[2]

Many of the programs that each BTG college focused on (within the four target industries), existed prior to the grant but required funding and investments for expansion and enhancement purposes. The remaining programs were developed at the colleges once the grant was awarded. Many of the facilities used to house these programs also existed prior to the grant, while other facilities were developed throughout the grant period to house these new technical programs. The funds provided by USDOL and investments made by community partners and the colleges made these expansions, enhancements, and new opportunities possible.

The existing foundation that many colleges had initially afforded leadership, staff, faculty, and instructors the opportunity to utilize and enhance existing curriculum used in the industry, expediting project start-up time. While project implementation was a lengthy process for the colleges due to the significant time required to launch a project such as BTG, the existing foundation that many colleges utilized provided the consortium with a framework from which to work.

Outreach and recruitment efforts began early in the grant for many colleges, aided by expedited project start-up time in some instances (see above), to increase awareness for the training programs. Individuals interested in BTG programs received support from peer coaches, advisors and counselors, faculty and instructors, and staff as they navigated initial assessment and placement, enrollment, and post-program experiences. The following page identifies the ways participants generally moved through BTG programs at the colleges (Figure 1).

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[1] Early in the grant, the two institutions – Bridgemont and Kanawha Valley merged to become BridgeValley Community and Technical College.
[2] BTG was designed based on USDOL-identified core elements, identified and defined in *Appendix A.*

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Figure 1: Participant Flow

Marketing and Recruitment	• **Marketing** through promotional materials, television ads, brochures, flyers, social media, presentations, local events, etc. • **Recruitment** through partnerships with local community partners (e.g., employers, workforce system, community organizations, and other organizations). • **Prior Learning Assessments** provided as option to potential students interested in receiving college credit for previous work experience, if eligible.
Enrollment and Assessment	• **Peer coaches** made first contact with potential students and assisted throughout enrollment, admissions, registration, and beyond. • Potential students completed college-wide and/or program-specific **assessments and placement tests** (e.g., Accuplacer). • Students met with advisor, peer coaches, and/or instructors to discuss **career pathways**. • **Co-requisite model** enabled students who required remedial assistance (following low scores on assessments) to get the support they needed without losing time in developmental education courses. These students enrolled in credit-bearing courses at the same time as they received support (e.g., through tutors).
Programs and Services	BTG focused on the following sectors, with specific programs developed around these sectors. Innovative learning strategies were utilized to facilitate program completion and success (e.g., online, hybrid, simulated, and blended). **BTG Industry Sectors** • Advanced Manufacturing • Energy • Construction • Information Technology **Support services available to students included the following:** • Peer coaches met with students frequently throughout program enrollment • Counselors/Advisors utilized intrusive advising model to assist with program advancement and career services. Guided Pathways to Success model provided advisors with information to encourage students down a path toward a career, facilitating completion and success • Support services offered through the college were utilized by BTG students (e.g., mental health counseling) • Internships and Learn-and-Earn opportunities were available
Employment and Continuing Education	Students typically took one of two paths: • **Obtain employment** in the industry through partnerships colleges established with local employers for hiring commitments, donations, Learn-and-Earn, and internships. • **Continue education** to four-year institution through transfer and articulation agreements established with the colleges and other universities in the region.

In addition to participant services and training, the BTG consortium also implemented the following:

- Consortium-wide data analytics and predictive analysis software – Blackboard Analytics[3]
- BEACON model to peer coaching providing a one-on-one approach to advising

Each element of BTG worked together to increase awareness of, and access to, career and training programs in four key industries in West Virginia.

PROGRAM EVALUATION

The West Virginia Community and Technical College System (WVCTCS) contracted with Thomas P. Miller & Associates, LLC (TPMA) to serve as an independent, third-party evaluator. TPMA, together with The Policy & Research Group (PRG), comprised the Evaluation Team. The evaluation's primary purpose was to assess the planning, implementation, and effectiveness of the intervention. The evaluation itself consisted of two components discussed below.[4]

Implementation Evaluation

The Implementation Evaluation began October 2013 and continued through March 2017, to document program progress, monitor program outcomes, and provide recommendations for continuous improvement of program operations. The Implementation Evaluation primarily focused on the training provided by the community and technical colleges within BTG, but also evaluated progress of all grant-funded components. A series of research questions guided the Implementation Evaluation (see *Appendix C*) and explored the development of BTG programs, employing principles of a utilization-focused framework. The Implementation Evaluation was primarily qualitative, including conference calls, phone and in-person interviews, document reviews, and survey data;[5] and can be described in two parts – the formative, or ongoing analysis of the program, and the summative, or the final, cumulative program analysis. A general inductive thematic approach, with influences of applied phenomenology, was used to analyze the data gathered throughout the Implementation Evaluation.

Impact Evaluation

The purpose of the Impact Evaluation was to assess whether the implementation of grant-funded programs at BTG colleges improved student persistence, completion, and short-term employment outcomes using a quasi-experimental design. A series of research questions guided the Impact Evaluation and can be found in *Appendix D*. This design compared grant-funded, BTG-enrolled students at each college with a group of students who enrolled in the same programs (at the same college) before the programs received grant funding. The programs that were assessed in the Impact Evaluation fell in the four target industry sections – Advanced Manufacturing, Energy, Construction, and Information Technology. The Impact Evaluation included students who enrolled in BTG programs from January 1, 2014 through July 31, 2016 and students who enrolled in comparison programs from January 1, 2012 through July 31, 2014.

This Final Evaluation Report provides USDOL with evidence-based findings and lessons learned from BTG, giving insight for future funding and program scaling decisions.

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[3] A more detailed evaluation was conducted to examine the implementation of Blackboard Analytics across the consortium. For more information, see *Appendix B*.

[4] For a detailed description of the methods used in this evaluation, see *Appendix C* and *Appendix D*.

[5] Survey data was gathered from an add-on evaluation examining the use, implementation, and satisfaction with the new, system-wide data analytics system – Blackboard Analytics. Results from this analysis are located in *Appendix B*.

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SUMMARY OF EVALUATION FINDINGS

Between October 2013 and March 2017, BTG colleges developed and implemented a project designed to increase the number of qualified, employable candidates in four key industries – Advanced Manufacturing, Energy, Construction, and Information Technology – by providing them with enhanced academic instruction and student support services.

Themes of Successes

Important themes around BTG success include:

Flexibility

BTG was designed to be flexible, to allow for adaptation in a variety of educational structures, for employer needs, participant skill level and needs, and support methods. BTG was able to implement programs that were flexible and accessible to students through innovative learning strategies (e.g., block scheduling, acceleration, and remote, simulated, and online learning), comprehensive support services, and programs aligned with industry needs. With the flexible structure, modifications were made to employer communication strategies, recruitment approaches, and program structures to better meet the needs of participants and the local economy. BTG staff and instructors leveraged this flexible approach to refine grant components throughout the grant period.

Innovation

BTG's most significant objectives were to implement enhanced technical programs, support services, and engagement approaches to provide ample opportunities for student success. Because BTG targeted non-traditional students with barriers to education, their needs required innovative strategies that empowered students to obtain credentials, certificates, and degrees that lead to employment or advancement. BTG staff and instructors emphasized that this model enabled students to enroll and complete programs that they would not have otherwise, in a shorter amount of time. With the implementation and success of BTG, colleges anticipate expansion of grant components moving forward.

Partner Investments and Engagement

Partner investments and engagement with employers, community organizations, educational institutions, high schools and high school programs, and among the BTG colleges enabled BTG colleges to enhance and expand programs. Through the investments made and level of engagement, BTG colleges were able to purchase up-to-date equipment, hire personnel, enhance existing curriculum and develop new curriculum (and receive feedback from employers), build technology centers, and offer students work opportunities through apprenticeships and internships. Without these investments and partnerships, including the award of the USDOL TAACCCT grant, BTG would not have been able to provide the competitive training in the four target industry sectors (Advanced Manufacturing, Construction, Information Technology, and Energy) that are currently offered.

Data Availability

One success of the BTG evaluation was the cooperation with state organizations in securing data use agreements and gaining access to individual-level data for the Impact Evaluation. Often, impact studies like this are not possible due to the lack of available, individual-level data. Both the West Virginia Higher Education Policy Commission (WVHEPC) and WorkForce WV were cooperative and timely with providing data that allowed the impact study to be conducted. WVHEPC provided student administrative data for the study and Workforce WV provided unemployment insurance wage data.

Themes of Challenges

Helpful background around BTG challenges include:

Grant Structure

Throughout the course of the grant, the structure of the grant (e.g., timeline, definitions of success and completion, and communication plans) created a number of challenges in implementation. The timeline of the grant (i.e., two-year implementation phase) resulted in lower completion rates, according to grant staff. Longer timeframes for implementation could have given the student population more time to complete programs. The Evaluation Team was only able to measure the effects of programming over a short period. If they exist, completion and employment effects resulting from programs such as those in BTG would be expected to increase over time. For this evaluation, however, the Evaluation Team was constrained to a relatively narrow window in which to observe the potential benefits of programming. As a result, the Impact Evaluation might not encompass all of the effects of programming on student outcomes. Only those students who enrolled in their programs in the first semester of their respective study window had two years (six semesters) to achieve academic outcomes and one quarter to achieve employment outcomes. Most students in this study had much less time. A longer study period with more time post-college exit would have likely permitted more students to graduate and others to fully realize the benefits of their education. For more information, see the *Impact Evaluation* section.

With this, BTG staff and instructors reported challenges in student retention as students would leave programs once obtaining a credential as they needed employment (e.g., to support their families). Finally, communication regarding grant definitions, requirements, and regulations was disjointed, according to BTG leadership, staff, and WVCTCS leadership. Because of this, implementation was hindered in some cases (e.g., staff could not purchase equipment until budget modifications were approved).

Sustainability

BTG colleges indicated concerns with sustainability throughout the grant period. Because the grant facilitated such a drastic change in college processes, new staff were hired to help implement BTG. However, colleges reported challenges in maintaining staff after the grant period due to the colleges' low budgets and statewide budget cuts. Grant components such as peer coaches were typically not sustained as programs and instructors were prioritized. While the colleges anticipated sustaining many of the grant components, BTG staff reported ongoing concerns with grant sustainability.

BEYOND THE GRANT

Lasting Effects

One of the many findings within this evaluation report is projects like BTG take time to design, coordinate, implement, re-examine, and improve upon. In the early stages of BTG, success and progress had been made toward increasing relevant and employable educational offerings in the Advanced Manufacturing, Construction, Energy, and Information Technology industries. As the grant period concludes, BTG leadership at each institution are sustaining current programs and continuing to pursue partnerships and other expansion opportunities (e.g., funding, institution-level commitment, etc.) to continue growing BTG programs and services. Effects of BTG are anticipated to continue through the end of the grant and beyond,[6] including:

- Sustaining training programs, consortium-wide initiatives (e.g., co-requisite model,[7] Sector Strategies,[8] Guided Pathways to Success,[9] and prior learning assessments), services that were expanded through the grant (e.g., peer coaches, advising models, etc.), and exploring implementation of other initiatives beyond the grant (e.g., Blackboard Analytics).[10]
- Establishing additional partnerships with community partners for donations; funding; equipment; internship, apprenticeship, and Learn-and-Earn opportunities; hiring and interviewing commitments; and engagement in curriculum and program development/modifications to ensure that programs continue to meet employer needs. The best practices and strategies drawn from this grant will likely be sustained moving forward.
- Ongoing collaboration between the community and technical colleges within the BTG consortium. Throughout the grant, colleges shared resources, information, and curricula, and will continue to do so beyond the grant.
- Continuing modifications and improvements to current training program curriculum as well as potential addition of programs for some institutions.

Through the funding provided by USDOL, donations made by employers, and investments made by other partners, the community and technical colleges were able to successfully implement the BTG project and solidify a framework for future success and growth.

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[6] Training funds ended in March 2017 and all other funding ends in September 2017.

[7] For more information, please see: http://www.completecollege.org/docs/CCA%20Co-Req%20Model%20-%20Transform%20Remediation%20for%20Chicago%20final%281%29.pdf

[8] For more information, please see: www.wvedc.org/assets/images/headers/WVEDC_Leg_2015_-_M_Julian.ppt

[9] Guided Pathways to Success is an initiative of Complete College America to provide students with guidance to complete programs efficiently. For more information, please see: http://doingwhatmatters.cccco.edu/Portals/6/docs/Building%20Guided%20Pathways%20to%20Success%20-%20EAB%20Report%20FINAL.pdf

[10] Some institutions indicated a need to remove components (e.g., peer coaches) but the impact and best practices drawn from those areas would continue beyond the grant.

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Replication Strategies

Throughout the grant, BTG leadership, staff, faculty, and instructors identified recommendations for an educational institution considering implementing a grant project similar to that of BTG. These recommendations, at a high level, included:[11]

Remain Flexible – The needs of employers and students can change as the grant moves forward, so remaining flexible is critical in grant implementation. Staff should be aware of in-demand occupations and job areas throughout the project to ensure sustainability and success of programs.

Focus on Sustainability – An early focus on sustainability enables staff to consider sustainable practices when making decisions regarding program development and implementation through development of program goals (i.e., enrollment and revenue). Setting sustainability goals early in the grant facilitates staff accountability and provides tangible goals to work toward. Challenges meeting these goals can then prompt adjustments needed for long-term success.

Early Planning – Implementing a grant project requires coordination of a number of different stakeholders/audiences including, but not limited to, project stakeholders, project leadership, project support staff, and project oversight (in BTG's case, the West Virginia Community and Technical College System (WVCTCS)). These individuals must have an understanding of grant requirements, definitions, terminology, expectations, and timelines to ensure success in the project. Ensuring these stakeholders/audiences are in place early in the grant and understand their roles, responsibilities, and expectations is critical to successful implementation.

Consider Innovative Delivery Models – Consider the best delivery methods for the college's student body. For some BTG non-traditional students, blended learning models better addressed student needs than traditional instruction (i.e., lecture style). However, other students respond well to lecture-style courses as they may require additional instructor assistance. Being mindful of different delivery models and how they best fit the students' needs is critical to success.

Engage the Community – Recognizing potential partners in the community (e.g., city councils, employers, workforce systems, and other organizations) can be beneficial in generating community buy-in for educational programs, aiding in student enrollment, program development, and sustainability (e.g., through financial assistance). Establishing these partnerships early in the grant affords community partners the opportunity to participate in program design, development, and implementation, which can increase investment in the programs (i.e., increased investment through stronger participation).

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[11] For more detailed findings, see *Future Program Implementation* section below.

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Future Research

A review of study findings and study limitations suggests several avenues for future research. The Evaluation Team has identified four areas where further research may yield greater insight into the effects of the TAACCCT-funded community college programs. These are:

1) Whether a longer post-program observational window would reveal impacts of greater magnitude;
2) Whether impacts on intermediate credentials (if data were available) could help explain the apparently countervailing effects on persistence and completion outcomes;
3) To conduct an exploratory analysis that further investigates the possibility that the BTG programs may have increased wages for a sub-group of participating students; and
4) To explore why the estimates for wage growth and probability of employment were of differing magnitudes.

While exploring additional research in the field of technical education, it is recommended that additional exploration on the use of a mixed-methods approach be conducted, especially regarding its usefulness in large-scale grant projects. Key information gathered through the formative Implementation Evaluation in this study was used to inform the Impact Evaluation design.[12] Understanding real-time changes to the program model allowed for increased relevance and applicability of design for impact-related analyses. However, in order to implement a successful mixed-methods strategy, a significant amount of time is required to collect data from both the implementation and impact analyses.[13] Future researchers could examine the effectiveness of this approach in greater depth, over a longer period, potentially yielding more conclusive evidence on whether this approach is the best suited for large-scale, grant-funded projects.

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[12] See the *Informing Impact Evaluation* section for more information.

[13]Creswell, J. (2009). Research design: Qualitative, quantitative, and mixed-methods approaches. SAGE: Thousand Oaks, CA. Retrieved by: http://www.ceil-conicet.gov.ar/wp-content/uploads/2015/10/Creswell-Cap-10.pdf

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# WV BTG

WEST VIRGINIA BRIDGING THE GAP

DESIGN SUMMARY

In 2013, Bridgemont Community and Technical College (now BridgeValley Community and Technical College (CTC) – lead institution for the *Bridging the Gap* consortium) received a $25,000,000 grant through the U.S. Department of Labor (USDOL) Trade Adjustment Assistance Community College and Career Training (TAACCCT) program to fund the West Virginia Community and Technical College System's (WVCTCS's) *Bridging the Gap* (BTG) project. The BTG project united nine community and technical colleges[14] with the goal of creating career pathways for four in-demand industries: energy, advanced manufacturing, information technology, and construction. The project sought to enhance academic instruction and bridge student support gaps throughout the WVCTCS, while creating a culture of continuous improvement.

The BTG project served nine community and technical colleges in West Virginia, which included: Blue Ridge Community and Technical College, BridgeValley Community and Technical College, Eastern West Virginia Community and Technical College, Mountwest Community and Technical College, New River Community and Technical College, Pierpont Community and Technical College, Southern West Virginia Community and Technical College, West Virginia Northern Community College, and West Virginia University at Parkersburg. See *Figure 2* for a map of these community and technical colleges as well as their satellite locations and campuses.[15]

Figure 2: BTG CTC Map

BTG's strategy for transforming education to decrease the skills gap in the workforce and more effectively meet the needs of Trade Adjustment Assistance (TAA)-eligible workers, non-traditional students, and employers in West Virginia involved a three-pronged approach. First, **enhanced and accelerated sector-driven career pathways** were developed to support favorable employment and wage outcomes for low-income, disadvantaged workers and job seekers. The consortium anticipated expanding certificate offerings within career pathways and accelerating credential attainment through prior learning assessments, program scheduling innovations (e.g., block scheduling), and overhauling developmental education. Second, **contextualized, online, blended, simulated, and remote academic instruction** were implemented through gateway and bridge courses;[16] apprenticeship, internship, and Learn-and-Earn opportunities; and capstone courses to demonstrate mastery of competencies. These academic instruction strategies were anticipated to increase retention, completion, and other outcomes (e.g., higher wages). Third, **student support strategies** were expanded and customized with a focus on student recruitment, college success courses, peer coaching, career planning, and data-driven decision-making to encourage retention and completion in programs.[17]   For this section, information was drawn from WVCTCS's original

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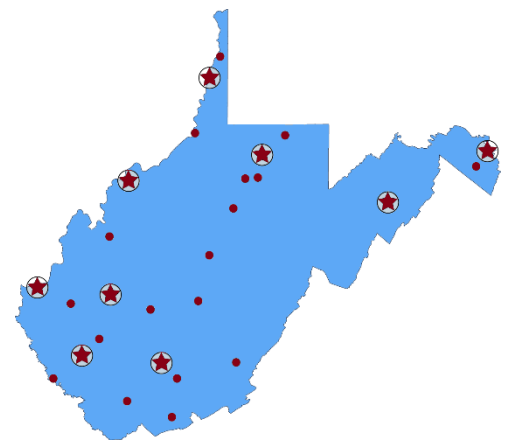
[14] During the initial phases of the grant, there were 10 community and technical colleges. However, Bridgemont and Kanawha Valley merged into one institution – BridgeValley – the lead institution for this grant.

[15] The map was drawn from www.wvctcs.org

[16] For purposes of this grant, gateway courses incorporated technical instruction consistent with I-BEST and other standards, while bridge courses were those that combined crosscutting technical skills sets.

[17] This information was drawn from the original grant narrative.

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grant narrative submitted to USDOL. In addition, the following sources were used to supplement the information gathered from the original grant narrative:

- Implementation evaluation update calls with the BTG colleges and WVCTCS leadership
- In-person interviews with BTG college leadership, staff, faculty and instructors, participants, WVCTCS leadership, and regional employers[18]
- BTG documents and artifacts, including quarterly program reports, program-related brochures and promotional materials, and other documents

The information from these data sources were combined to identify the project's scope, grant elements and activities, logic model, participant flow, and evidence base.

GRANT ELEMENTS AND ACTIVITIES

The core elements[19] of BTG were developed to build training and educational programs to meet industry needs. These elements, with associated activities explained within, included: (1) evidence-based design; (2) stacked and latticed credentials; (3) advanced online and technology-enabled learning; (4) transferability and articulation of credit; (5) strategic alignment; and (6) alignment with previously funded TAACCCT projects. For the progression and changes to these elements throughout the life of the project, see the *Program Changes* section.

Evidence-based design[20] – The primary objectives within this element were built around three strategies: career pathways, academic instruction, and student support services. The consortium worked to implement programs with **career pathways** in four key industries: Advanced Manufacturing, Energy, Construction, and Information Technology. Within these programs, certificate offerings were expanded to accelerate credential attainment through prior learning assessments, innovative program schedules (e.g., block scheduling), and revamped developmental education.

Within **academic instruction**, contextualization was expanded through gateway and bridge courses as well as apprenticeships, Learn-and-Earn, and capstone course opportunities to ensure students mastered competencies. Online, blended, remote and simulated instruction and learning techniques were used to increase retention and completion in programs.

Student support services were expanded through the grant and incorporated the BEACON model, which included utilization of peer coaches and professional counselors.[21] The purpose of the BEACON model was to provide students with one-on-one support through a peer coach (a student at the institution) and a counselor. These individuals not only guided students through their educational experience from enrollment through completion, but also served as a liaison between the college, instructors, and students. Efforts within the BEACON model included: targeted recruitment, career planning systems, course and retention analytics, and job placement

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[18] The Evaluation Team used purposive and convenience sampling for employer and participant interviews coordinated by BTG college leadership. See *Appendix C* for a discussion on various limitations to the study.
[19] The referred to "core elements" were drawn from the USDOL-issued Solicitation for Grant Applications document. See *Appendix A* for definitions.
[20] For more information regarding the project's evidence-based design, please see *Evidence Base* section.
[21] Additional details around the BEACON model are available through the following: http://www.mctc.edu/student-services/beacon-project/

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partnerships. These strategies provided students with 'wrap-around' services that helped remove practical barriers to enrollment, persistence, and completion.

Stacked and latticed credentials – In order to develop stacked and latticed credentials, two phases were implemented. In the first phase, led by WVCTCS, national, state, and regional employers and employer-driven organizations (e.g., Manufacturing Institute) were engaged to identify skillsets, programs, and credentials that were valuable to employers. With that feedback, in the second phase, a skills-mapping process was utilized to stack and lattice credentials across technical programs. Certifications were built into existing programs to offer industry-recognized incentives for students to complete programs, bridge courses were developed to modularize courses and combine crosscutting technical skillsets, and certificate degree offerings were expanded as a result of the career pathways realignment. The second phase continues beyond the grant for some institutions as they work to build certifications into programs and expand certificate degree offerings.

In addition, prior learning assessments (PLAs) were implemented to provide non-traditional students and other students with barriers to education with college credit for prior work experience. A web portal[22] was developed to increase usage of PLAs across the consortium and veteran-specific staff were hired at many institutions to simplify the PLA process for military veterans. Toward the end of the grant, an advising tool – Guided Pathways to Success[23] – was created to build roadmaps for student success. This tool enabled the colleges to target advising more appropriately, providing students with steps to complete their programs efficiently.

Advanced online and technology-enabled learning – Open source tools, simulations, remote, online, and blended course offerings were incorporated into gateway, bridge, and capstone courses. Course content was developed in a way that engaged students in rural communities, including those with barriers to education, and in a way that increased accessibility to technical programs. PLA tools were developed to provide students with college credit for previous work experience; and predictive and course analytics were implemented through use of Blackboard to ensure that high-risk students were identified as early as possible so interventions could be made promptly.[24]

Transferability and articulation of credit – Through this component, the consortium worked to (1) strengthen transitions from non-credit to credit-bearing credentials; (2) establish transferability of credit; and (3) establish articulation agreements. To facilitate the transition from non-credit to credit-bearing credentials, the consortium set parameters around the conversion – 15 hours of lecture-based instruction, 30 hours of laboratory instruction, or 160 hours of on-the-job training equated one college credit hour. Within and outside of the consortium, transferability agreements were established to enable students to change campuses without losing credits accrued at the time. Throughout the grant period, articulation agreements were set up with four-year institutions

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[22] https://www.stepupwv.com/#/

[23] Guided Pathways to Success is an initiative of Complete College America to provide students with guidance to complete programs efficiently. For more information, please see: http://doingwhatmatters.cccco.edu/Portals/6/docs/Building%20Guided%20Pathways%20to%20Success%20-%20EAB%20Report%20FINAL.pdf

[24] For some institutions, implementation of these components will continue beyond the grant or will not occur (e.g., implementation of Blackboard) due to capacity and finance challenges.

(e.g., West Virginia University) across the state to encourage continuing education to a higher degree.

Strategic alignment – During the initial design and implementation phases, a number of stakeholders were engaged and initiatives were referenced to develop the BTG project. For instance, the state's economic development and Governor's plans were referenced to finalize the target industries (e.g., Advanced Manufacturing) and structure/focus (e.g., improving developmental education) for this project. Employers, community partners, and the workforce system were also engaged for partnerships (e.g., apprenticeship and Learn-and-Earn opportunities) and referrals (e.g., TAA-eligible participants). The implementation of the statewide workforce development initiative – Sector Strategies – facilitated many of these relationships and encouraged colleges to rethink community engagement.[25] This initiative, partly grant funded, aligned with the goals of the TAACCCT grant and colleges coordinated these efforts to create stronger, more meaningful relationships with community members.

Alignment with previously funded TAACCCT projects – Strong engagement with Mountwest Community and Technical College's BEACON project (TAACCCT Round 1 awardee) was utilized throughout the grant period. Mountwest hosted a number of trainings and information sessions on the BEACON model, and held one-on-one meetings with individual BTG colleges to help them incorporate BEACON into their support service functionalities. All of the BTG colleges implemented the BEACON model in some capacity (e.g., some institutions utilized the full model, while others solely focused on hiring peer coaches or a position with similar responsibilities).

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[25] For more information, please see: www.wvedc.org/assets/images/headers/WVEDC_Leg_2015_-_M_Julian.ppt

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PARTICIPANT FLOW

For the BTG project, BTG leadership, staff, faculty, and instructors developed a series of marketing and outreach strategies designed to guide participants to BTG programs. Once enrolled, assessments and placement tests, diverse training program offerings, and a wide array of student support services were implemented to increase retention in programs and subsequent completion. Relationships and connections with employers and community partners as well as articulation and transfer agreements enabled participants to obtain employment or continue their education.

Figure 3 represents the marketing, outreach, assessment and placement, programs, and post-program opportunities for a participant going through a BTG program.

Figure 3: BTG Participant Flow

Marketing and Recruitment
- **Marketing** through promotional materials, television ads, brochures, flyers, social media, presentations, local events, etc.
- **Recruitment** through partnerships with local community partners (e.g., employers, workforce system, community organizations, and other organizations).
- **Prior Learning Assessments** provided as option to potential students interested in receiving college credit for previous work experience, if eligible.

Enrollment and Assessment
- **Peer coaches** made first contact with potential students and assisted throughout enrollment, admissions, registration, and beyond.
- Potential students completed college-wide and/or program-specific **assessments and placement tests** (e.g., Accuplacer).
- Students met with advisor, peer coaches, and/or instructors to discuss **career pathways**.
- **Co-requisite model** enabled students who required remedial assistance (following low scores on assessments) to get the support they needed without losing time in developmental education courses. These students enrolled in credit-bearing courses at the same time as they received support (e.g., through tutors).

Programs and Services

BTG focused on the following sectors, with specific programs developed around these sectors. Innovative learning strategies were utilized to facilitate program completion and success (e.g., online, hybrid, simulated, and blended).

BTG Industry Sectors
- Advanced Manufacturing
- Energy
- Construction
- Information Technology

Support services available to students included the following:
- Peer coaches met with students frequently throughout program enrollment
- Counselors/Advisors utilized intrusive advising model to assist with program advancement and career services. Guided Pathways to Success model provided advisors with information to encourage students down a path toward a career, facilitating completion and success
- Support services offered through the college were utilized by BTG students (e.g., mental health counseling)
- Internships and Learn-and-Earn opportunities were available

Employment and Continuing Education

Students typically took one of two paths:
- **Obtain employment** in the industry through partnerships colleges established with local employers for hiring commitments, donations, Learn-and-Earn, and internships.
- **Continue education** to four-year institution through transfer and articulation agreements established with the colleges and other universities in the region.

The BTG project was designed to walk participants through a set of activities that would prepare them for employment in key industries – Advanced Manufacturing, Construction, Energy, and Information Technology. Because previous education, employment history, and job readiness varied among participants, there was no standard timeframe for an individual to be involved in activities.

Marketing and Recruitment

BTG leadership reported that students entering BTG programs came from a number of different sources (e.g., workforce and employers). The specific avenues included:

Marketing

Marketing occurred through use of promotional materials, television ads, brochures, flyers, social media, presentations, local events, newspaper ads, radio ads, among others. Each of the colleges took a similar approach to marketing, which typically involved targeted outreach toward the non-traditional student population and TAA-eligible individuals. For some institutions, this involved hiring a BTG-specific recruiter, while other institutions utilized the recruiters available at the college.

Recruitment

Through partnerships with local community partners (e.g., employers, workforce system, and community organizations), students could be recruited for BTG programs. BTG colleges utilized referrals from these partners and established relationships to present at company meetings, set up booths at workforce centers, and participate in local events (e.g., job fairs).

Prior Learning Assessment

Throughout marketing and recruitment phases, Prior Learning Assessments (PLAs) were provided as an option to potential students interested in receiving college credit for previous work experience, if they were eligible. The ability to offer PLAs to non-traditional students was used as a marketing tool to attract students that may not return to college otherwise (i.e., because they could complete a program faster). The state implemented an initiative to facilitate the process of finalizing PLA policies at their institutions in an effort to recruit military veterans and other individuals with previous work experience.

Assessment and Placement

Upon enrollment in a BTG college, peer coaches would make the initial contact with the student to guide them through the enrollment, admissions, and registration processes as well as throughout their educational experience.

Potential students would complete:

- College-wide assessments, as a requirement to enrollment at the college;
- Program-specific assessments to prepare students for the requirements of the technical program and gauge student level of experience in the field; and/or
- Placement tests (e.g., Accuplacer) to review the student's educational background and measure need for remedial coursework.

If remedial coursework was necessary, the statewide shift to the co-requisite model for developmental education supported additional training for students without losing time in non-credit developmental

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education courses. Through this model, remedial students were enrolled in credit-bearing courses at the same time they received support (e.g., tutoring).[26]

Programs and Services

Industry Sectors

Based on priorities from the state's economic development and Governor's plans, and employer needs, programs within BTG colleges were developed around the following industries: Advanced Manufacturing, Energy, Construction, and Information Technology.

Student Support Services

To ensure students received access to adequate support throughout their educational experience, the following support and career services were provided at many of the BTG colleges:

Peer coaches[27] met with students regularly from program enrollment through completion to facilitate retention in programs and subsequent completion. For many institutions, technical program students were asked to sign a contract that required them to meet with peer coaches at least three times per semester to encourage relationship building. The peer coaches assisted the students through courses, in many cases taking the same courses as the students, and helped serve as a liaison between the college, instructors, and students. With this, in some cases, peer coaches reported that they served as the student's support system and helped alert instructors to at-risk students (i.e., those that were not attending class or not completing assignments).

Counselors/Advisors used the intrusive advising model – an action-oriented approach to involving and motivating students to seek help when needed[28] – to assist with program advancement and career services. This model encouraged one-on-one support that worked to engage the students rather than rely on the students to engage the counselors/advisors. The Guided Pathways to Success[29] model provided advisors with information to encourage students down a path toward a career, facilitating completion and success. Rather than the advisor relying on their knowledge of college programs and pathways to guide the student, the Guided Pathways to Success model created a roadmap for students to complete their programs effectively and efficiently. The roadmap was a systematic guide that outlined the courses students would need to take and when, as well as the potential career pathways that stemmed from that program/major.

Institutions also offered a **range of additional support services** to their students that could be utilized by BTG students including, but not limited to, mental health counseling, transportation assistance, food pantries, and connections to community resources (e.g., Veteran Administration offices).

Internships and Learn-and-Earn[30] opportunities were available to provide BTG students with real-world experience in the field. In most cases, internships and Learn-and-Earn opportunities were embedded into technical programs to ensure students could gain experience in a real work setting. Institutions

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[26] For more information, please see http://www.completecollege.org/docs/CCA%20Co-Req%20Model%20-%20Transform%20Remediation%20for%20Chicago%20final%281%29.pdf

[27] For more information on the BEACON model utilized in this project, see http://www.mctc.edu/student-services/beacon-project/

[28] http://higheredforhigherstandards.org/wp-content/uploads/2015/07/BestPractices.pdf

[29] For more information, see http://doingwhatmatters.cccco.edu/portals/6/docs/Building%20Guided%20Pathways%20to%20Success%20-%20EAB%20Report%20FINAL.pdf

[30] For more information, see http://wvctcs.org/employer-partnerships/

reported that companies often hired students obtaining internships and Learn-and-Earn opportunities once their program was complete.

Employment or Continuing Education

Once students completed BTG programs, the majority of students took one of the following two paths:

- Obtain employment in one of the four key industries through the partnerships that colleges established with local employers for internships, Learn-and-Earn opportunities, donations, and commitments to hire; or
- Continue education to a four-year institution through the transfer and articulation agreements between BTG colleges and other universities in the region (e.g., West Virginia University).

LOGIC MODEL

The logic model that follows in Figure 4 outlines the resources utilized, activities undertaken, outputs targeted, and outcomes that resulted from BTG. For the evaluation, qualitative data were gathered through calls, interviews, and focus groups to better understand implementation activities as outlined in the logic model. Qualitative data were also gathered to understand how the inputs influenced activities, and examined impacts such as employer relationships through the Implementation Evaluation. Outputs, which were tracked by BTG colleges, and impacts outlined in the logic model such as increased student persistence and completion were measured with quantitative data through the Impact Evaluation.

Figure 4: BTG Logic Model

Input

Grant funds

Existing foundation of curriculum and knowledge

Student commitment

BTG Consortium CTCs

Partner funds (state, regional, national, community, and workforce)

Activities

Enhanced and accelerated sector-driven career pathways

Advanced Manufacturing, Energy, Construction, and Information Technology credentials

Technology-driven academic instruction and learning

Individualized support services

Outputs

TAACCCT-required tracking B1 (# unique participants served) – B10 (# employed at enrollment who receive wage increases post-enrollment)

Impacts and Long-Term Outcomes

Improved employer relationships and engagement

Improved course alignment with employer needs

Increased student persistence and completion

Increased pursuit of career opportunities

More affordable training options

Employer access to workforce

Employer recognition of credentials value

Cost savings for employers

EVIDENCE BASE

The activities conducted under BTG represented an emerging strategy, one that brought together accelerated sector-driven career pathways, contextualized academic instruction through different learning models (i.e. online, blended, simulated, and remote) to provide training with the latest technologies and processes as identified by employers, and expanded student support services. The accelerated sector-driven career pathways were new to the region.

As a new and untested idea, the proposed strategy was based on evidence that there were not enough middle-skills workers in Energy, Mechatronics/Advanced Manufacturing, Information Technology, and Construction in West Virginia. Employers participating in community outreach activities conducted by BTG leadership reported difficulty finding skilled workers. This challenge in producing middle-skilled workers was coupled with the belief that institutional programs vary in alignment with national standards or regional needs (e.g., instructors may not have been offering in-demand certifications or using the latest equipment, processes, and techniques). Additionally, institutions reported having outdated student support systems, a need for increased flexibility for non-traditional students, and less than ideal collaboration at the community and technical college level.

Given the evidence and assumptions, BTG's hypothesis was based on the following:

- Sector-driven programs produce labor-market gains for low-income, disadvantaged workers and job seekers, including greater likelihood of working and working regularly with higher earnings.[31]
- Long-term certificates have more labor market value and earnings than short-term certificates,[32] and accelerated pathways to completion improve persistence and completion rates.[33]
- Contextualized, career-focused instruction increases developmental education completion and the likelihood students will persist through and complete degree-applicable courses.[34]
- Coaching focused on goal setting and execution, including time-management, self-advocacy, and study skills, improves student retention.[35]

With this evidence in mind, BTG leadership designed the project to incorporate enhanced and accelerated sector-driven career pathways; contextualized, online, blended, simulated, and remote academic instruction; and expanded and individualized student support strategies. BTG was designed to lead to better trained candidates who would be able to retain or obtain jobs, advance, experience higher wages, and be more productive for their employers.

To understand the skills required in each industry, and the crosscutting skills, BTG leadership used information on O*Net's occupation database and ShaleNET's stackable credential model, which started with a three-week non-credit course where the student gained the certifications needed to obtain employment, and from there, students could complete one-year or more certifications.[36] These data

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[31] Maguire, S., et al. (2010). *Tuning in to labor markets: Findings from the sectoral employment impact study.* Public/Private Ventures.

[32] Complete College America (CCA)/FutureWorks (2010). *Certificates count: An analysis of sub-baccalaureate certificates.*

[33] Kolenovic, Z., Linderman, D., & Karp, M.M. (2012). Improving student retention and graduation via comprehensive supports: Two- and three-year outcomes from CUNY's Accelerated Study in Associate Programs (ASAP). *Proceedings of the 8th Annual National Symposium on Student Retention*. 221-233.

[34] Wiseley, W. C. (2011). *Effective basic skills instruction: The case for contextual developmental math (Pace Policy Brief 11-1).*

[35] Bettinger, E.P., & Baker, R. (March 2011). *The effects of student coaching in college: An evaluation of a randomized experiment in student mentoring.*

[36] For more information, please see https://www.shalenet.org/about/nlviewuploadfile/15

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showed there was overlap in personal effectiveness, academic, and workplace competencies, as well as the technical skills needed by workers across the Energy, Manufacturing, Information Technology, and Construction industries.[37] BTG leadership and institutions used the skills and competencies shown in Tables 1 and 2 along with employers in sector partnerships to assess general industry needs.

Table 1: Crosscutting Personal Effectiveness, Academic, and Workplace Competencies[38]

Types	Competencies
Personal Effectiveness	**Oil and Gas:**[39] interpersonal skills **Energy Generation:** interpersonal skills, integrity, professionalism, reputation, motivation, dependability and reliability, self-development, flexibility and adaptability, and ability to learn **Advanced Manufacturing**: interpersonal skills, integrity, professionalism, initiative, dependability and reliability, and lifelong learning **Information Technology:** interpersonal skills and teamwork, integrity, professionalism, initiative, adaptability and flexibility, dependability and reliability, and lifelong learning **Construction:** interpersonal skills, integrity, professionalism, initiative, dependability and reliability, and willingness to learn
Academic Competencies	**Oil and Gas:** applied math, reading for information, locating information, and computer literacy **Energy Generation:** math, locating, reading and using information, writing, listening, speaking, engineering and technology, critical and analytic thinking, science, and information technology **Advanced Manufacturing**: science, basic computer skills, math, reading, writing, communication (listening and speaking), critical and analytic thinking, and information literacy **Information Technology:** reading, writing, math, science, communication, critical and analytical thinking, and fundamental information technology user skills **Construction**: reading, writing, math, science, communication (visual and verbal), and basic computer skills
Workplace Competencies	**Energy Generation:** business fundamentals, teamwork, following directions, planning, organizing and scheduling, problem solving and decision making, ethics, employability and entrepreneurship skills, working with basic hand and power tools, and technology **Advanced Manufacturing**: business fundamentals, teamwork, adaptability/flexibility, marketing and customer focus, planning and organizing, problem-solving and decision making, working with tools and technology, checking, examining and recording, and sustainable practices **Information Technology**: teamwork, planning and organizing, innovative thinking, problem solving and decision-making, working with tools and technology, and business fundamentals **Construction**: teamwork, following directions, following plans and schedules, problem solving and decision making, working with tools and technology, checking, examining and recording, craftsmanship, and sustainable practices

From ShaleNET stackable credential model

[37] U.S. Department of Labor, Employment and Training Administration. (n.d.). *CareerOneStop*. Retrieved from www.CareerOneStop.org

[38] U.S. Department of Labor, Employment and Training Administration. (n.d.). *CareerOneStop*. Retrieved from www.CareerOneStop.org and ShaleNET Stackable Credential Model

[39] Oil and Gas and Energy Generation categories align with the Energy sector that was targeted through this grant.

Table 2: Crosscutting Technical Skills[40]

Skill	Energy	Manufacturing	IT	Construction
Mechanical	Gas Compressor, Pumping Station Operator	Industrial Machinery Mechanic, Machinery Maintenance Worker	----------	Millwright, Pipefitter
Electrical	Electrical Power Line Installer/Repairer	Electrical Engineering Technician	----------	Electrician
Instrumentation/ Electronics	Powerhouse, Substation, and Relay Repairer	Electronics Engineer Technician	Computer User Support Specialist	----------
Quality Control Analysis	Environmental Compliance Inspector	Chemical Plant Operator	Computer Programmer, Software/Web Developer	----------

WVCTCS also conducted community outreach activities with employers, TAA workers, and TAA service providers to determine gaps in skills and education for job candidates, and gaps in the WVCTCS system. These activities provided WVCTCS with the areas to focus on for development of career pipelines. WVCTCS found that there was overlap from most groups in many areas, including:[41]

- Lack of training with the latest equipment, processes, and techniques;
- Need for soft-skills training (e.g. critical thinking, active listening, and reading comprehension);
- Weak student support systems, especially for TAA-eligible workers;
- Inflexible college systems, including systems that do not accommodate workers' needs; and
- Weak local-level collaboration between employers, consortium members, and public workforce systems.

As the intervention concept was developed, the following strategies, designed by WVCTCS to align with USODL's core elements were anticipated. These strategies, drawn from the original grant narrative submitted to USDOL, outline the anticipated strategies for BTG as well as their anticipated impact.[42]

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[40] O*Net, 2013

[41] Information drawn from the original Technical Proposal submitted to USDOL.

[42] The activities listed were anticipated at the initial inception of the grant narrative, while actual activities are reflected earlier in this section and throughout the report.

Table 3: BTG Initial Strategies and Expected Impact within USDOL-Identified Core Elements

Core Element	BTG Initial Strategy[43]	Expected Impact
Evidence-Based Design	Create a blended learning environment with enhanced, accelerated, sector-driven career pathways and expanded and individualized student support strategies.	Blended learning can increase persistence, achievement, and attainment of TAA-eligible students.
Stacked and Latticed Credentials	Partner with employers and industry representatives at the national, state, and regional level to identify the most valuable credentials and how the credentials can be made stackable and portable. Introduce PLAs to provide credits to students who have previous training.	Stacked and latticed credentials and PLAs can expedite participant time to credential attainment.
Transferability and Articulation	Strengthening and expanding transitions from non-credit to credit-baring institutions through the existing systems, transferability of credits, and articulation agreements.	Transferability agreements can ensure that students are able to retain their earned credits, which can lead to a compressed schedule of attainment of new certificates.
Online and Technology-Enabled Learning	Incorporating advanced technology into program design and delivery through online learning, using open source tools for effective technical concept delivery and advanced capstone simulations in partnership with employers. Improve technology-based student supports for academic advising and career-pathways, PLAs, and course-level analytics.	Improved access to hybrid training programs and student services can allow students to work around current work or family schedules, removing potential barriers to success.
Strategic Alignment	Coordinating with the Governor's economic development plans, employers and industry, apprenticeships and Learn-and-Earn programs, the public workforce system, and other organizations to assist/facilitate program development and implementation.	Coordinating with these entities can ensure industry-recognized credentials, continuing education opportunities, resources, and TAA-eligible participants.
Alignment with Previously-Funded TAACCCT programs	Incorporating the work of four previously funded TAACCCT projects[44] to embed stackable credential models, certificate degree content, accelerated advanced manufacturing programs, and BEACON student supports model.	Aligning with previously funded TAACCCT projects incorporate evidence-based components focused on serving TAA-eligible workers.

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[43] Information drawn from the original Technical Proposal submitted to USDOL.
[44] Pennsylvania College of Technology ShaleNET US Round II, Community College of Denver Round I, Henry Ford Community College Round I, and Mountwest Community and Technical College Round I.

THE EVALUATION

THE EVALUATION

The West Virginia Community and Technical College System (WVCTCS) contracted with Thomas P. Miller & Associates, LLC (TPMA) to serve as an independent, third-party evaluator. Within the evaluation, there were two main components:

IMPLEMENTATION EVALUATION

The Implementation Evaluation began October 2013 and continued through March 2017, to document program progress, monitor program outcomes, and provide recommendations for continuous improvement of program operations. The Implementation Evaluation primarily focused on the training provided by the community and technical colleges within BTG, but also evaluated progress of all grant-funded components. The Implementation Evaluation was primarily qualitative, including conference calls, phone and in-person interviews, document reviews, and survey data;[45] and can be described in two parts – the formative, or ongoing analysis of the program, and the summative, or the final, cumulative program analysis.

IMPACT EVALUATION

The purpose of the Impact Evaluation was to assess whether the implementation of grant-funded programs at BTG colleges improved student persistence, completion, and short-term employment outcomes using a quasi-experimental design. This design compared grant-funded, BTG-enrolled students at each college with a group of students who enrolled in the same programs (at the same college) before the programs received grant funding. The programs that were assessed in the Impact Evaluation fell in the four target industry sections – Advanced Manufacturing, Energy, Construction, and Information Technology. The Impact Evaluation included students who enrolled in BTG programs from January 1, 2014 through July 31, 2016 and students who enrolled in comparison programs from January 1, 2012 through July 31, 2014.

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[45] Survey data was gathered from an add-on evaluation examining the use, implementation, and satisfaction with the new, system-wide data analytics system – Blackboard Analytics. Results from this analysis are located in *Appendix B*.

Figure 5: Grant Timeline
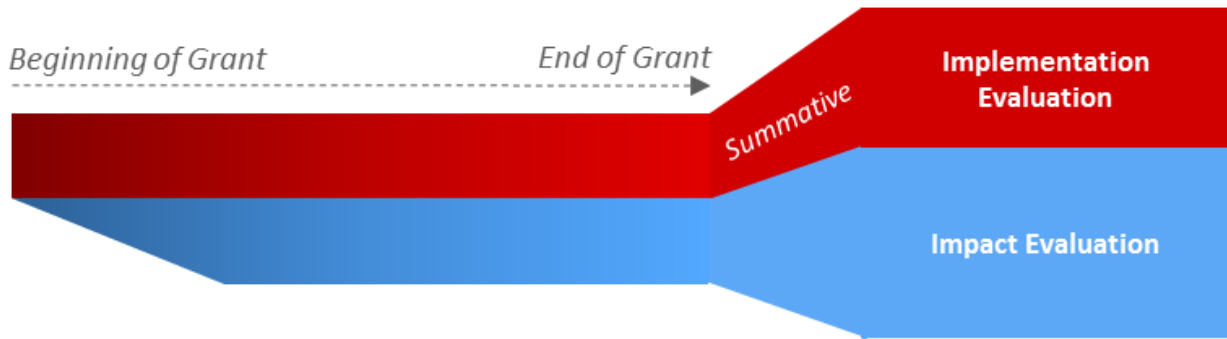
The formative Implementation Evaluation was conducted throughout the delivery of BTG. Through this evaluation, the Evaluation Team documented program progress, successes, challenges, and provided ongoing recommendations to BTG staff, faculty, instructors, and leadership. Additionally, the formative Implementation Evaluation provided context for the Impact Evaluation by documenting the timing and nature of adjustments to program design. The Impact Evaluation used this documentation to understand whether changes to the program might affect various participants.

At the conclusion of the evaluation, and presented within this report, are the findings from the summative (cumulative) Implementation Evaluation and Impact Evaluation.

IMPLEMENTATION EVALUATION

IMPLEMENTATION EVALUATION

## DESIGN SUMMARY

The Implementation Evaluation for the *Bridging the Gap* (BTG) project began in October 2013 and continued through March 2017 to document project progress, monitor program outcomes, and provide recommendations for continuous improvement of project operations. The Evaluation Team conducted a formative and summative evaluation, primarily focused on the training and services provided through BTG. Because BTG's purpose was to bridge career pathways, enhance academic instruction, and close student support gaps, the Implementation Evaluation proved to be a key element in establishing lessons learned to enhance project implementation and results in real-time. Evaluation feedback was provided through analysis of the following primary themes:[46]

- Progress toward achieving program outcomes or milestones
- Program accelerators, barriers, and best practices
- How unsuccessful strategies or activities could be adapted or modified to the realities surrounding the project
- Context for sustaining components

To gather information on the themes above, the Evaluation Team used a combination of conference calls, phone and in-person interviews, program document and artifact reviews, and survey results[47] including:

- Monthly and bimonthly implementation update calls with BTG college leadership[48]
- Monthly and bimonthly implementation update calls with West Virginia Community and Technical College (WVCTCS) leadership
- Phone and in-person interviews with BTG college leadership, WVCTCS leadership, staff, faculty and instructors, regional employers, workforce board staff,[49] and BTG participants[50]
- BTG-related documents and artifacts, including quarterly program reports, annual performance reports to USDOL, program-related brochures, curricula,[51] and other documents
- Survey results from Blackboard Analytics system implementation evaluation[52] and the Advanced Manufacturing Recruitment Study[53]

The Implementation Evaluation enabled the Evaluation Team, BTG college leadership, WVCTCS leadership, faculty, staff, and instructors to better understand the program's core activities and the outputs produced

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[46] For a description of analysis methods and a full listing of Implementation Evaluation research questions and the relationship between the research questions, data sources, and methods, see *Appendix C*.

[47] Survey data was gathered from an add-on evaluation examining the use, implementation, and satisfaction with the new, system-wide data analytics system – Blackboard Analytics. Results from this analysis are located in *Appendix B*.

[48] At each community and technical college within the consortium, leadership were identified as Institutional Transformation Leaders. For this report, these individuals will be referred to as BTG college leadership or college leadership.

[49] Interviews with workforce board staff were conducted as part of a separate study examining the levels of collaboration between the workforce boards and community and technical colleges. Findings from this study are located in *Appendix E*.

[50] The Evaluation Team used purposive and convenience sampling for employer and participant interviews coordinated by BTG college leadership. See *Appendix C* for a discussion on various limitations to the study.

[51] The Evaluation Team, providing a forum for community and technical college leadership, staff, faculty, and instructors to discuss program curriculum in the four industries, hosted a retreat with all community and technical colleges. See *Appendix F* for the retreat summary report.

[52] See *Appendix B* for more information on the results from this evaluation.

[53] To better understand enrollment patterns within the Advanced Manufacturing sector, WVCTCS oversaw a study conducted by the Evaluation Team examining these patterns at two community and technical colleges. See *Appendix G* for the findings from this study.

by each activity. The analysis qualitatively evaluated how the operations of BTG functioned (before and through the grant), placing the outcomes of the intervention into context with the implementation process and determining whether the program was implemented as designed. This allowed the Evaluation Team to uncover potential threats to the validity of the study[54] and helped program staff understand how the process might be modified to produce better results.

FINDINGS OVERVIEW

Findings from the Implementation Evaluation were grouped by research question themes. Every Implementation Evaluation research question is represented within this section. Overall themes within the Implementation Evaluation findings include:

Table 4: Findings Overview

Programmatic Development within Consortium Environment	Project development and implementation was facilitated in the consortium environment in a number of ways. WVCTCS leadership reported that collaboration within the consortium was both a strength (e.g., shared resources and curriculum, and professional development and training opportunities) and a challenge (e.g. coordinating all nine community and technical colleges to make decisions and schedule information sharing meetings). BTG college leadership reported that the consortium environment enabled colleges to launch programs and models that would not be possible otherwise due to limitations in staff capacity, funding, and college resources (e.g., co-requisite model, technical programs, accelerated models, peer coaching). However, the consortium environment also required a more uniform approach to grant components (e.g., developmental education, support service models), which BTG college leadership, staff, faculty, and instructors noted did not necessarily align with each college's environment, culture, and economic landscape. While some colleges reported this as a challenge, the collaborations between the colleges that were established through the grant helped alleviate some of those obstacles (e.g., through support and guidance to navigate grant components) and will likely continue to grow and expand beyond the grant.
Capacity Building	The grant funds enabled BTG college leadership, staff, faculty, and instructors to experiment with programming and support service innovations. While elements of these innovations will last, including the technical program offerings and blended, hybrid, remote, and simulated learning environments, even more so, the impact will be on the capacity of the BTG colleges to continue to enhance program offerings and support services to meet the needs of non-traditional students. Grant-funded activities that contributed to capacity building of the colleges are detailed in the *Implementation Evaluation: Beyond the Grant* section and include sector strategies enhancements, support service expansions, positive student outcomes, and community and technical college system collaboration.
Importance of Stakeholder Engagement	BTG colleges reported that success within the grant was primarily relationship-driven. BTG college leadership, staff, faculty, and instructors needed to have, and build, close relationships with employers, educational institutions, community organizations, and the workforce system. Meaningful investments and partnerships – through discussions with industry leaders on employee skill gaps and equipment/monetary donations– allowed colleges to provide appropriate and relevant training. BTG college leadership relied on close connections with employers to facilitate programmatic developments through equipment donations; establishment of internships, apprenticeships, and Learn-and-Earn opportunities; commitments to hire and interview student program completers; review of BTG curriculum;

[54] See the *Appendix C: Implementation Evaluation Methods* section.

	and development of customized training programs. These opportunities were facilitated through the implementation of a statewide workforce development initiative – Sector Strategies.[55] This initiative, partly grant funded, aligned with the goals of the grant, so many colleges coordinated grant implementation with these efforts.
Flexibility and Innovative Learning Strategies	An overarching theme throughout the project was the challenges associated with, and the benefits of, flexibility. The BTG project was designed to be flexible and adaptable through innovative learning strategies (i.e., blended, hybrid, remote, online, and simulated), allowing each student to customize their educational experience at each BTG college. With this flexibility, however, came challenges finding qualified and interested personnel to teach courses with varied schedule offerings (e.g., weekends and evenings). BTG college leadership attempted to hire faculty and instructors to teach programs and recruit students, but BTG college staff reported that finding innovative ways to accommodate diverse student needs was difficult. However, it was through this struggle with flexibility that BTG college leadership, staff, faculty, and instructors were able to create real-time program innovations and customized employer-specific training approaches that led to successful student outcomes, such as employment.

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[55] For additional information, please see: www.wvedc.org/assets/images/headers/WVEDC_Leg_2015_-_M_Julian.ppt

PROJECT IMPLEMENTATION

The content within this section of findings focuses on research questions grouped around the common elements of project implementation. These findings discuss the overall grant rollout, changes, and project outputs.

Research Questions

- How were programs and program designs modified or expanded using grant funds? What delivery methods were offered? What was the program administrative structure? What support services and other services were offered?
- Was an in-depth assessment of participants' abilities, skills, and interests conducted to select participants into the grant program? What assessment tools and processes were used? Who conducted the assessment? How were the assessment results used? Were the assessment results useful in determining the appropriate program and course sequence for participants? Was career guidance provided, and if so, through what methods?
- How have results varied across institutions? Why?
- What program outputs have been generated to date?
- How satisfied are program partners, staff, and participants with the program? Why?

Annual Activities

Year 1 (October 1, 2013 – September 30, 2014)

Many BTG colleges used existing personnel to establish program curriculum and/or utilized existing curriculum to expedite project implementation. For colleges who did hire personnel specifically for the grant, many reported challenges with finding qualified grant staff and faculty (see *Barriers and Challenges*). Five of the nine colleges developed no more than one program from scratch during initial grant implementation. Additionally, instances of college collaboration were reported in Year 1 of grant operations regarding student support service development (i.e., implementation of the BEACON model) and curriculum development (e.g., sharing specific program curriculum and providing guidance). For instance, Mountwest Community and Technical College presented the BEACON model to each institution and met with BTG college leadership to determine the most practical implementation strategy. Additionally, colleges met to discuss Advanced Manufacturing program curriculum, and how development and implementation could be streamlined across the consortium (e.g., through sharing of curriculum and resources).

Challenges regarding definitions (e.g., qualifications for a TAACCCT participant) and grant requirements (e.g., translating Advanced Manufacturing sector to appropriate programs for each region) surfaced early as BTG colleges attempted to navigate the grant from a consortium-level. Year 1 consisted mainly of curriculum development, hiring and staffing, equipment purchases, facility expansions, student services development, grant navigation, and other project set-up activities.

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Year 2 (October 1, 2014 – September 30, 2015)

Year 2 of the grant consisted of a range of project implementation activities including:

- Modifying curriculum based on student feedback and shifting employer needs (e.g., adding courses, modifying course content to focus on components used more heavily in the industry, and incorporating soft skills into technical program courses),
- Strengthening and expanding relationships with local Workforce Development Boards (WDBs) and employers (e.g., through regular meetings with WDB staff as well as formation of Advisory Committees with employers),
- Establishing marketing and recruitment plans to implement strategies focused on the target population,
- Enrolling students in BTG-funded programs, and
- Implementing expanded student support services (e.g., BEACON model and peer coaches).

While BTG colleges made significant progress in grant implementation, they reported challenges with tailoring these activities toward BTG students and their needs (e.g., structuring programs and partnerships in a way that kept students in programs through completion rather than dropping out to obtain employment). Challenges around grant requirements, expectations, and definitions also continued into Year 2 (e.g., definition of BTG participant), and concerns with sustainability of grant components and grant spending surfaced in Year 2. BTG colleges worked to strengthen implementation in Year 2 through increased and expanded partnerships, programs, and support services; targeted marketing and recruitment; and enhanced solutions to meet students' needs.

Year 3 (October 1, 2015 – September 30, 2016)

The BTG consortium worked to finalize and expand grant components in Year 3, which included:

- Continuing to modify existing programs and expand offerings;
- Increasing use of learning strategies (e.g., hybrid and blended learning);
- Implementing the co-requisite model for developmental education;
- Hosting consistent meetings with employers and community partners; and
- Discussing/Beginning to implement consortium-wide initiatives such as Prior Learning Assessments (PLAs), Guided Pathways to Success,[56] and Blackboard Analytics.[57]

Similar challenges continued from Year 2 (e.g., tailoring activities to student's needs, grant requirements and terminology, and concerns around sustainability) but BTG colleges began to report positive outcomes (e.g., employment) for students completing BTG programs, both anecdotally and in Annual Performance Reports. The consortium also continued discussions around sustainability and reported ongoing success with BTG-funded components (e.g., expanded support services, revised developmental education, and ability to implement innovative learning strategies).

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[56] Guided Pathways to Success is an initiative of Complete College America to provide students with guidance to complete programs efficiently. For more information, please see: http://doingwhatmatters.cccco.edu/Portals/6/docs/Building%20Guided%20Pathways%20to%20Success%20-%20EAB%20Report%20FINAL.pdf
[57] Blackboard Analytics is consortium-wide data analytics and predictive analysis software developed through the BTG grant.

Extension (October 1, 2016 – March 30, 2017)

The BTG colleges accepted an opportunity to extend grant implementation without receiving additional grant funding. This extension period allowed the colleges to continue implementing activities from Year 3 for an additional six months. Activities that were continued during the grant extension period included:

- Ongoing curriculum/program modifications and expansions,
- Consistent meetings with employers and expanded partnerships,
- Ongoing implementation of consortium-wide initiatives (e.g., PLAs, co-requisite model, and Guided Pathways to Success),
- Recruitment and enrollment of students in BTG programs, and
- Discussions regarding sustainability.

BTG colleges worked to reallocate funding and staff during the extension period to help continue positive BTG affects beyond the grant period. All colleges committed to sustaining all or most of the BTG grant components, with peer coaches reported as the area that would likely not continue due to funding challenges for some colleges. While colleges reported the value of peer coaches, some institutions chose to prioritize sustainability of other components (i.e., programs and instructors).

Project Changes

As highlighted in the Implementation Evaluation narrative above, throughout the course of the grant, changes and adjustments were made to the original project model as implementation varied institution-by-institution throughout the grant period. While the overarching implementation goals were maintained across all nine community and technical colleges (e.g., expanded support services; enhanced career pathways; innovative academic strategies; and consortium-wide initiatives such as the BEACON model, co-requisite developmental education model, and Blackboard Analytics), many of the colleges tailored these goals to align with the institution's environment, culture, and economic landscape. Delays in implementation due, in part, to challenges in finding qualified and interested faculty, instructors, staff, and leadership as well as lengthy project design and start-up also contributed to varied project implementation at each BTG college.

Reflecting on the original project design created for the grant application, several adjustments were made to account for actual project rollout and implementation. These adjustments to grant concepts/activities are outlined in Table 5 below.

Table 5: Changes and Rationale

Item (Change)	Rationale
Programmatic Development	
Remote Learning and Collaboration	To increase remote learning and collaboration within the consortium, Mondopads were purchased at the beginning of the grant period to enable the BTG colleges to easily communicate with each other. However, because of the colleges' rural locations throughout the state, a reliable connection/signal was an ongoing challenge. With this, use of the Mondopads decreased significantly relatively early in the grant period. Therefore, consortium collaboration strategies changed (e.g., to in person and through Skype) to support regular college communication.
Curriculum Collaboration	Colleges anticipated that much of the curriculum would be developed as a consortium during the initial stages of the grant in each of the four industry sectors. This would enable the colleges to share curriculum and expedite program implementation. This collaboration was initially delayed and then occurred on a smaller scale (i.e., a few colleges worked together to develop curriculum or colleges worked to develop skillset credentials rather than full program curriculum). This shift in implementation approach was due, in part, to existing curriculum that many colleges had in the relevant industry sectors and differing employer needs across the state. While this did not necessarily delay curriculum development processes, and this collaboration increased as the grant moved forward, it was a slight deviation from the original grant narrative.
Learning Strategies	Throughout the grant period, learning strategy components (e.g., remote, online, simulation, and gateway and bridge courses) experienced delayed implementation due to hiring challenges, questions regarding grant requirements, lengthy internal college processes (e.g., curriculum approval), among others. For example, some BTG colleges indicated plans for implementing these strategies in tandem to curriculum development. However, many colleges reported developing curriculum first and then incorporating the learning strategies later. As a result, learning strategies were implemented later in the

grant period than anticipated. Integration of these strategies into BTG program courses did not delay program launch but, rather, delayed these types of delivery offerings within programs for some colleges.

Internal Operations
BTG Staffing and Personnel	Initially, BTG colleges anticipated hiring a Learn-and-Earn Coordinator, Registered Apprenticeship Program (RAP) Coordinator, and other staff responsible for these specific components at each institution. However, during the initial grant stages, BTG colleges determined that these roles tended to overlap and rolled the responsibilities into other staff and leadership's roles. In many cases, faculty and instructors assisted with employer outreach to establish Learn-and-Earn, apprenticeship, and internship opportunities because of their experience in the field (i.e., they could use appropriate sector language and understood general market trends and expectations).

Additionally, to support sustainability of staff beyond the grant, many BTG colleges opted to utilize existing college staff for the grant, often giving them additional responsibilities on top of their existing workload. While some colleges could specialize roles within the grant, other colleges could not due to lack of capacity and resources. For instance, some colleges had specific personnel for employer outreach while other colleges opted to utilize the existing college's outreach personnel. Overall, BTG colleges did not specialize grant staff roles as much as originally anticipated due to the overlap in responsibilities (e.g., RAP Coordinator and Learn-and-Earn Coordinator), shortage of capacity and resources at the colleges to hire additional staff, and in some cases, challenges with finding qualified staff (see *Barriers* section for details). |

External Engagement
New Employer Relationships	New relationships with employers were formed through strategic employer outreach, the necessity to match employability skills with employment opportunities, and to facilitate sustainability. This strategic outreach to employers and community partners was facilitated through the hiring of BTG-specific recruiters and/or the use of targeted recruitment (i.e., developing recruitment strategies for specific populations). Colleges recruited non-traditional students through newspaper ads, Workforce Development Boards, one-on-one outreach, and other targeted approaches. For instance, colleges found that non-traditional students were not likely to be recruited through high school and community events (e.g., career fairs) as many of these individuals were in the workforce already. The ability to recruit and train adult learners encouraged employers and community partners to donate equipment, work with BTG staff to establish employee training programs, participate in Advisory Committee meetings and feedback/information sessions as well as other events, establish agreements to provide internships and other work-based learning opportunities, and commit to hiring and interviewing BTG graduates. College and WVCTCS leadership, faculty, and staff reported that the expanded partnerships and new connections formed through the grant were beneficial to better serving students, and will continue to be valuable moving forward.[58]

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[58] See *Partner Engagement* section for more information on the nature of these partnerships and relationships.

	In addition, the state implemented a workforce development initiative that sought to bridge educational institutions and employers in a meaningful and targeted way. This initiative – Sector Strategies – encouraged institutions to create more meaningful partnerships – a goal of the grant.[59] As an initiative that was partly funded by the BTG grant, colleges aligned these efforts due to the overlap in objectives of the grant and workforce initiative.[60]
Workforce System Engagement	While no specific parameters were set around workforce system engagement initially, WVCTCS leadership anticipated deeper participation including Trade Adjustment Assistance (TAA)-eligible participant referrals and engagement in outreach. BTG college staff and leadership indicated the importance of engaging the workforce system, and most attempted to do so, but many colleges reported a lack of engagement with the workforce system. Staff reported that this, in part, was due to the nature of the relationships with the workforce system prior to the grant (i.e., these relationships may not have existed or were affected by previous experiences). While this did not necessarily affect student enrollment, many colleges indicated interest in expanding these partnerships with the WDBs and will likely continue these efforts beyond the grant.[61]

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[59] For more information, please see: www.wvedc.org/assets/images/headers/WVEDC_Leg_2015_-_M_Julian.ppt
[60] For more information, please see: www.wvedc.org/assets/images/headers/WVEDC_Leg_2015_-_M_Julian.ppt
[61] A separate evaluation was conducted examining the relationship between the colleges and WDBs. See *Appendix E* for findings from this evaluation.

Program Outputs

Four industry sectors were targeted through the grant and included: Advanced Manufacturing, Energy, Information Technology, and Construction. These four sectors were implemented in different ways across the consortium depending on regional and employer needs (i.e., different programs within the sectors were implemented). The focus of the grant was to identify skill gaps and needs for the four sectors in each college's service area based on discussions with local employers and community organizations. These discussions helped the colleges identify the potential programs within each sector (e.g., within Advanced Manufacturing, many BTG colleges targeted Mechatronics and Welding programs) that should be targeted through the grant.

With the leadership of WVCTCS, BTG colleges worked to implement a number of initiatives in different areas (e.g., developmental education and industry engagement). These initiatives were not all grant-funded but aligned with grant objectives. While the implementation of these initiatives differed in some instances (e.g., utilizing parts of BEACON model rather than full implementation), the colleges launched many of the initiatives in some way. BTG college leadership and staff reported project success due to implementation of these consortium-wide initiatives. The initiatives are highlighted below:

Sector Strategies – Reported as one of the most successful initiatives implemented across the consortium, Sector Strategies was a workforce initiative that targeted meaningful and strategic partnership engagement. The initiative sought to: (1) ensure continuous dialogue between resources, business, and industry; (2) address current and emerging skill gaps; (3) provide a means to engage directly with industry and across traditional boundaries; (4) better align state programs serving employers and workers; and (5) maximize economic opportunities occurring in the state.[62]

Guided Pathways to Success – Implemented toward the end of the grant, Guided Pathways to Success was an initiative of Complete College America to provide students with guidance to complete programs efficiently. The model sought to: (1) maximize credit attempts by encouraging students to enroll in at least 15 credits per semester; (2) reduce lost credits by implementing systems and services that could identify at-risk students for dropping out; (3) simplify course selection by template plans that simplified the registration process and ensured students took the right courses; and (4) preserve flexibility to encourage students to take courses that could be transferred to other programs.[63] The Guided Pathways model sought to provide students with a roadmap to expedited program completion.

BEACON Model – Implemented the most consistently across the consortium, the BEACON model guided students through the enrollment process and introductory coursework, and assisted with career planning and job placement. Students were matched with peer coaches and counselors who helped them navigate the path toward their goals. The peer coaches acted as the liaison between the college and student, bridging student needs and concerns with college operations (e.g., connecting students to resources) and faculty (e.g., identifying at-risk students and taking action).[64]

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[62] For more information, please see: www.wvedc.org/assets/images/headers/WVEDC_Leg_2015_-_M_Julian.ppt

[63] For more information, please see: http://doingwhatmatters.cccco.edu/Portals/6/docs/Building%20Guided%20Pathways%20to%20Success%20-%20EAB%20Report%20FINAL.pdf

[64] For more information, please see: http://www.mctc.edu/student-services/beacon-project/peer-coaches/

Co-Requisite Model – The co-requisite model, implemented for many colleges in Year 3 and during the extension period, enrolled students in remedial and college-level courses in the same subject at the same time. Students received targeted support to help boost their understanding of the course content, expediting student time to completion. Co-requisite developmental education was offered as non-credit connected to a credit-bearing college course.[65]
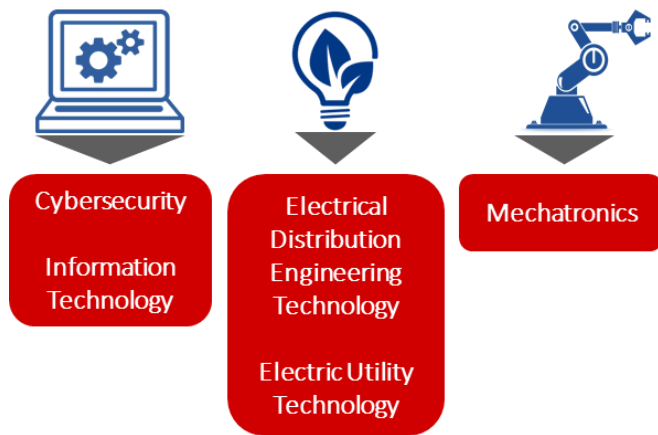
Prior Learning Assessments – PLAs were a way to evaluate college-level knowledge and skills an individual gained outside of the classroom for college credit. These assessments could be a range of methods used to grant credit for college-level learning for students that earned experience outside of the academic classroom. For BTG, PLAs were implemented late in the grant and for some colleges, implementation will continue beyond the grant. All colleges were part of the development of a PLA website that streamlined communication with the college and provided potential students with an understanding of what might translate to college credit prior to connecting with the institution.[66]

Blackboard Analytics – Many colleges anticipated continuing conversations about Blackboard Analytics implementation beyond the grant. Blackboard is a learning management system that enabled colleges to use data and performance analytics to increase student success by tracking and measuring performance data (e.g., retention) and identifying potential solutions.[67]

Highlights from grant implementation as well as distinctive activities from each college in the BTG consortium are outlined below:[68]

Blue Ridge Community and Technical College

Blue Ridge Community and Technical College (Blue Ridge) serves the following counties in West Virginia's eastern panhandle: Berkeley, Morgan, and Jefferson.[69] Through the grant, Blue Ridge implemented a number of technical programs within the Advanced Manufacturing, Energy, and Information Technology sectors. These technical programs are highlighted below:[70]

Cybersecurity

Information Technology

Electrical Distribution Engineering Technology

Electric Utility Technology

Mechatronics

Through implementation of these programs, Blue Ridge was able to better accommodate non-traditional student needs, including the incorporation of diverse learning strategies that utilized online and hybrid formats into technical program courses. For instance, Blue Ridge developed short videos recording specific course topics within technical programs that students tended to struggle with so they could reference the material later. These videos were also

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[65] For more information, please see: http://www.completecollege.org/docs/CCA%20Co-Req%20Model%20-%20Transform%20Remediation%20for%20Chicago%20final%281%29.pdf

[66] For more information, please see: https://www.stepupwv.com

[67] For more information, please see https://www.blackboard.com/education-analytics/index.aspx

[68] The highlights outlined in this section describe grant implementation outside of consortium-wide initiatives (e.g., co-requisite developmental education model, BEACON peer coaches, etc.), examining only implementation activities that were unique to the institution.

[69] For more information, please see: http://catalog.blueridgectc.edu/content.php?catoid=5&navoid=90

[70] Icons throughout this section were drawn from www.iconfinder.com

developed to serve as a recruiting mechanism for potential students as they could better understand the structure of technical program courses.

Utilizing the Information Technology Sector Lead that was housed at the institution, the college was able to implement NetLab consortium-wide.[71] This virtual lab simulator enabled the consortium to share resources beyond the grant. Additionally, Blue Ridge worked to embed innovative career and support services into the college by becoming certified to implement the World of Works, Inc. career assessment.[72] Students were able to complete the assessment prior to program enrollment to refine and/or validate their career interests. In some instances, Blue Ridge staff reported that the findings that highlighted the students' career interests and strengths encouraged students to change their career path. See the *WOWI Assessment* highlight for information about this tool.

WOWI Assessment

Blue Ridge received a certification to administer the World of Works, Inc. (WOWI) career assessment enabling career service staff to help students refine and/or validate their career interests, creating a more robust approach to career services at the college. This multi-dimensional tool helped promote an improvement to earnings, employment, and other outcomes for non-traditional job seekers.

BridgeValley Community and Technical College

BridgeValley Community and Technical College (BridgeValley)[73] serves the following counties in the state of West Virginia: Fayette, Kanawha, Clay, Putnam, Nicholas, and Raleigh.[74] As the lead institution for the grant, BridgeValley implemented a number of technical programs in all four sectors – Advanced Manufacturing, Energy, Information Technology, and Construction – utilizing grant funds. These technical programs are highlighted to the left:

Cybersecurity

Information Technology

Computer Maintenance

Process Instrumentation

Mechanical Engineering Technology

Diesel

Advanced Manufacturing Technology

Machine Tool Technology

Industrial Piping Design

Electrical Engineering

Mechanical Engineering

Building Design and Construction
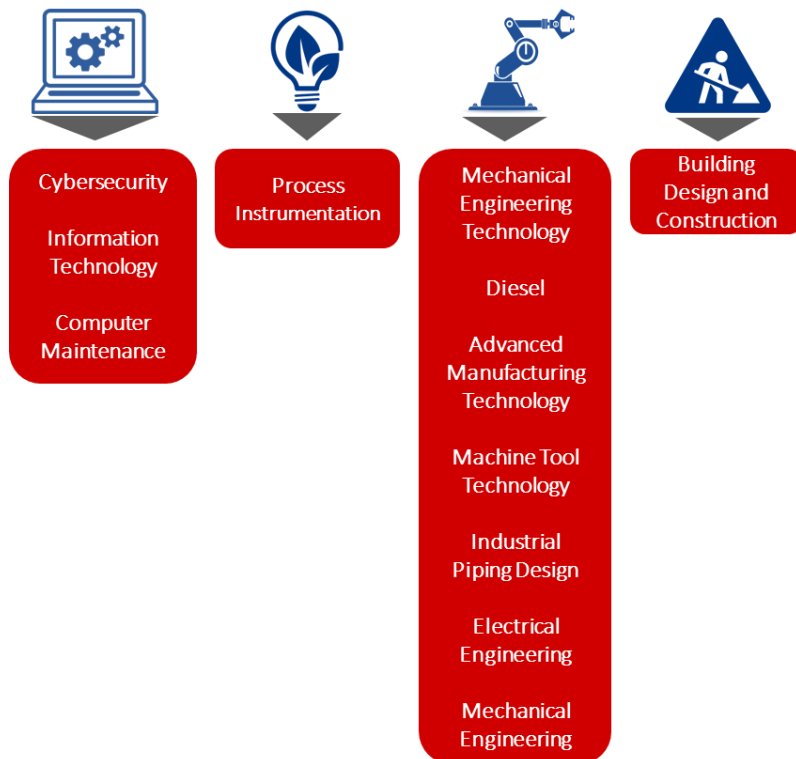
The use of diverse learning strategies enabled BridgeValley to accommodate the non-traditional student population. For instance, BridgeValley staff experimented with open entry, open exit as well as accelerated models for technical programs in order to increase enrollment and retention of non-traditional students. BridgeValley also utilized block scheduling and remote instruction to accommodate working students.

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[71] For more information, please see: https://www.netdevgroup.com/products/features/
[72] For more information, please see: https://www.wowi.com/
[73] At the beginning of the grant, BridgeValley was Kanawha Valley and Bridgemont Community Colleges. However, early in the grant (2014), these two institutions merged to become BridgeValley.
[74] For more information, please see: http://www.bridgevalley.edu/history

BridgeValley worked to increase veteran enrollment by becoming fully compliant with Principles of Excellence[75] and the Five-Star Challenge.[76] This compliancy enabled the college to offer a safe and friendly environment to veterans as staff were trained in how to navigate veteran's benefits and circumstances. With this, veteran fall-to-spring retention increased to 87 percent in the 2016-2017 academic year.[77] Additionally, within student support services, staff utilized the College Central Network[78] to register employers and students, creating a one-stop dashboard for students searching for jobs and employers searching for potential employees. The Miners Path to Success program was also implemented to assist students in technical programs to program completion. See the *Miners Path to Success* highlight[79] for more information.

Miners Path to Success

This program embedded peer coaches into the BTG students' experience to create a positive educational experience. Peer coaches utilized goal setting and regular meetings, which resulted in increased pass rates (94% after 4th meeting vs. 44% in Spring 2016) at the college. By Spring 2016, 548 students (BTG and non-BTG) were enrolled in this program.

Eastern West Virginia Community and Technical College

Eastern West Virginia Community and Technical College (Eastern) serves a number of counties in the northeastern part of the state, including Grant, Hampshire, Hardy, Mineral, Pendleton, and Tucker.[80] With the award of the grant, Eastern focused program development to three sectors – Advanced Manufacturing, Energy, and Information Technology. The specific programs within these sectors are outlined below:

Information Technology | Wind and Energy | Electromechanical Technology

Utilizing grant funds, Eastern was able to purchase equipment to enhance the Technology Center on campus with computers and other technology. This enabled the institution to offer tutoring resources through tutor.com[81] at the Technology Center. Tutor.com allowed students to access assistance at any time (via the Technology Center, a library, a student's home computer, etc.), offering flexibility for student commuters and reducing the need for additional tutoring staff. This was significant, as many of Eastern's faculty were adjunct rather than full-time. See the *Tutor.com* highlight for more information.

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[75] Principles of Excellence is a guideline for institutions to follow to provide veterans with information, support, and protection while using their benefits. For more information, please see: http://www.benefits.va.gov/gibill/principles_of_excellence.asp
[76] The Five-Star Challenge is a call to action for West Virginia's public two-year and four-year institutions and their coordinating agencies to adopt a set of standards for supporting veterans. Retrieved from: http://cfwvconnect.com/veterans-education/office-of-veterans-education-and-training-issues-5-star-challenge/
[77] Data was drawn from site visit documentation provided by college staff that was tracked within the Student Services department.
[78] College Central Network is a tool that links employers to job candidates through college-based Career Centers. For more information, please see: https://www.collegecentral.com/
[79] Data from call-out box was drawn from site visit documentation provided by college staff tracked within the Student Services Department. For more information on the program, please see: http://www.bridgevalley.edu/sites/default/files/BridgeValley_Site_Files/BOG/Agendas/BOG%20Agenda%20November%2018%2C%202016.pdf
[80] For more information, please see: http://www.easternwv.edu/Home.aspx
[81] For more information, please see: http://www.tutor.com/our-company

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Eastern Advocates were also integrated into the institution to provide support for students, using the BEACON model as the framework from which the Advocates' roles were designed. The Eastern Advocates had a similar role to BEACON coaches but focused on serving as the advocate for students with the college and instructors, while the Eastern Coach focused on matching students to resources.[82]

Tutor.com

A resource that offers live, on-demand, one-on-one assistance from experts and other professionals. Eastern students indicated this resource as a key player in their course success. As of February 2016, 77 students conducted live sessions with tutor.com representatives and 96% of those students were satisfied with their experience.

Mountwest Community and Technical College

Once part of Marshall University, Mountwest Community and Technical College (Mountwest) serves students in the greater Huntington area, including Cabell and Wayne counties as well as counties in the Tri-State Area (Kentucky, West Virginia, and Ohio).[83] Utilizing grant funds, Mountwest focused on revamping and launching programs in the Advanced Manufacturing and Information Technology sectors. These programs included:

Information Technology

Engineering Design Technology

Mountwest focused heavily on program development in the two programs revamped/launched through the grant. The institution utilized hybrid methods for course delivery and accelerated models to accommodate non-traditional student needs. Through the grant, Mountwest was also able enhance the existing BEACON model,[84] launched at Mountwest in a TAACCCT Round 1 grant, which included peer coaching and student support. Peer coaches were students enrolled in BTG programs that completed an application to serve as a liaison between the college and student, and ambassador for the institution. Peer coaches assisted students in all aspects of their educational journey – from enrollment to completion. Counselors were staff that worked with peer coaches and instructors to support students through advising assistance. Counselors provided students with course selection assistance and served as a resource for advising-related questions.[85] Additional peer coaches were hired to support students in the BTG programs using grant funds. See the *BEACON Model* highlight for more information about the model.

Mountwest also worked to support veterans at the institution through use of the college's veteran representative and worked with the local organizations to increase veteran enrollment. The institution also offered summer boot camps to better prepare students needing remedial assistance for credit bearing courses in the fall. The boot camps were designed to provide incoming students with expedited remedial English and math coursework.

BEACON Model

This was a student success model that provided students with a team to support them including peer coaches, counselors, and other resources. For non-traditional students especially, this model helped promote student success and college completion as the peer coaches, counselors, and instructors worked together to support students.

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[82] Information drawn from document shared with evaluators from the BTG college leadership.
[83] For more information, please see: http://www.mctc.edu/about-us/campus-locations/
[84] For more information about BEACON, please see: http://www.mctc.edu/student-services/beacon-project/
[85] For more information, please see: http://www.mctc.edu/student-services/beacon-project/

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New River Community and Technical College

New River Community and Technical College (New River) serves an area including Fayette, Greenbrier, Mercer, Monroe, Nicholas, Pocahontas, Raleigh, Summers, and Webster counties.[86] Through the grant, New River offered a number of programs within the Advanced Manufacturing, Energy, and Information Technology sectors, including:

Information Technology

Line Service

Electric Distribution Engineering Technology

Welding

Industrial Technology
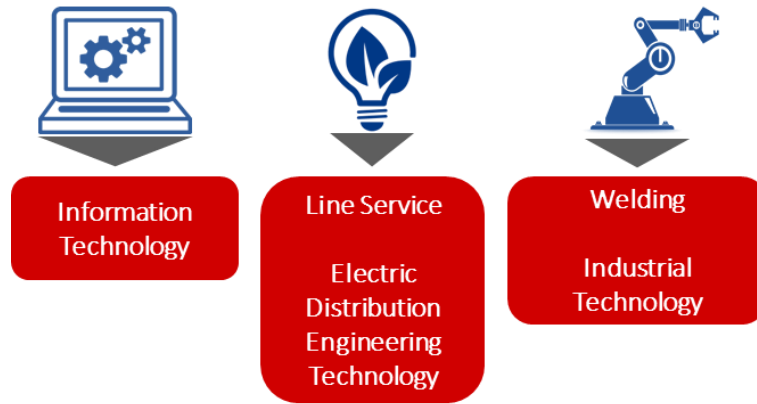
Through the grant, New River launched the Advanced Technology Center where instructors were certified to administer American Welding Society (AWS) exams and certifications within the Welding program. Obtaining a license to administer AWS certification tests was a lengthy process but with this, the college became one of the few institutions in the state that could administer the tests. New River was able to increase accessibility to the AWS testing for students, embed testing costs into BTG programs, and create partnerships with employers due to interest in utilizing the facility for employee testing. The funds gathered from employers, in part, helped sustain the Advanced Technology Center.

In an effort to strengthen the relationship with the local Workforce Development Boards (WDBs), New River hired a liaison (housed at New River) early in the grant. This individual worked with the WDB to establish opportunities for BTG program outreach and recruitment by setting up booths at the WDB to discuss BTG programs with interested individuals. The liaison also worked with the WDB to establish relationships with community organizations (e.g., Rapid Response Teams) that could aid in BTG program recruitment and provide access to the grant's target population – non-traditional and adult learners. The ability to leverage the liaison, an individual hired specifically for this role, was reportedly beneficial as significant time could be dedicated to building a strong relationship with the WDB. See the *Workforce Liaison* highlight for more information.

Workforce Liaison

The presence of a workforce liaison enabled the college to strengthen their relationship with the local Workforce Development Board, resulting in over 100 referrals to the college throughout the grant. The liaison helped educate the WDB on the BTG programs so recruitment activities (e.g., events) could occur for the appropriate population.

Pierpont Community and Technical College

Once part of Fairmont State University, Pierpont Community and Technical College (Pierpont) serves 13 counties divided by northern and southern regions of the state. The northern region includes Barbour, Doddridge, Harrison, Marion, Monongalia, Preston and Taylor counties, while the southern region includes Braxton, Calhoun, Gilmer, Lewis, Randolph, and Upshur counties.[87] The grant enabled the institution to provide programs in three sectors: Advanced Manufacturing, Energy, and Information Technology. The programs within each sector are outlined in detail on the following page:

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[86] For more information, please see: http://www.newriver.edu/about-new-river-aa
[87] For more information, please see: https://pierpont.edu/president/profile

Information Technology

Petroleum Technology

Power Plant Technology

Electric Utility Technology

Applied Process Technology

Mechatronics

Through grant, partner, and college funds, Pierpont was able to design and launch an Advanced Technology Center (ATC) to house BTG technical programs. The ATC aided in the expansion of the college's program offerings and provided a space to host all technical programs. Staff reported that because students preferred hands-on coursework rather than hybrid and online components, the ATC provided a space for these students to obtain the hands-on experience they sought. Pierpont utilized other learning strategies such as block scheduling to accommodate non-traditional students as well. See the *Advanced Technology Center* highlight for more information.

Working with the Workforce Development Board (WDB), Pierpont was able to attend Rapid Response meetings[88] to recruit dislocated workers and received a number of referrals from the WDB throughout the grant. Pierpont also worked to support veteran students through targeted recruitment, which did not occur prior to the grant, and hired a coordinator for career services to help place students at jobs in the area.

Advanced Technology Center

The development of this center enabled the college to expand capacity by providing a place to house BTG programs. The presence of this center also resulted in a number of partnerships with local employers. For instance, Pierpont reported expanded partnerships/donations from First Energy and Chevron because of the updated facility.

Southern West Virginia Community and Technical College

Southern West Virginia Community and Technical College (Southern) is located in the southwestern part of West Virginia and serves the following counties: Boone, Logan, Mingo, and Wyoming in West Virginia, and Martin and Pike in Kentucky.[89] Utilizing grant funds, the institution developed programs in the Advanced Manufacturing and Information Technology sectors. These programs are listed to the left:

Information Technology

Welding

Mechatronics

Industrial Technology

Southern leveraged the new program offerings to enhance skill-building opportunities for students. For example, Welding students were able to compete in SkillsUSA,[90] allowing students to apply their educational experiences to real-world scenarios in a competition setting. Southern also experimented with multiple tracks within the same program based on student's interests (customizing the student's educational experience) as well as implemented accelerated, hybrid, and simulated learning techniques to better accommodate non-traditional students.

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[88] Rapid Response team host meetings with companies to quickly maximize public and private resources to minimize disruptions that are associated with job losses. For more information, please see: https://www.doleta.gov/layoff/employers.cfm

[89] For more information, please see: http://www.southernwv.edu/?q=about/history-southern

[90] For more information, please see http://www.skillsusa.org/

For instance, the Information Technology program was shifted to an accelerated model to expedite student time to completion and the college reported drastic increases in student enrollment.

Recruiting veteran and dislocated students was accomplished through targeted strategies that were not utilized prior to the grant. This included dedicating staff time to recruiting dislocated workers and veterans through partnerships with community organizations (e.g., veteran organizations and workforce system). Because of the lack of job opportunities in the region, Southern also explored unique course offerings (e.g., drone flight) that could lead to jobs outside of the typical sector jobs (e.g., surveying and photography). See the *Unique Course Offerings* highlight for more information.

Unique Course Offerings

Because Southern's region had limited jobs available, staff explored unique course offerings such as drone flight. The skills developed from this course could be used in marketing, photography, and surveying occupations, among others.

West Virginia Northern Community College

West Virginia Northern Community College (Northern), located in the panhandle, serves Hancock, Brooke, Ohio, Marshall, Wetzel, and Tyler counties in West Virginia as well as Jefferson, Harrison, Belmont, and Monroe counties in Ohio and Allegheny, Beaver, Butler, Washington, and Greene counties in Pennsylvania.[91] Throughout the grant, Northern implemented programs in the Advanced Manufacturing, Energy, and Information Technology sectors. These programs included:

Information Technology

Cybersecurity

Petroleum Technology

Chemical Operator

Mechatronics
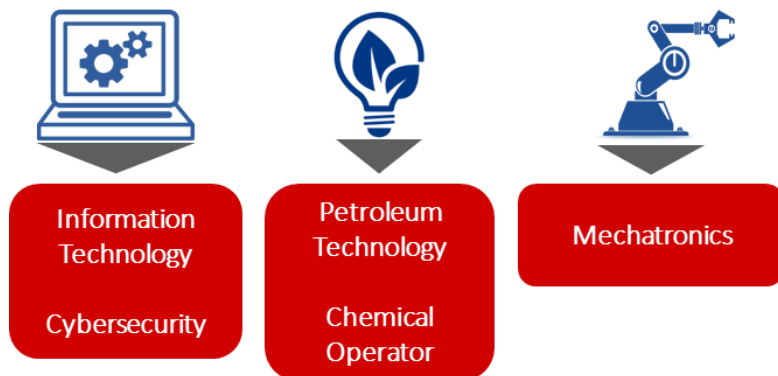
Utilizing grant funds, Northern was able to enhance and expand program offerings and learning strategies (e.g., online, hybrid, and accelerated). For instance, the college implemented accelerated Information Technology and Chemical Operator programs to expedite student time to completion and reported increases in enrollment numbers for both programs. Northern leveraged their location in the panhandle to establish partnerships in a number of different states with local organizations, businesses, and educational institutions. Grant leadership reported that the ability to engage with companies in other states resulted in a number of partnerships that would not have been possible otherwise.

Throughout the grant, Northern focused on continually improving BTG technical programs and embedded soft skill content into technical program courses. This content provided students with résumé, interview, communication, professionalism, and other relevant skills that would help them in their job search upon program completion. See the *Embedded Soft Skills* highlight for more information.

Embedded Soft Skills
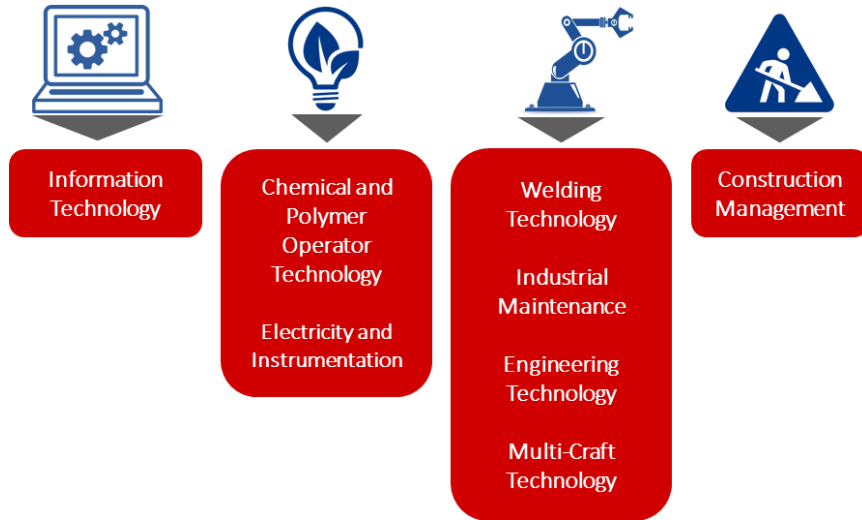
Because non-traditional students typically did not take advantage of support services and events that provide students with soft skills, Northern embedded soft skill content into technical program courses to strengthen student skills for when they obtained employment.

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[91] For more information, please see: http://www.wvncc.edu/about/west-virginia-northern-community-college/28

West Virginia University at Parkersburg

Affiliated with West Virginia University, the Parkersburg branch is accredited to award baccalaureate degrees and serves the following counties: Jackson, Pleasants, Ritchie, Roane, Tyler, Wirt, and Wood.[92] West Virginia University at Parkersburg (WVUP) designed programs in all four sectors targeted by the grant – Advanced Manufacturing, Energy, Information Technology, and Construction. The programs within these sectors are listed below:

| Information Technology | Chemical and Polymer Operator Technology / Electricity and Instrumentation | Welding Technology / Industrial Maintenance / Engineering Technology / Multi-Craft Technology | Construction Management |

While the program offerings changed throughout the grant due, in part, to low enrollment, WVUP continued to enhance technical program offerings through learning strategies (e.g., hybrid and online) and a strong relationship with the local WDB. This partnership resulted in a number of employer relationships, recruiting opportunities, and student referrals. For hybrid offerings, templates and shells were developed to enable technical program instructors to embed online components into courses easily.

Through WVUP's relationship with West Virginia University (WVU), the institution became the only community and technical college in the state that could offer baccalaureate degrees. WVUP was able to collaborate with WVU to develop four-year degree pathways for some technical programs (e.g., Construction Management). WVUP leveraged this relationship to share resources across the consortium, including an online bachelor's degree that was completed through the grant. This program enabled students with an associate's degree to transfer to WVUP with all credit hours counting toward the bachelor's degree. See the *Four-Year Degree Offerings* highlight for more information.

Four-Year Degree Offerings

The college led efforts to develop curriculum that would transfer to four-year institutions such as WVU and to develop an online degree that could be utilized across the consortium (and lead to a 4-year degree). The four-year degree options were developed to encourage students to complete higher degrees through increased accessibility. Development of these types of opportunities will continue beyond the grant.

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[92] For more information, please see: http://www.wvup.edu/about/about-wvu-parkersburg/historyprofile/

PROJECT ELEMENTS

The content within this section of findings focuses on research questions grouped around the common components of project elements. These findings discuss the accelerators, barriers, and environmental factors that affected grant success and progress.

Research Questions

- What have been accelerators and obstacles to program performance?
- What barriers hindered output achievement? What factors unexpectedly improved output achievement? Why?

Accelerators and Strengths

Strengths and accelerators are defined as elements of BTG that positively affected program outputs, outcomes, and/or implementation. Program accelerators included:

- Programs Aligned to Industry Needs
- Ongoing Recognition of Non-Traditional Student Needs
- Purchasing Power of the Grant
- Stakeholder Investments and Partnerships
- Advanced Technology-Enabled Learning

Programs Aligned to Industry Needs

Developing programs within the defined industry sectors (Advanced Manufacturing, Energy, Construction, and Information Technology) that were built on the identified needs of industry employers was a significant priority of the grant. With this in mind, BTG colleges worked to establish a number of employer relationships early in the grant and/or leverage existing employer relationships to receive input on the skill gaps and needs in the identified industry sectors. Colleges worked to establish Advisory Committees and, later

> "Through these programs, we are able to see what [students] can do in their courses but also see what they can do for the profession."
> **Employer Partner**

in the grant, hosted additional partnership meetings to engage employers throughout the grant process. The information gathered from these meetings facilitated the expansion and enhancement of technical programs at the colleges.

The partnerships enabled the colleges to provide industry-recognized credentials and programs through direct requests from employers in their regions. With this, many colleges reported hiring commitments, equipment and monetary donations, and internships that resulted from partnerships with local employers. BTG colleges continue to be successful in offering technical programs that tie directly to needs identified by the target industries.

Ongoing Recognition of Non-Traditional Student Needs

BTG colleges reported ongoing recognition of non-traditional students' academic and support service needs, and regularly modified grant components to increase the flexibility, accessibility, and retention of these students in technical programs. For instance, many colleges reported utilizing block scheduling and cohort models to accommodate students with other obligations (e.g., children and jobs) as well as provide an additional support system within the program. Support services were enhanced at all institutions through the BEACON model, using peer coaches and counselors/advisors to guide and support students

throughout their educational experience.[93] Additionally, online, hybrid, and hands-on learning strategies were used to encourage content retention (i.e., students identified hands-on learning as critical in content retention and program success – see *Student Progress* for more information) and increase accessibility to course content for commuters and students with other obligations (e.g., children and jobs). With these enhancements, it was found that BTG program students, on average, earn degrees at higher rates.[94]

To further enhance BTG colleges' ability to meet the needs of students, Prior Learning Assessments[95] and the Guided Pathways to Success model[96] were implemented as consortium-wide initiatives. Prior Learning Assessments enabled the colleges to articulate prior work experience to college credit, including prior military experience. The Guided Pathways to Success explicitly outlined career pathways for students so they could understand job projections and trends in the industry, course requirements at the college, and approaches

> *"These students typically come with a lot of baggage. Our job is to take that baggage and help them get to where they need to go."*
> Support Service Staff

to expediting time to program completion. These initiatives and models, as well as the changes and adjustments made to programs, enabled BTG colleges to remain flexible in how programs were delivered to continually meet the needs of non-traditional students enrolled in technical programs.

Purchasing Power of the Grant

The grant funds enabled faculty, staff, and instructors to purchase the equipment and technology necessary to enhance and expand program offerings as well as facilitate the development of new programs. The ability to purchase equipment and technology currently used in the industry that were aligned with industry standards, empowered BTG college staff, faculty, and instructors to better accomplish the objective of employing non-traditional students in high-skill, high-wage jobs.

College faculty, staff, and instructors emphasized the importance of purchasing updated and industry-relevant equipment that provided students with hands-on experiences, increasing their marketability and employability. BTG colleges used the grant funds to facilitate discussions with local employers regarding relevant equipment, as well as skill gaps and education needs. As reported by staff, many of these discussions resulted in meaningful partnerships with employers. Without the USDOL-issued TAACCCT grant, BTG college staff, faculty, and instructors emphasized that they would have been unable to enhance and expand programs as well as develop new programs at their institutions.

Stakeholder Investments and Partnerships

Many of the colleges worked early in the grant to identify strategies for encouraging stakeholder investments and participation in BTG development. During the grant period, the state implemented a workforce development initiative – Sector Strategies – to encourage colleges to revisit stakeholder engagement at their institutions.[97] The initiative sought to bridge educational institutions and regional employers in a strategic and targeted way, encouraging partnerships that last beyond the grant period.

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[93] This model is described in greater detail in the *Grant Elements and Activities* section.
[94] For more information, please see the *Impact Evaluation* section.
[95] Prior Learning Assessments are described in greater detail in the *Grant Elements and Activities* section.
[96] For more information about this model, see
http://doingwhatmatters.cccco.edu/Portals/6/docs/Building%20Guided%20Pathways%20to%20Success%20-%20EAB%20Report%20FINAL.pdf
[97] For more information, please see: www.wvedc.org/assets/images/headers/WVEDC_Leg_2015_-_M_Julian.ppt

Through this partly grant-funded initiative, rethinking employer and community engagement was a goal of the grant; therefore, many colleges aligned these efforts.[98]

Colleges reported leveraging previous relationships with employers and faculty with industry experience to expand employer partnerships. Local employers, community leaders and organizations, and workforce systems offered donations (e.g., monetary and equipment), established student professional experiences (e.g., internships) and hiring commitments, provided curriculum feedback, and assisted with participant recruitment. Colleges worked to establish Advisory Committee meetings and, later in the grant, hosted sector meetings to convene these partners and provide a forum for discussion. Partnerships with large companies afforded colleges the opportunity to develop training programs for employees and establish hiring commitments for technical program graduates. College leadership indicated that these partnerships and investments would likely contribute to the sustainability of technical programs beyond the grant.

Most notably, industry engagement was identified as a significant priority of the grant and an area where colleges experienced an important benefit. Colleges reported using grant funds to make connections with new industries, which are anticipated to last well beyond the grant. For example, agreements were set up with local organizations and community leaders to attend Rapid Response meetings in an effort to recruit non-traditional student populations. Partnerships with local high schools enabled colleges to create a pipeline of students that could contribute to technical program enrollment, and relationships with local workforce systems enabled the colleges to expand non-traditional student recruitment through utilization of the workforce system's databases and networks. The partnerships established with and investments provided by local employers, high schools, workforce systems, and other organizations afforded BTG colleges the opportunity to enhance and expand programs, and other grant components (e.g., career services) in a way that was tailored to the needs of the stakeholder.

Advanced Technology-Enabled Learning

Unlike traditional classroom settings (i.e., lecture-style), the BTG project targeted advanced technology-enabled learning such as hybrid courses as well as hands-on and blended learning to engage non-traditional student populations. This structure enabled students to transform classroom content into meaningful learning experiences through hands-on experience, and hybrid and blended learning. For example, in Information Technology programs, hands-on learning typically involved simulations and working directly with computer hardware and software. For Advanced Manufacturing programs, hands-on learning involved working on equipment used in the industry (e.g., welders and robotics). The hands-on and blended learning content was reported by students as easier to retain and more applicable to the needs of the industry. The hands-on content also increased the marketability of students as employers identified this type of learning as a significant factor in their decisions to hire BTG students.

> "With our equipment and hands-on coursework, we were able to put the technical back in technical college."
> **Program Instructor**

The hybrid formats empowered non-traditional students to take control of their education by accessing content outside of the classroom. For these students, accessing online components allowed many non-traditional students to maintain their external obligations (e.g., children and jobs) while still attending courses. The use of these technology solutions afforded BTG colleges the opportunity to bridge hands-on

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[98] For more information, please see: www.wvedc.org/assets/images/headers/WVEDC_Leg_2015_-_M_Julian.ppt

experience with online and traditional classroom learning, while incorporating technologies that were used by employers in the industry.

Barriers and Challenges

As with any grant program, several factors hinder or slow grant progress. For BTG, these included a range of elements from student completion and demographics, to sustainability and communication. These challenges included:

- Federal- and State-Level Communication
- Recruiting Qualified Personnel
- Student Completion and College Success
- Non-Traditional Student Demographics
- Sustainability of Grant Components

Federal- and State-Level Communication

During the initial stages of the grant, BTG colleges reported uncertainty regarding grant components, deliverables, timelines, expectations, and terminology from both the state and Federal Government. WVCTCS and BTG colleges also reported inconsistencies and lack of information concerning tracking participants, participant definitions, grant implementation regulations, and grant spending protocols from the Federal Government. The need for clarification of grant components, requirements, regulations, and expectations influenced the colleges' abilities to plan

> "We were trying to get everything to everyone [WVCTCS and USDOL] but things were so unclear we didn't know what to do."
> Grant Staff

efficiently and appropriately, according to interviewed college staff. While WVCTCS worked to inform the consortium of how their grant progress compared to expectations through quarterly meetings, updated goals documents, the online project management tool Teamwork, and other more informal methods, BTG colleges reported that the uncertainty during the initial stages of the grant created delays in grant design and implementation. Uncertainty and changing guidelines was also a challenge for WVCTCS as federal regulations and guidance were released after implementation of specific grant components compelling the state and consortium to regress.

Additionally, WVCTCS and the BTG colleges indicated ambiguity regarding federal regulations and requirements, especially around grant spending, persisted throughout the life of the grant. Colleges struggled to develop budget plans that complied with federal requirements and processes for modifying those plans were lengthy. While the colleges and WVCTCS indicated a number of lessons learned from this process, clarity and consistency from the beginning could have alleviated some of the challenges that WVCTCS and the BTG colleges faced throughout the grant.

Recruiting Qualified Personnel

BTG college staff continually emphasized the challenges associated with locating and recruiting qualified and knowledgeable instructors and faculty to develop curriculum, course structures, and schedules; identify industry needs; connect with local employers; and teach BTG technical program courses. Many candidates had limited availability or were not willing to instruct courses on weeknights and weekends, which were structured to accommodate non-traditional students that had jobs and/or families. Interviewed college leadership indicated that qualified candidates were typically employed in the industry and were not interested in accepting cuts in salary and benefits.

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For other BTG personnel, challenges in recruiting grant-funded support service staff emerged during Year 1, as many candidates reported they were not interested in short-term positions. With this challenge, many of the colleges decided to use existing staff to fill these positions, adding a significant amount of responsibility to their already full-time workload. For candidates that accepted grant-funded positions, significant turnover occurred toward the end of the grant, as many staff were unsure of whether or not their position would be sustained beyond the grant.

Because of the challenges associated with recruiting personnel at the BTG colleges, programmatic development and progress was delayed as the colleges needed to hire personnel before proceeding to the development phase. College staff reported that the delays caused by not having these personnel on board resulted in additional delays in sustainability planning, which later facilitated the turnover of grant-funded personnel at the college toward the end of the grant.

Student Completion and College Success

BTG college faculty and instructors indicated a trend among non-traditional learners of obtaining employment prior to program completion. Many non-traditional students reported a need for accelerated education to enter back into the workforce as quickly as possible. These students typically indicated that they were laid off, had family obligations, or both and relied on a steady income. While the technical programs were developed to address this need of accelerated education among the non-traditional learner population, even the accelerated programs experienced challenges with retention.

Challenges with student retention were an issue for both the program and the college. Most college funding (e.g., federal funding) is contingent upon enrollment and completion numbers. Therefore, colleges rely on this data to determine future sustainability of technical programs. However, technical programs typically struggle because students receiving the training they need to enter back into the workforce are sought after by employers that recognize the training as addressing a need in their company. Because of the opportunities that students are exposed to in the technical programs (e.g., company tours, job fairs, and networking events), employers are made aware of the talent at the community and technical colleges and offer students enrolled in those programs full-time jobs. In many instances, this job offer can come in the middle of a student's program and rather than wait until completion, the student is inclined to accept the offer. While this is deemed a success to the students, faculty, staff, and instructors at the college, the state and Federal Government must look to completion data to make funding decisions.

> "We want students to get jobs but when they do, they upset the completion part [because they do not complete the program]."
> **Program Instructor**

Completion numbers do not fully capture the impact of technical education on non-traditional students. This has been a challenge for colleges across the U.S. as they attempt to shift the conversation through success stories, urging the state and Federal Government to change their definition of success. See *Future Program Implementation* for more information.

Non-Traditional Student Demographics

Grant staff and faculty reported challenges in engaging, accommodating, and retaining the target population for the grant – non-traditional, adult learners, and TAA-eligible individuals. The demographic of students targeted through the grant were typically recently laid off, unemployed, or employed with a need for upskilling. Additionally, many had external factors affecting their ability to pursue and complete

education (e.g., children, full-time jobs, and little money for tuition). While the grant was structured to reduce those barriers through short-term training programs and intrusive support services, grant staff emphasized the challenges associated with engaging this population and accommodating the challenges students were facing outside of the classroom. Colleges reported accommodating these students in a number of different ways (e.g., block scheduling, online courses, and intrusive advising) but inevitably, not all students were able to persist through their program of study. These findings align with the Impact Evaluation. While BTG program students earn degrees at a higher rate, on average, these students also accumulate fewer credits and drop out more frequently. The structure of BTG programs may permit students to leave programs earlier for a possible economic gain (i.e., job obtainment).[99]

Student service staff reported challenges in engaging non-traditional students in campus events, activities, and services. As noted above, with other responsibilities such as children and full-time jobs, grant staff indicated that it was difficult to engage these students beyond their course responsibilities. While interviewed students reported appreciation for the vast services available to them, many students did not utilize the services due to other obligations. Throughout the grant, support service staff worked to develop creative methods for engaging students (e.g., offering services during class times, proposing mandatory events, or reaching out to students individually to encourage participation) and plan to continue exploring other methods of engaging non-traditional student populations beyond the grant period.

Sustainability of Grant Components

For the BTG colleges, sustainability of grant components was an ongoing concern. With many of the colleges struggling to fund basic services and programs, sustainability beyond the fundamentals (programs and instructors) was a question from the beginning. While most colleges planned to sustain the BTG programs, there was uncertainty toward the end of the grant whether support services and grant-funded personnel would be absorbed into the colleges' budgets.

> "The embracing [of the BTG grant components] is not the issue, the resources are."
> Grant Staff

Additionally, many colleges emphasized sustainability challenges associated with grant timelines. Grant funding ended in March 2017, which fell in the middle of a standard semester.[100] In order to bring the final cohorts of students through to program completion, the programs, faculty, and many of the support services required additional funding beyond the grant period. The colleges recognized the positive affect of the support services, technical programs, and grant-funded staff on student achievement and success, but struggled with sustainability for all BTG components in many cases. This was a significant challenge reported by many BTG colleges, especially those that did not plan to sustain all grant components.

Overall, the uncertainty of sustainability for grant-funded staff led to significant turnover within the consortium, as reported by grant staff and leadership. Grant-funded staff accepted full-time positions elsewhere (both inside and outside of the college). Staff turnover led to slower grant progress as well because grant leadership had to spend time locating and onboarding new staff, or taking on the responsibilities themselves. This uncertainty around sustainability created challenges for the grant project as a whole.

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[99] For more information, please see the *Impact Evaluation* section.
[100] While the grant received a six-month extension, even the original timeline (September 30, 2016) would have concluded during a traditional college semester.

Environmental Factors

In addition to accelerators and barriers, there were also several external factors within the environment surrounding BTG, which positively and negatively affected program implementation. These included:

- Regional Differences
- Geographic Accessibility
- TAA Population
- Internet Accessibility
- Consortium Approach

Regional Differences

The nine community and technical colleges within the BTG consortium represent varying populations, industries, skill needs, and more. Many colleges reported difficulty in uniformly applying consortium-level solutions, which made collaboration around certain facets of the grant (e.g., student services) difficult. At the same time, these differences also increased the reach of the grant. For example, by allowing colleges to focus on different components of Advanced Manufacturing rather than attempt to apply the same solution to different needs, the State of West Virginia provided greater depth and breadth of Advanced Manufacturing training. The consortium was able to remain flexible but also find ways to collaborate and work together through the grant.

Geographic Accessibility

Much of West Virginia is rural, which caused challenges in student accessibility to BTG college campuses. Many interviewed students reported traveling over two hours to the college campuses.[101] While this acted as a deterrent for some students, staff from many colleges reported that those who made the commute were more committed to their education. Specifically, staff reported that the students that had longer commutes were more likely to persist through BTG programs and complete more successfully.

TAA Population

As confirmed by the USDOL Employment and Training Administration, the number of petitions awarded, workers covered, and TAA participants in the State of West Virginia decreased since 2012 – the start of the grant. This information is outlined in the table to the right:[102]

Because the number of TAA individuals decreased, it became more of a challenge for BTG college staff to target these individuals in their recruitment and outreach efforts. Even with assistance from the local WDBs, this population was reportedly challenging to recruit and locate. College staff indicated that despite these efforts, the number of TAA individuals enrolled at the college was less than expected. The decreasing presence of TAA individuals may not have directly affected grant progress, but it did create challenges in

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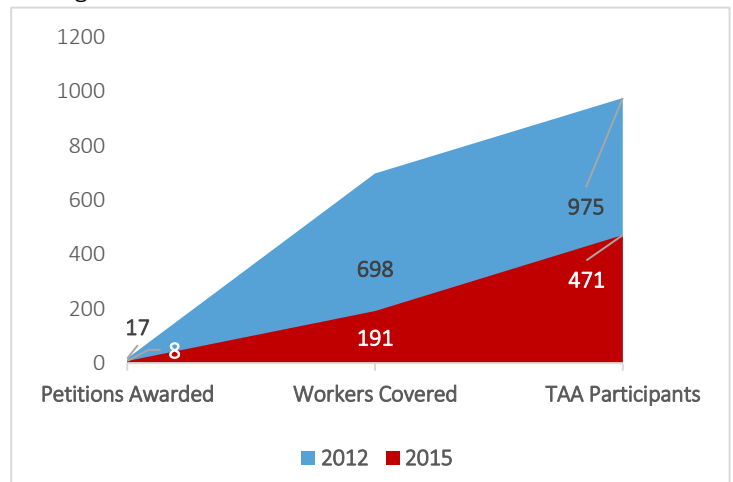
[101] It is important to note that the sample of interviewed students may not reflect the student population as a whole. However, the lengthy commutes were worth noting.

[102] Retrieved from: https://www.doleta.gov/tradeact/TAPR_2015.cfm?state=WV

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recruiting this population – a target for the TAACCCT grant. To counteract this challenge, colleges recruited other non-traditional and adult learners for technical programs through targeted recruitment efforts. These non-traditional student populations were also a focus of the grant, and colleges reported recruiting these individuals successfully.

Internet Accessibility

As indicated in interviews throughout the grant, students in rural parts of West Virginia typically did not have Internet access to complete online coursework. Although 63 percent of all West Virginia households have some form of access to the Internet, the state ranks 48th in the percent of the population with access to broadband at home.[103] Many students reported a preference toward online education but had to travel lengthy distances to BTG college campuses to access the Internet for their studies. See the *Geographic Accessibility* section for more information. Of those students that had Internet access, instructors indicated that for some programs, the hands-on nature of the work did not always translate well to online curriculum (i.e., students needed to be in class with the instructors to receive feedback and guidance). While college leadership reported that Internet accessibility did not affect student enrollment, in some cases, approaches to student learning (e.g., remote, online, and hybrid learning) had to be revisited.

Consortium Approach

Similar to the *Regional Differences* section, approaching a federal grant as a consortium has advantages and disadvantages. When developing a consortium grant, by nature, there needs to be a single, high-level approach (e.g., utilizing the BEACON model and addressing developmental education with the co-requisite model). Institutions within the consortium then align to fit within that approach, despite the differences within their institutions (e.g., student population, college culture and environment, and geographic differences). BTG staff reported that this was challenging and worked to navigate how to align the BTG grant and their college's internal policies and priorities, while also addressing changes in the external environment. For many BTG institutions, navigating and sometimes seeking to bring change to the college's internal policies and cultures were ongoing sources of delay for grant implementation.

Alternatively, taking the above approach also enabled colleges within the consortium to collaborate more easily. With institutions implementing similar components, they were able to share resources, discuss obstacles, and potential solutions, rather than remaining siloed. Institutions collaborated in a way that they likely were not before, which would have been more challenging if each institution had its own separate grant project approach. Many BTG institutions reported collaborating with other institutions in a meaningful way that would likely continue beyond the grant.

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[103] West Virginia Center on Budget and Policy: http://www.wvpolicy.org/downloads/Broadband102411.pdf

STUDENT PROGRESS

The student-centered approach to the development of grant components – support services, technical programs, developmental education, industry engagement, and recruitment strategies – facilitated a focus on student progress in the evaluation. The findings within this section highlight elements of student progress including student feedback and perspectives.

Research Questions

- How satisfied are participants with the program? Why?

Student Perspectives

Interviewed students reported overall satisfaction with the course and program offerings as well as support services offered at the BTG colleges. More specifically, students indicated satisfaction with the following:

Mixed learning environments – Interviewed students continually reported an appreciation for the mixed teaching methods (i.e., blended, hybrid, online, and simulated learning environments). The ability to learn content in the classroom or online and practice the material through hands-on opportunities (e.g., internships and simulations), was a reported selling point for students and helped them retain course content easier. Interviewed students recognized that the colleges accommodated their needs by offering online courses as many students commuted long distances and/or had other obligations (e.g., children and jobs).

> "It's nice to see [the equipment] in front of you. You learn how to use it in different situations and that's really important."
> **Program Participant**

For non-traditional, adult learners with previous industry experience, students indicated that the hands-on components played a significant role in their return to college. These students understood the importance of obtaining relevant knowledge and skills needed in the industry for future employment. Interviewed students reported that the structure of technical programs at the colleges facilitated their transition into post-secondary education.

Attentive and experienced faculty and instructors – The attentiveness and experience of BTG technical program faculty and instructors was valuable to interviewed students. Many of the students indicated that discussions with the faculty and instructors prior to enrollment influenced their subsequent decision to enroll. Students reported faculty and instructors as knowledgeable and attentive to the students' needs and career goals, guiding students through their educational experience and providing networking opportunities with local employers to support student employment upon program completion.

> "Every instructor cares about you and your goals. They were the reason why I enrolled after talking to them about the program."
> **Program Participant**

Ample employment opportunities – Through the BTG grant, the most in-demand and growing industry sectors in the state were identified as a focus: Construction, Energy, Information Technology, and Advanced Manufacturing. These sectors had the most promising projections for growth in the coming years, providing students with many opportunities within the various industries. Each BTG college developed programs within a combination of these four sectors that reflected the needs of the industry in their region. With this approach, colleges reported increased job placement outcomes and other opportunities for students (e.g., internships).

Interviewed students recognized the in-demand employment opportunities in the region and chose to enroll in BTG-funded programs that reflected those regional needs. Students sought after programs in industries with ample job opportunities to help provide stable employment moving forward. Interviewed students reported that the employment opportunities available following completion of BTG-funded programs helped justify returning to college.

Extensive student support – BTG facilitated an overhaul of student support services at each of the colleges. With this, many BTG colleges experienced a significant expansion of services provided at their institutions including the implementation of peer coaches and counselors/advisors. These changes empowered the college to refocus services on innovative strategies supporting student success and retention. The colleges practiced a one-on-one, student-centered approach to support services, guiding each student individually through their educational experience. Students noted the student-centered approach and vast expansion of services provided at the colleges as a significant contributor to their success in BTG programs. Interviewed students indicated that the regular and ongoing guidance received by peer coaches and counselors empowered students to succeed in their respective BTG programs. Students reported that they felt comfortable discussing their concerns and challenges with the peer coaches, and peer coaches indicated guiding students back to a path toward program completion because of the open relationship.

> "If I didn't have that support person with me, I don't think I would be here right now."
> **Program Participant**

PARTNER ENGAGEMENT

The content within this section is focused on partner engagement and perspectives. Throughout the course of the grant, the Evaluation Team interviewed multiple employers and discussed partner engagement with BTG staff and leadership.

Research Questions

- How satisfied are program partners with the program? Why?
- What contributions did each of the partners (employer, workforce system, other training providers and educators, philanthropic organizations, and others as applicable) make in terms of: (1) program design; (2) curriculum development; (3) recruitment; (4) training; (5) placement; (6) program management; (7) leveraging of resources; and (8) commitments to program sustainability? What factors contributed to partners' involvement or lack of involvement in the program? Which contributions from partners were the most critical to the success of the grant program? Which contributions from partners had less of an impact?

Partner Perspectives and Contributions

Interviewed partners reported that the revised approach (i.e., targeted, strategic, and regular engagement) to engaging employers and community partners was a significant project strength. This revised approach focusing on sector strategies was a statewide workforce development initiative that worked to break down silos in the region between educational institutions and business, and facilitate long-lasting relationships among regional partners. Partly grant-funded, this initiative prompted the colleges to rethink employer and community engagement – a goal of the TAACCCT grant.[104]

Interviewed employers indicated that the forum developed through targeted and strategic engagement enabled them to share their needs and determine the most promising partnership opportunities for both the college and employer. While some employers had previously worked with the college, many still emphasized an appreciation for the revised engagement structure and implementation of technical programs. Many of the technical programs were a new focus area for the college, or a revamped area, facilitating expanded partnerships with employers in the region as they were interested in the updated equipment and curriculum that could produce quality employees. Interviewed employers reported satisfaction with BTG throughout the course of the grant.

Partner engagement in the development and implementation of the BTG project primarily took four forms:

Partner meetings – Throughout the grant, colleges met regularly with stakeholders from different sectors to increase BTG program relevance to employer needs and provide students with in-demand skillsets. Through these meetings, BTG college staff elicited curriculum input, discussed skill gaps and needs, and shared resources (e.g., offering customized training programs to employees) to make ongoing technical program improvements. The ability to meet with employers in the region to determine their needs and discover ways for the college to meet those needs was reported by many BTG colleges and partners as a significant success.

> "I feel I can be more involved in these programs and with the institution than with four-year schools."
> Program Partner

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[104] For more information, please see: www.wvedc.org/assets/images/headers/WVEDC_Leg_2015_-_M_Julian.ppt

Student placement and work experience – Through partnerships with local employers and community partners, all BTG colleges were able to establish hiring commitments; internships, apprenticeships, and other work-based opportunities; and/or company tours and events (e.g., career fairs) for students. These resources and agreements enabled BTG colleges to offer students relevant work experience, improving the likelihood of student placement with these companies. The relationships built with employers over the course of the grant created a pipeline of students that would receive credentials, certificates, and degrees from the college and move into employment. Colleges were able to connect students with job opportunities, a goal of the grant, and employers were able to access quality students for internships and employment.

> "For aging professions, there isn't an avenue for people coming in, but this college fills that and puts people in those trades."
> Program Partner

Donated resources – A number of employers and community partners donated funds and equipment to the BTG colleges. The donated resources and supplies (e.g., program-specific equipment such as Computer Numerical Controls program equipment, and general program supplies such as computers) enabled the colleges to offer training that was relevant and in-demand for the employers and other partners in the region.

Employee training programs – Many colleges indicated that the donated equipment and supplies from employers in the region helped the college implement the BTG program and subsequently offer customized training programs for those employers. Employers that provided donations often reported feeling invested in the BTG technical programs and would expand upon those partnerships in different ways. For instance, some BTG colleges reported that the partnerships with local employers resulted in tailored training programs for employees, with curriculum developed specifically for these partnerships. Donated resources and customized training programs provided a foundation for the program's sustainability – a point that was emphasized by many BTG colleges.

> "We want to make sure our employees have the skills they need and this school gives them that – it strengthens the workforce."
> Program Partner

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BEYOND THE GRANT

The following research question addresses considerations for BTG once grant funding ends. These findings center around sustainable change created as a result of the grant and recommendations for consideration should another educational institution chose to implement a program similar to those found at BTG.

Research Questions

- How can program processes, tools, and/or systems be modified to improve performance?

Program Sustainability

Reflecting over the grant period, college leadership, staff, faculty, instructors, and administrators indicated satisfaction with the grant. All individuals recognized the importance of the grant in expanding and enhancing training programs and academic instruction as well as support services at their institutions.

College leadership and staff anticipated continuing to implement and improve the training program offerings at the colleges to continually serve the needs of the students moving forward. Colleges also anticipate continuing to provide and expand support services[105] as well as employer partnerships to facilitate future success and sustainability. Additionally, BTG colleges plan to continue implementing statewide initiatives such as Prior Learning Assessments, the co-requisite model to developmental education, and Guided Pathways to Success.[106]

College leadership and staff reported satisfaction in several areas including positive experiences of participants[107] and of employers and other partners,[108] and sustained changes from the grant. The following are legacies of the BTG project:

- College Capacity Building
- Sector Strategies Enhancements
- Support Services Expansion
- Positive Student Outcomes
- Community and Technical College System Collaboration

College Capacity Building

Through BTG, the colleges reported the ability to examine internal operations and processes in order to identify areas for improvements. The grant led the colleges to launch technical programs, update program equipment, better focus outreach strategies, implement innovative programming and delivery models, enhance support services, expand sector strategies, and remodel developmental education. BTG colleges reported being able to recognize the gaps in services and programming, and leverage BTG to fill those gaps through innovative programming and service models.

The increased college capacity resulted in positive student outcomes, as reported by BTG grant staff. Most colleges reported increased retention/persistence, enrollment, engagement, completion/graduation, and student commitment to education. Grant staff emphasized that the capacity to examine internal operations

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[105] While not every college is sustaining peer coaches, colleges reported utilizing the best practices gathered from the BEACON model to continue to expand support services beyond the grant.

[106] These initiatives are discussed in greater detailed in the *WV BTG* section.

[107] Seen throughout *Accelerators* and *Impact* sections.

[108] Seen throughout *Accelerators* and *Employer Partners* sections.

and make positive improvements was beneficial to the colleges and students, and will likely continue beyond the grant.

Sector Strategies Enhancements

Sector Strategies was a statewide workforce development initiative that involved all BTG colleges and encouraged more strategic and targeted employer engagement. The framework for Sector Strategies included engagement with industry as well as other community organizations such as workforce boards, human service organizations, and economic development organizations. Many colleges noted the implementation of Sector Strategies (i.e., targeted and strategic engagement) as the most significant success of BTG. The BTG colleges relied on employers for program-related donations (e.g., monetary and equipment), workplace experience for students (e.g., through internships, Learn-and-Earn opportunities, and apprenticeships), providing students with job opportunities upon program completion, and understanding the industry (e.g., through curriculum reviews and discussions). The implementation of Sector Strategies enabled the colleges to promote continuous dialogue between business and industry, address current and emerging skill gaps and needs, better align state programs serving employers, maximize economic opportunities, and provide a means to engage directly with industry.[109]

Enhancements made to career services were facilitated by the implementation of Sector Strategies (i.e., targeted and strategic engagement). The connections and partnerships made with local industry through this initiative enabled the colleges to establish more opportunities for students (e.g., internships, Learn-and-Earn opportunities, apprenticeships, and hiring commitments). Interviewed staff reported that these opportunities increased job placement rates at many colleges within technical programs, strengthening the effect of career services at the BTG institutions.

Colleges also reported that this framework significantly expanded the college's engagement with the community, increasing the referrals to the college, name recognition in the community, resource sharing, collaboration, and participation in both college and community events.

Support Services Expansion

The colleges made a variety of changes to student support services offered at their institutions through the BTG grant. These changes included the implementation of the BEACON model, intrusive advising, co-requisite model for developmental education, and enhanced career services with additional opportunities for students (e.g., Learn-and-Earn). The expansion of services enabled the colleges to offer more one-on-one guidance to students, which grant staff noted was beneficial for non-traditional students in particular.

The new support models enforced a more action-oriented approach to engaging students in their education. The BEACON model encouraged peer coaches to act as a liaison between new students and the institution. These coaches guided students from the enrollment process to program completion.[110] Students reported that having a peer to confide in helped them persist through the program.[111]

Additionally, intrusive advising encouraged faculty and staff to actively engage students through regular communication, involving and motivating students to seek help when needed.[112] Grant staff noted that this

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[109] For more information, please see: www.wvedc.org/assets/images/headers/WVEDC_Leg_2015_-_M_Julian.ppt
[110] For more information, please see: http://www.mctc.edu/student-services/beacon-project/peer-coaches
[111] See *Student Progress* section for more information.
[112] For more information, please see: http://undergraduate.wvu.edu/for-faculty-and-staff/academic-advising-council/academic-advising-development-collaborative

model enabled students to recognize the challenges they were facing and seek guidance from college faculty and staff.

Positive Student Outcomes

Through BTG funding, all colleges reported positive student outcomes including retention, completion, graduation, and job placement. Colleges also indicated increases in enrollment since implementation of the revamped/new support services and technical programs. Because college funding and sustainability of new initiatives was contingent upon positive outcomes and enrollment numbers, WVCTCS and college leadership reported that the data was critical to the college's ability to sustain services and programs moving forward. While these outcomes may not completely capture the effect of technical programs and support services on non-traditional/adult learners, the positive outcomes colleges reported were valuable for sustainability discussions. See *Barriers: Student Completion and College Success* and *Future Program Implementation* for more information.

Interviewed grant staff indicated that the implementation of the BEACON model, intrusive advising, co-requisite model, and technical programs empowered the colleges to better focus on student needs. Additionally, the refocus within the consortium, facilitated through grant funds, helped put the state of West Virginia at the forefront of educational innovation according to grant staff and leadership.

Community and Technical College System Collaboration

Since the BTG grant, WVCTCS and BTG college leadership reported enhanced collaboration and opportunities for collaboration across the consortium. This collaboration included sharing resources (e.g., curriculum and equipment), discussing curriculum, and sharing information to solve consortium-wide and/or institutional-level problems. The increase in collaboration was noted as a direct result of BTG and colleges anticipated continuing and strengthening this collaboration beyond the grant.

WVCTCS emphasized the importance of system collaboration in implementing statewide initiatives and maintaining cost efficiency through resource and information sharing. For example, institutions that may not have the capacity to develop curriculum utilized the assistance, guidance, and curriculum from other system colleges to expedite the process at their institution. BTG colleges expect positive outcomes from the ability to collaborate with other institutions in the state moving forward.

Future Program Implementation

BTG college leadership, staff, instructors, and faculty identified the following recommendations and best practices for an educational institution and/or consortium considering implementing projects similar to BTG. It is important to note that these recommendations were drawn from promising practices utilized within the consortium as well as lessons learned that were identified by the colleges and leadership. These promising practices fall into three general categories – considerations for educational institutions, consortia, and the Federal Government.

Considerations for Educational Institutions

- Plan College-Level Implementation Strategically
- Ensure College Buy-In Prior to Implementation
- Focus on Sustainability Early in the Grant
- Examine Potential for Specialized Staff
- Identify and Engage Target Employers and Community Partners
- Develop Basic Marketing Plan Prior to Program Implementation
- Create Implementation Plan Prior to Roll-Out

Considerations for Consortia

- Ensure Diverse College Involvement in Grant Design
- Provide Opportunities for Consortium Collaboration
- Discuss Funding Structure Options Prior to Grant Proposal Development

Considerations for the Federal Government

- Modify Federal Definition of Success
- Realign Grant Timelines to Standard Semesters

Considerations for Educational Institutions
For Starting or Adapting BTG

Plan College-Level Implementation Strategically

Federal grants require a significant time commitment from the participating colleges and staff, especially during the initial planning and design phases. College buy-in, programmatic development, departmental consultation and collaboration, and the majority of hiring must take place during the initial stages to provide ample time for grant implementation. For many grants, however, the planning phase is delayed both by internal and external processes (e.g., internal hiring and external coordination). These delays reduce the time to establish a plan, to generate administrative and college buy-in, to determine next steps, and to engage appropriate staff and faculty. With reduced time to plan and design, college implementation may be disjointed and inefficient moving forward.

To reduce this, colleges could enact a task force that would include representatives from all relevant departments as well as leadership to increase buy-in, streamline internal processes, and provide an all-encompassing approach to implementation. The task force could enable the college to evenly distribute the work of implementing a grant, ideally expediting time to completion of deliverables. In general, taking a more strategic approach to grant implementation is critical at the college-level.

Ensure College Buy-In Prior to Implementation

College, faculty, and community investment in new grant projects is significant when considering grant success. Discussions with key representatives from these areas could help the grant development team determine if there is truly a need for the proposed project and in what ways it makes sense to work and

communicate with the college, faculty/instructors, and community as a whole. Engaging these individuals from the beginning could expedite program development and implementation, as these entities are already aware of the grant components and activities as well as their role in the project.

Focus on Sustainability Early in the Grant

A focus on sustainability early in the grant enables staff to build sustainable practices moving forward. For example, staff could be more likely to consider sustainability when making decisions regarding program development and implementation (e.g., staff hiring, program capacity) when a plan is put in place early in program design. An early focus on sustainability encourages grant staff to develop program goals (e.g., enrollment and revenue), which could better help the college gauge grant progress and make ongoing adjustments to better support program sustainability. Solidifying these practices early can help support future sustainability of grant programs.

Examine Potential for Specialized Staff

Colleges can consider the feasibility of hiring specialized grant staff upon award of a grant or other program funding. Funders, such as USDOL, have various financial, reporting, and monitoring requirements, in addition to the overall project management required of grant initiatives. Hiring staff that specialize in one or multiple of those areas could alleviate the burden from individuals that are already serving in multiple roles (e.g., grant faculty and college staff) and/or may not have grant-specific knowledge or expertise. For example, a grant staff person could commit their time to regular reporting, tracking grant expenditures, submitting budget and grant modifications, monitoring compliance and adherence to grant components, and/or overall project management and goal tracking.

Creating more specialized roles within a grant, while problematic (e.g., temporary positions are difficult to hire and sustain), could help the college meet grant deliverables and timelines more efficiently and maximize grant funds for programmatic development. While colleges should consider the delays in locating and bringing on new staff, hiring a staff person to dedicate time to the various grant requirements could be a valuable addition to the college's grant implementation team.

Identify and Engage Target Employers and Community Partners

Identifying priority industry sectors and the key regional employers within these sectors is critical to program enrollment, curriculum development, and post-program student employment. This allows the college to actively target and engage regional employers in identifying program gaps and curriculum enhancements as well as increase student enrollment. Employers understand the job market, skillsets needed for the job and new and emerging trends within the industry. Engaging employers to provide this feedback to the college will strengthen college programming and increase the competitiveness of program graduates. In addition, engaging employers through internships, informational sessions, job fairs, and facility tours increases student and faculty understanding of industry needs and can build ties between students and industry that are beneficial for student job placement.

Additionally, recognizing potential partners in the community (i.e., city councils, high schools, and other organizations) can be beneficial in generating community buy-in for educational programs. Community investment in new programs can aid in student enrollment, program development, and sustainability (e.g., financial assistance). Establishing these partnerships early in the grant affords the community partners the opportunity to participate in program design, development, and implementation, which can increase investment in the programs (i.e., increased investment through strong participation).

Develop Basic Marketing Plan Prior to Program Implementation

Marketing and recruitment efforts are beneficial to enrolling sufficient students to sustain program implementation and future improvements. A basic outline of a marketing plan prior to program implementation could allow staff to develop tangible goals and action items for achieving those goals. The marketing plan could include general avenues for marketing (e.g., brochures, radio, newspaper, etc.) and encourage staff to find the most efficient ways to reach the target population. Educating themselves on the target population could promote better marketing practices as the programs launch and expand. Along with general goals and marketing avenues, the plan could also include target outcomes, timelines, and budgets.

Create Implementation Plan Prior to Roll-Out

An implementation plan includes setting goals and timelines, establishing concrete items to work from, and identifying staff and leadership ownership over specific components of the plan. A concrete plan can help promote progress and consistency in program implementation. A component of this plan could include establishing marketing efforts early in the program (as outlined above), and looking for early successes and employer "champions" who can serve as the programs' most significant partners.

Considerations for Consortia
For Starting or Adapting BTG

Ensure Diverse College Involvement in Grant Design

While it may be impractical to involve all relevant individuals in grant planning and design (e.g., grant staff may not yet be hired, and constrained writing timelines may prevent conversations with multiple individuals from each college), consulting with a variety of college departments when designing a consortium grant could be beneficial. Within consortia, there are a number of different college environments, economies, and cultures to integrate into one grant narrative. With this, feedback from different regions and college departments could be beneficial in structuring a narrative that encompasses as many of the colleges' needs as possible. There may be outlier colleges or unique college programs that are more difficult to integrate, but accommodating the larger need by gathering diverse perspectives to better understand the challenges at each college and better structure a solution could be a valuable process for other educational institutions considering applying for a similar large-scale grant.

Additionally, more diverse involvement in grant writing and design could help the participating colleges better understand the vision and purpose of the grant, thus generating buy-in early in the grant. This enhanced understanding and buy-in at the beginning could streamline grant activities throughout implementation. Involving diverse perspectives in grant design could be useful as colleges and consortia consider grant writing in the future.[113]

Provide Opportunities for Consortium Collaboration

Implementing a consortium grant requires a significant amount of coordination and collaboration to execute grant components consistently across the institutions and with fidelity to the original plan. Because institutions operate with different internal functions and have different landscapes (e.g., cultures,

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[113] It is important to note that involving diverse perspectives in the grant writing process may not always be feasible given the nature of the grant writing process (e.g., constrained timelines, specific grant requirements, etc.). In many cases, those involved in grant writing may not be involved in grant implementation. However, this could be a promising practice for other educational institutions to consider when applying for a similar large-scale grant.

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environments, and geographic locations), encouraging collaboration across institutions is critical. Not only can institutions share resources, expediting grant implementation, they can also share promising practices and innovative approaches within the group to help other institutions address challenges and obstacles.

Providing opportunities for consortium institutions to regularly collaborate throughout the grant period is essential to grant success. As an example, these collaboration opportunities can be offered as formal meetings on specific topics (e.g., employer engagement) or can be informal forums of discussion on general challenges and successes that each institution is facing. A subset of institutions could also meet to discuss implementation of a shared resource or could meet one-on-one to discuss other opportunities for collaboration (e.g., development of shared curriculum, identification of shared equipment, etc.).

Discuss Funding Structure Options Prior to Grant Proposal Development

Prior to grant proposal development, discussions around the funding structure could occur to lay the foundation for successful grant implementation. For example, consortium members could discuss ways to house the federal funding – one lead institution/entity or each individual institution – as there are advantages and disadvantages to both approaches. If each individual institution houses the grant funding for their institution, they are free to utilize the funds as they wish. The process for purchasing equipment and making changes, for instance, could be expedited as there is no "middle man." However, institutions could also change their implementation plan without coordination with the consortium and may not be held accountable for their fidelity to the original plan.

On the other hand, if one institution or entity held all of the funds, this entity could drive increased accountability for grant implementation. Additionally, if minimal progress or significant roadblocks occurred in a particular area, funds could be shifted to areas with more opportunity for expansion, thus enhancing the effect of grant funding. However, if changes to equipment, programs/curriculum, or staffing were requested, the process of approval could be lengthier. Institutions would be held to their internal processes as well as the process requested by the lead institution/entity, which could slow grant progress.

While there are advantages and disadvantages to both approaches, it would be best for institutions and leadership to discuss their preferences prior to grant proposal development to determine the optimal choice for their consortium.

Considerations for the Federal Government
For Starting or Adapting BTG

Modify Federal Definition of Success

The basic philosophy of a community college is to serve all students and provide the education needed to obtain employment and/or continue to a higher degree. While the USDOL grants were developed to expedite the time to completion for non-traditional learners, there is still disconnect between federal, state, and college definitions of success. More specifically, the Federal and State Governments look to enrollment and completion data to determine the success of a program/grant project. This is reflected in the types of information (i.e., participant outcomes) collected by the Federal Government to determine project success. However, this data can be misleading, as many non-traditional students may not complete a program due to obtaining employment during the program.

Often, colleges provide students with opportunities to network with employers and in addition to providing relevant training within the industry. As such, employers in the region may begin to recognize the college

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as a resource for obtaining quality employees and seek those students for employment. Because non-traditional student populations typically have other responsibilities (e.g., families and children), it is important for students to obtain employment as quickly as possible, which may occur during a program. This, however, can affect program completion numbers, which can also affect the college's eligibility for receiving additional funding – both at the state- and federal-level. While the colleges typically deem job obtainment as a success at any point in program enrollment, the enrollment and completion data misrepresent the effect of technical programs on non-traditional student populations.

The Federal Government has attempted to alleviate this misrepresentation using evaluation, which incorporates both qualitative and quantitative information. However, funding streams still heavily rely on this data to make decisions. Therefore, a top-down shift in the definition of success could better capture the effect of grant-funded technical programs on non-traditional, adult learners.

Realign Grant Timelines to Standard Semesters

Many colleges align programs with standard semesters, which is more straightforward from an administrative- and system-level. It is also more financially viable, as many colleges are unable to support the hiring of additional faculty and staff for special programs or administrative tasks (e.g., integrating program data with the college's learning management system). While most colleges adhere to a standard term/semester, federal grant timelines do not typically align with the college terms. This misalignment creates challenges with design and planning, hiring personnel, launching grant components, and sustainability.

As an example, if a college is awarded a grant during the summer semester, implementation will likely be delayed as faculty and staff may not be contracted through the summer. Therefore, hiring, designing, and planning are delayed a semester, which can have a negative effect on implementation for the remainder of the grant. Additionally, if a grant ends in the middle of a college's semester, the college will likely need to sustain the grant components through the end of the semester to support successful student completion of the grant-funded programs. For many colleges, supporting and maintaining programs, services, and personnel beyond the grant is infeasible. Realigning grant timelines to standard college semesters could have positive implications for colleges as they begin to navigate federal grants and design grant programs and services.

IMPACT EVALUATION

IMPACT EVALUATION

DESIGN SUMMARY

Purpose and Background

The purpose of the Impact Evaluation was to assess whether the implementation of Trade Adjustment Assistance Community College and Career Training (TAACCCT)-funded programs at *Bridging the Gap* (BTG) consortium colleges improved student persistence, completion, and short-term employment outcomes, using a quasi-experimental design (QED). As detailed in the Analysis Plan,[114] the Evaluation Team was interested in estimating the impact of BTG across all eligible academic programs that received TAACCCT funding.[115] That is, instead of gauging the impact of TAACCCT funding on a specific program, campus, or college, the objective of this Impact Evaluation was to estimate the average impact of BTG across the nine colleges that were part of the BTG consortium.[116]

The key challenge of an Impact Evaluation such as this is to identify how an intervention has affected participants without conflating it with alternative causal factors. Student educational and employment outcomes, after all, have not just been influenced by the features of the programs students attended, but by the students' background experiences, current circumstances, and personal attributes. The most effective way to ensure that these factors do not bias the program impact estimates is by random assignment of participants to treatment and comparison groups. Only through random assignment, can the Evaluation Team be certain that these background variables are balanced across the treatment and comparison groups (and therefore do not differentially influence outcomes). In the absence of random assignment, the Evaluation Team must rely on quasi-experimental techniques to synthetically create balance across these two groups.

The method employed in this evaluation was to compare students who enrolled in TAACCCT-funded BTG programs at a given college with another group of students who enrolled in the same programs (at the same college) before the institution received the TAACCCT funding. In cases when TAACCCT funding supported the development of new programs rather than modified existing programs, the Evaluation Team compared BTG students with students enrolled in a similar program at the same college.[117] By doing so, the Evaluation Team directly compared students who selected to participate in the same program (i.e., programs that were virtually identical, except for the intervention of TAACCCT funding).[118, 119] The assignment mechanism should not insinuate bias, because it is an external alteration to the program that will not likely change who elects to enroll in the program. Moreover, comparing the BTG program with the same program before TAACCCT-funded improvements were implemented is the most sensible contrast.

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[114] The Analysis Plan was developed in 2015 and outlined proposed data collection, design, and analysis procedures.

[115] BTG college leadership identified the programs at their institutions that were the recipients of TAACCCT funding.

[116] BTG as it was evaluated in the Impact Evaluation consisted of 48 (academic outcomes)/47 (employment outcomes) degree programs, offered across 19 campuses, within nine colleges. In the fall of 2014, Bridgemont Community and Technical College and Kanawha Valley Community and Technical College merged to become BridgeValley Community and Technical College. According to program staff, this was an administrative merge and did not affect the location of the programs that were included in the Impact Evaluation.

[117] For a complete list of BTG programs and comparison programs that were considered for the Impact Evaluation, see *Appendix D*.

[118] An alternative approach was to compare BTG program students with students from a different program at the same college. The Evaluation Team avoided this approach for two reasons. First, students who have selected into different programs are motivationally dissimilar. Second, it contrasts programs that not only differ in terms of the features of interest (i.e., TAACCCT funded versus not) but also in terms of the program itself. The evaluated contrast therefore is not the intervention of interest (e.g., TAACCCT improvements) but the intervention of interest plus the difference in programs. The net result is that any estimate of program impact is sandwiched with these selection effects and contrast confounds.

[119] The Impact Evaluation considered students who were newly enrolled in a BTG or comparison program.

The major complication and limitation to this approach is that it compares students who were exposed to different economic and contextual conditions. The Evaluation Team maintains, however, that these economic conditions were largely observable through inclusion of labor force statistics.

Design and Analytic Procedures

The research design and analytic procedures are detailed in *Appendix D,* however, an overview of the framework is provided in this section.[120] The Evaluation Team's approach was to first balance the analytic sample through a quasi-experimental approach. Specifically, the Evaluation Team used a two-stage procedure that matched treatment students (i.e., BTG students) with a group of similar students who enrolled in the same academic programs within a period of identical length, positioned similarly in the academic year (at a time up to two years prior to the start of BTG). The Evaluation Team then employed propensity score matching procedures to weight the analytic sample in order to maximize the equivalence of both groups on observed characteristics.[121]

The Evaluation Team assessed balance in the two groups by comparing BTG students and their matched comparison counterparts in terms of their background characteristics. Summary statistics of these baseline data before weighting suggest that the first-stage procedure has identified a comparison group that is comparable to the BTG group in terms of observed background characteristics. Summary statistics of these baseline data after weighting suggest that the analysis compared groups that are very similar. For more information on these findings, please se*e Appendix D.*

Analytic statistical models were constructed to estimate the impact of BTG. When outcome data were pre/post in structure (i.e., employment/wage outcomes), the impact of the defined intervention was estimated by way of a multilevel difference-in-differences (DID) method.[122] DID is a statistical technique that calculates the effect of an intervention by subtracting the average change observed for the treatment group from the average change for the comparison group.[123] When only post-program outcome data were available (i.e., educational outcomes), impact was estimated through a multilevel regression that modeled outcomes as a function of treatment status.[124] This statistical model estimates a treatment effect as the difference in post-intervention outcomes for both the treatment and comparison groups.[125]

Data for this study were collected from a variety of existing administrative sources and publicly available information.[126] Using this information, the Evaluation Team finalized definitions of key data to guide the future analysis. These definitions included:

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[120] The study design was detailed in the Analysis Plan submitted in June 2015; these details were reproduced in *Appendix D,* along with any additional relevant methodological information. Minor features of the analytic procedure changed and are noted in *Appendix D.*

[121] Guo, S., & Fraser, M. W. (2010). *Propensity score analysis: Statistical methods and applications*. Thousand Oaks, CA: Sage.

[122] Angrist, J. D., & Pischke, J. S. (2009). *Mostly harmless econometrics: An empiricist's companion*. Princeton, NJ: Princeton University Press. Schlotter, M., Schwerdt, G., & Woessmann, L. (2010). *Econometric methods for causal evaluation of education policies and practices: A non-technical guide* (Institute for the Study of Labor [IZA] Discussion Paper No. 3478). Available online: http://ftp.iza.org/dp4725.pdf. Antonakis, J., Bendahan, S. Jacquart, P., & Lalive, R. (2010). On making causal claims: A review and recommendations. *The Leadership Quarterly*, *21*, 1086–1120. Murnane, R. J., & Willett, J. B. (2011). *Methods matter: Improving causal inference in educational and social science research*. New York: Oxford University Press.

[123] For a detailed description of this method, see *Appendix D.*

[124] A randomized control trial (RCT) was deemed impracticable prior to the creation of the Analysis Plan.

[125] For a detailed description of this method, see *Appendix D.*

[126] The study relied upon three sources of data: (1) administrative data collected by the West Virginia Higher Education Policy Commission, (2) individual-level economic data from WorkForce West Virginia, and (3) contextual economic data from the United States Bureau of Labor Statistics. Detailed information about these data sources, variables received, variables created, data sharing agreements, and data manipulation and processing are provided in *Appendix D.*

- **Credits earned in target field:** (persistence domain) measured as the proportion of credits that a student earned toward the required number of credits for the certificate or associates degree indicated by their degree objective code in their first semester of enrollment.
- **Dropout:** (persistence domain) categorized if (1) the data indicate an official withdrawal, (2) the student has a gap of two or more semesters following enrollment and has no graduation data, or (3) the student exited the program and failed to enroll for two or more semesters following enrollment, and has no graduation data.
- **Degree acquisition in target field:** (completion domain) measured as the probability of earning a certificate or associates degree in their field as indicated by the student's degree objective code in their first semester of enrollment.
- **Change in employment status:** (employment domain) measured as the change in employment status from baseline (pre-enrollment) to one quarter post-exit from a BTG or comparison program. Employment is indicated if the individual has any amount of wages in the quarter(s) being measured.
- **Change in earnings:** (employment domain) measured as the change in wages from baseline (pre-enrollment) to one quarter post-exit from a BTG or comparison program.

In this study, the Evaluation Team operationally defined an academic certificate/degree as either the Certificate of Applied Science or the Associate of Applied Science degree. While these academic certificates/degrees are the degree end-points to each of the 48 programs of study included in the analysis, students may also earn many other industry-recognized, noncredit credentials.[127]

A more detailed account of the samples, data collection and data management procedures, variable construction, and analytic methods are described in detail in *Appendix D*. Summary findings from the benchmark analyses are presented in the *Findings Overview* section.

Research Questions

The Impact Evaluation's general hypothesis was that exposure to BTG should improve educational persistence, educational completion, and employment outcomes. It was anticipated that the enhanced academic instruction, student support, and career pathways would improve access to, support for, and motivation toward remaining in and graduating from target academic programs, which would be observable as improved persistence and completion outcomes. The Evaluation Team also hypothesized that, in addition to these educational improvements, placement enhancements, industry partnerships, and other improvements to career pathways would result in improved labor market outcomes for participating students. These expectations were formalized in the following five Impact Evaluation questions.

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[127] Some examples of these certifications include American Welding Society (AWS) certifications; National Center for Construction Education & Research (NCCER) certifications; National Institute for Metalworking Skills (NIMS) certifications; Siemens Mechatronics Systems certifications; The Association for Packaging and Processing Technologies (PMMI) certifications; International Society of Automation (ISA) certifications; CompTIA certifications; and Microsoft certifications. Early in the grant period, the Evaluation Team met with the West Virginia Higher Education Policy Commission (WVHEPC) to discuss potential data sources for the Impact Evaluation. WVHEPC confirmed that data on one- and two-year degree programs were collected in the main student dataset and the graduation dataset. While it appeared that WVHEPC collected data on less-than-one-year certificates in the skillset dataset, WVHEPC staff advised against using these data for the study, stating that the data were not compatible with the other datasets.

Educational Outcomes

- **Research Question 1:** (persistence domain) Did individuals who received the BTG intervention earn *more credits* than those in the retrospective comparison group who were in the same or similar programs of study but did not receive the defined intervention?[128]
- **Research Question 2:** (persistence domain) Did individuals who received the BTG intervention demonstrate lower likelihood of *dropping out* than those in the retrospective comparison group who were in the same or similar programs of study but did not receive the defined intervention?
- **Research Question 3:** (completion domain) Did individuals who received the BTG intervention demonstrate higher likelihood of *academic certificate/degree acquisition* in their target field than those in the retrospective comparison group who were in the same or similar programs of study but did not receive the defined intervention?[129]

Employment Outcomes

- **Research Question 4:** (employment domain) Did individuals who received the BTG intervention demonstrate higher likelihood of improving their *employment status* from pre- to post-program than those in the retrospective comparison group who were in the same or similar programs of study but did not receive the defined intervention?
- **Research Question 5:** (employment domain) Did individuals who received the BTG intervention demonstrate greater increases in *quarterly wages* from pre- to post-program than those in the retrospective comparison group who were in the same or similar programs of study but did not receive the defined intervention?

FINDINGS OVERVIEW

Sample Characteristics

Baseline statistics reported in the <u>Analytic Samples</u> section demonstrate that the BTG and comparison groups are comparable prior to weighting. This means that the first-stage matching procedures appear to have been successful at identifying a comparison group that is equivalent to the BTG group. The statistics for the weighted samples show that the analytic sample is exceptionally well balanced. Data also show that study participants are predominantly male and white, and a majority were either academically or economically disadvantaged when they entered college.

Research Question 1: Program Effect on Credit Accumulation

Findings from the benchmark analysis for Research Question 1 reveal that students who enrolled in TAACCCT-funded, BTG academic programs accumulated fewer of the required credits than comparison students who were exposed to similar programs that were not TAACCCT-funded. Model estimates presented in <u>Table 16</u> in Appendix D show that BTG participants accumulated about six percent fewer of the required credits within the study window than their comparison counterparts – a statistically significant difference.[130] As detailed in <u>Appendix D</u>, the Evaluation Team defined credit accumulation as a proportionate measure of total credits accumulated during the study period divided by the total number

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[128] For the benchmark approach, the Evaluation Team studied credit acquisition in the target field. This was an adjustment to the original research question. See <u>Appendix D</u> for details on the operationalization of outcome variables.

[129] Due to data availability limitations, the Evaluation Team was limited to including certificate and associates degrees in the analysis of Research Question 3.

[130] Hedges' g=-0.213.

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of credits required to achieve the relevant academic certificate/degree.[131, 132] Figure 6 (below) illustrates the results.

Figure 6: Estimated Effect of BTG in Accumulating Required Credits in Field of Study
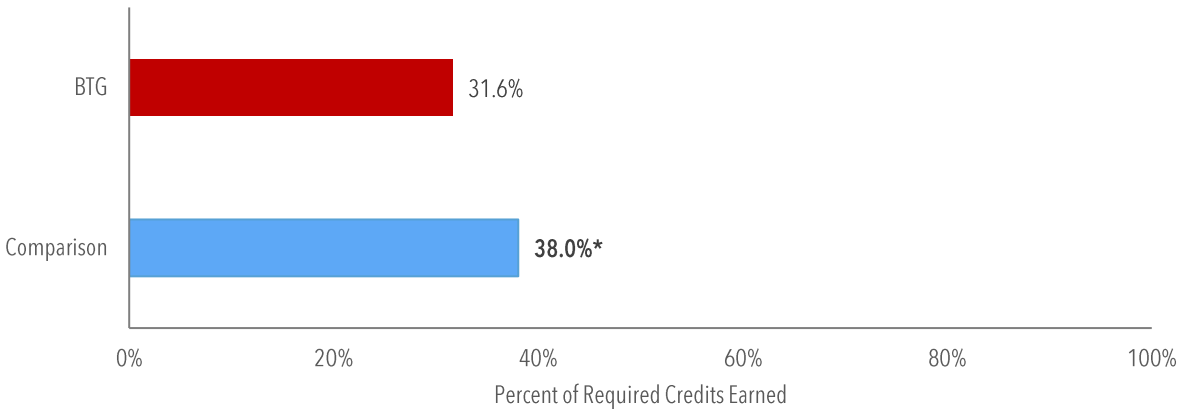
Note: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

To clarify, Figure 6 depicts the estimated difference in the percentage of required credits for both groups that is attributable to the BTG program itself (and not any other contextual or economic factors captured in the benchmark model). Additional analyses reveal that the results are sensitive to the time-variant economic controls such as localized unemployment rate, labor force size, and number employed. This is implied by the unadjusted means produced in *Table 15*, which indicate that without considering the structure of the data[133] or the economic contextual factors, the treatment group has accumulated about three percent more required credits on average than the comparison group. The Evaluation Team used secondary analyses to investigate why the treatment effect switches from positive in the unadjusted results to negative in the benchmark estimates.[134] While this sort of sensitivity raises questions about the robustness of the findings, the Evaluation Team remains confident that the benchmark analysis represents the most defensible modeling approach.[135] The results suggest that as unemployment rates become higher,

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[131] Although this may seem more complex than raw credit hours, the Evaluation Team reasoned that a proportionate measure was more interpretable given the wide variety of programs and program requirements. Further, given that the aim of the program was to graduate students from specific programs and into targeted industries, the Evaluation Team wanted the benchmark measure to reflect credits that were earned while the student was enrolled in the targeted field of study. The Evaluation Team also investigated the impact of the program on the raw credit hours and proportion of total credit hours earned (not just in the target field) using the same benchmark approach. Findings were not statistically significant (but point estimates remained negative).

[132] However, as noted throughout the Implementation Evaluation section, BTG students obtained a number of industry-recognized credentials (e.g., American Welding Society, Cisco, and Microsoft) throughout their programs. In some cases, students would leave the program after obtaining the credential due to a need for immediate employment, according to BTG instructors and grant leadership. The target population for the grant was individuals with barriers to education/non-traditional students. Because of this, many students reported a need to enter back into the workforce quickly (e.g., needed a job, supporting family, and other life circumstances), which may have resulted in lower percentages of credits earned for BTG students.

[133] The "structure of the data" refers to the clustering of BTG and comparison students within programs, campuses, and colleges.

[134] All sensitivity analyses reproduce benchmark findings. On the other hand, when the economic condition control variables are removed – localized unemployment rate, labor force size, and number employed – the estimated impact becomes positive (.02); results are not statistically significant.

[135] The positive effect observed in the unadjusted data (*Table 15*) persists (but is not significant) after controlling for the structure of the data and the cohort and campus-level controls. The estimated effect becomes negative (and significant) only after the control variables for post-program economic conditions are included. The inclusion of the time-varying economic context variable, which captures the regional unemployment rate

the proportion of credits that a student will accumulate will decrease. This effect fits with what is known about persistence in college, which is to say that persistence is responsive to economic conditions. As an individual's relative economic situation deteriorates, they are less likely to remain in college.

Research Question 2: Program Effect on Remaining in College

Results for Research Question 2 suggest that students who enrolled in the BTG program dropped out at statistically higher rates than those students who enrolled in similar programs during the comparison period. Model estimates in *Table 16* present these estimated differences. Predicted probabilities, derived from the benchmark model, are illustrated in Figure 7 (below). The figure depicts the estimated impact of the BTG program on the probability of dropping out, exclusive of other confounding factors that are accounted for in the benchmark design. Results show that BTG and comparison students are dropping out at noticeably different rates.[136,137] BTG students have a 13.5% greater probability of dropping out than their comparison counterparts.

Figure 7: Estimated Effect of BTG on Dropping Out
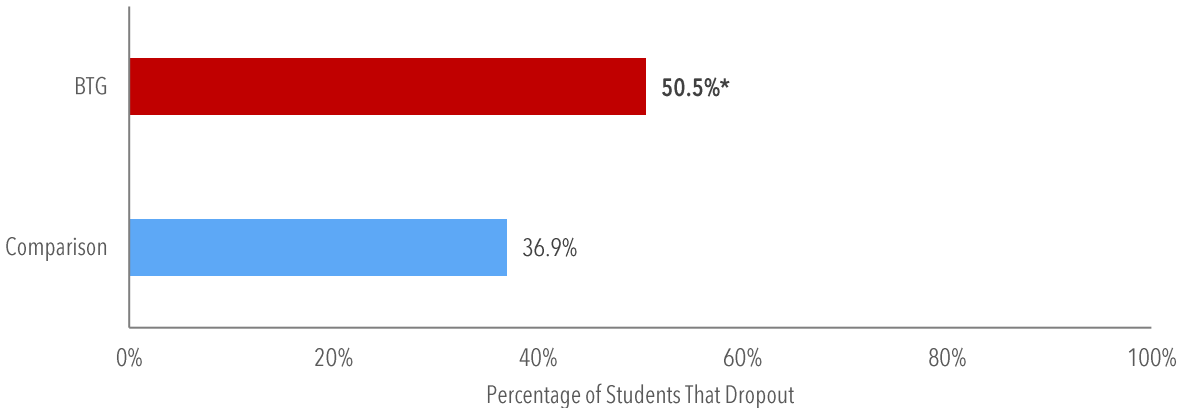
Note: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

The Evaluation Team should emphasize that this definition of dropout may be more sensitive than the one used by college administrators, resulting in a higher proportion of students categorized as having "dropped out."[138] Further, these numbers do not reflect the actual number of students who have dropped out in the analytic sample. The actual proportion of dropouts are 0.42 (n=850) for the BTG group and 0.47 (n=958) for the comparison group. These are reported in *Table 15*. The predicted probabilities reported above reflect those based on the estimates produced by the statistical model, which controls for the structure of

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in the quarter following the semester that the student is actively enrolled in the study, causes the treatment effect to swing from positive to negative.

[136] The coefficients reproduced are not directly interpretable, but marginal effects, which are predicted probabilities derived from model results, present a more understandable estimate of program impact. Predicted probabilities are derived as marginal effects with mean values for all independent variables in the estimating model.

[137] The Implementation Evaluation reports that BTG students were provided with opportunities to connect with local employers through BTG instructors. In some cases, as reported by BTG instructors and leadership, an employer would offer the student a job prior to program completion. See the Implementation Evaluation section for more information.

[138] Measured as the probability of officially withdrawing from the college or ceasing to be enrolled in the college without earning a certificate or associates degree. For more details on the operationalization of this measure, see *Appendix D*.

the data[139] and the varying economic conditions experienced by both groups.[140]

Research Question 3: Program Effect on Obtaining an Academic Certificate/Degree

Benchmark results for the third research question suggest that students who participate in a BTG program have a higher likelihood of obtaining an academic certificate/degree in their field than do comparison students.[141] The differences are small but statistically significant, and are shown in *Table 16*. Figure 8 below illustrates this finding and shows the estimated differences in the probability of obtaining an academic certificate/degree in the target field and treatment window for the typical student in each group that is attributable to the intervention itself.[142]

Figure 8: Estimated Effect of BTG on Obtaining an Academic Certificate/Degree in Field of Study
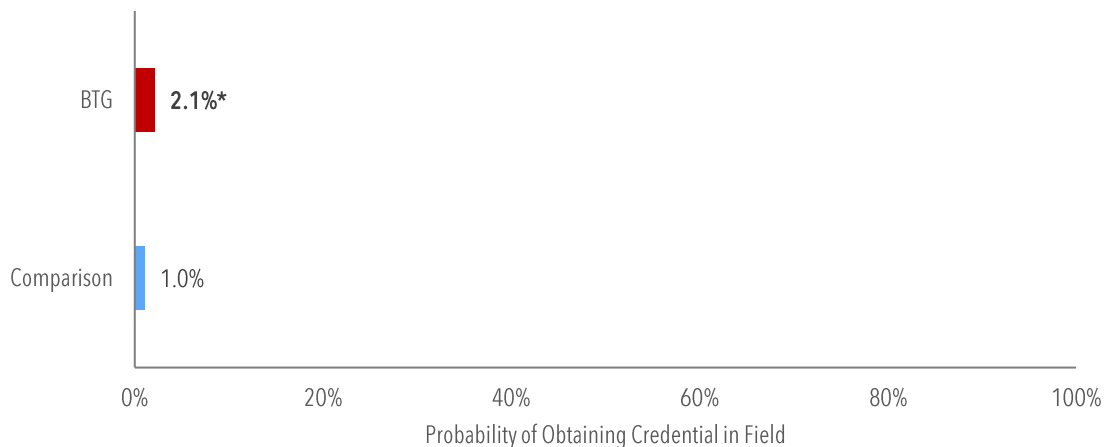
Note: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

The BTG group's probability estimate is double that of the comparison group but the rates and real differences are modest. One percent more students in the BTG group are predicted to obtain an academic certificate/degree in the target field as a result of the program alone. In other words, for every 1,000 students enrolled, BTG will cause an additional ten students to graduate with an academic certificate/degree in the target field, solely based on exposure to the BTG program. The unadjusted

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[139] "Structure of the data" refers to the clustering of BTG and comparison students within programs, campuses, and colleges.

[140] The Evaluation Team conducted a series of sensitivity analyses and two of these analyses generate divergent results. For transparency, the Evaluation Team includes discussion of the sensitivity studies that produce substantively alternative findings. The first exception is the Linear Probability Model (LPM). One typically expects the LPM and the logistic regression to offer substantively identical findings. However, the predicted probabilities estimated by the logistic model in this case are very low (<.20) and very high (>.80), resulting in LPM estimates that are above one and below zero. In cases such as this, the logistic model will fit the data better. The second exception is the one that models the clusters as fully nested (programs within campuses) and ignores the cross-nesting. The Evaluation Team believes that this empirical model does a poorer job of accounting for the structure of the data (than the benchmark model). As with the credit accumulation outcome, estimates are also sensitive to the inclusion of time-variant economic conditions control variables. Consequently, the Evaluation Team believes the benchmark analysis to be robust.

[141] Since the intent of the TAACCCT program was to develop student potential in targeted academic programs that served specific target industries, the outcome of interest was the acquisitions of an academic certificate/degree in the BTG field of study. Field of study was defined as the major that the student declared in their first semester of enrollment in a BTG program. The target fields of study for the BTG grant were Advanced Manufacturing, Energy, Information Technology, and Construction. For exploratory purposes, the Evaluation Team also investigated program impact on any (not just BTG) academic program; point estimates remained positive but became insignificant.

[142] The coefficients produced by a logistic regression are not interpretable in their raw form, but marginal effects can be created based on model output. These present a more understandable estimate of program impact. Marginal effects are the predicted probability of obtaining an academic certificate/degree in the target field. More generally, it is the predicted change in probability of an outcome given a one-unit change in the predictor. In this case, the predictor is treatment status, so the one-unit change is the shift from comparison to treatment. Marginal effects are estimated at the mean values for all independent variables included in the estimating model.

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statistics in *Table 15* show that the observed numbers are somewhat higher. Two percent of 958 students in the comparison group graduated (n=23) and six percent of 850 students in the BTG group graduated (n=55) with an academic certificate/degree. The regression-adjusted numbers suggest that some of this variation is due to contextual and structural factors,[143] [144] but that the BTG program itself is responsible for some of the variation in outcomes.

Research Question 4: Program Effect on Employment

Results produced by the benchmark analysis for Research Question 4 indicate that participating in the BTG program had no statistically detectable effect on participants' short-term employment outcomes.[145] Estimates presented in *Table 17* show that the difference in the probability of employment for BTG and comparison students is not statistically significant in the first-quarter post-program.[146]

For this outcome, it is especially important to note that the Evaluation Team was constrained to a relatively narrow window in which to observe the potential benefits of programming (see *Limitations* and *Implementation Evaluation* section). Figure 9 below illustrates these estimated trends in the regression-adjusted proportion of participants employed for both groups from pre- to post-program. As detailed in *Appendix D*, the modeling strategy for these outcomes is different from the one used for educational outcomes because of the availability of baseline outcome data. These data allow the Evaluation Team to use a more robust difference-in-differences (DID) modeling approach, which estimates the differential effect of the program by comparing the average change over time for the BTG and comparison groups.

Figure 9: Pre- to Post-program Change in Probability of Employment

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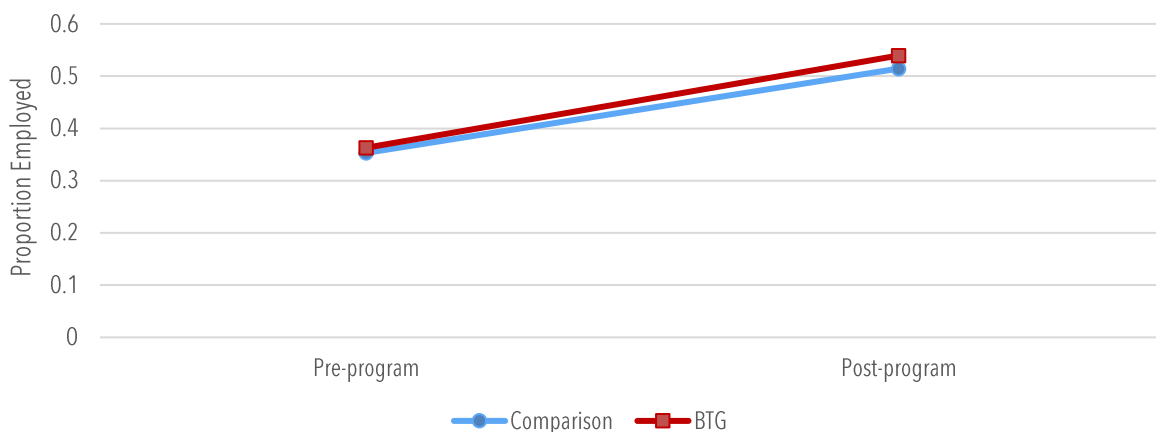
[143] "Structural factors" refer to the ways in which BTG and comparison students are (differentially) distributed within programs, within campuses, within colleges (institutions).

[144] Two sensitivity studies generate substantively different findings, but these are largely explainable. The LPM and the logistic model diverge. Even though the sample size is large, the incidence of the outcome variable is rare. The LPM is a less appropriate estimator in instances where the probability of the event is greater than 0.80 and less than 0.20. To investigate the possibility that the event is rare enough to cause the maximum likelihood estimator to suffer from small-sample bias, the Evaluation Team added a Firth logit model to the sensitivity studies. The model is not identical to the benchmark approach but it confirms the benchmark results. See King, G., & Zeng, L. 2001. Explaining rare events in international relations. International Organization, 55(3), 693–715. The other exception is the sensitivity study that models campus attended as a fixed effect. This model produces an impact estimate that is positive but not statistically significant. In this case, however, because the outcome is such a rare event, the fixed-effects approach results in the dropping of nearly 400 cases, which alters the analytic sample considerably. The difference in estimates is more likely attributable to the sample.

[145] Hedges' g = 0.031.

[146] Again, the analytic strategy employed is a difference-in-differences (DID) estimator.

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The four points plotted in the graph are estimates of the average probability of BTG and comparison groups being employed pre- and post-program, once contextual, clustering, and background characteristics have been statistically removed. The lines are estimates of the respective employment growth trajectories. The program impact is the difference in the adjusted slope of the top and bottom line, which is the effect reported in *Table 17*. In this case, after statistical modeling, the BTG group and the comparison group demonstrate very similar trajectories in employment growth. Both groups appear to improve in terms of the proportion employed, but the difference is not statistically significant.[147]

Research Question 5: Program Effect on Wages

Results produced by the benchmark analysis for Research Question 5 indicate that participating in BTG had no statistically detectable effect on participants' short-term wage outcomes. Estimates presented in *Table 17* show the adjusted first-quarter post-program earnings of students in the BTG program and students in similar comparison programs prior to TAACCCT funding. The difference in both groups' earnings is not statistically significant.[148] Figure 10 below illustrates these estimated trends in quarterly wages for both groups from pre- to post-program. Again, we use a DID approach to estimate the differential effect of the program by comparing the average change over time for the BTG and comparison groups.

Figure 10: Pre- to Post-program Change in Quarterly Wages
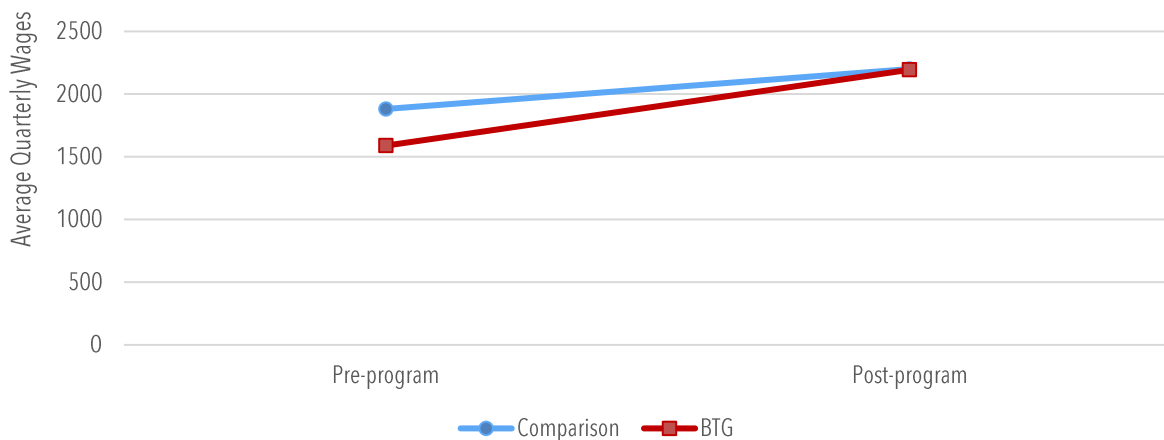
The four points plotted in the graph are estimates of the average quarterly wages for the BTG and comparison groups at pre- and post-program. The lines are estimates of the respective wage growth trajectories and the program impact is the difference in the slope of the top and bottom line, which is the effect reported in *Table 17*. In this case, after controlling for contextual and economic factors, remaining background differences, and clustering, both groups demonstrate increases in quarterly wages from pre- to post-program. The BTG group starts with a lower average wage pre-program, and achieves a

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[147] All sensitivity studies were substantively consistent with the benchmark model results. In addition, the Evaluation Team also investigated whether or not the operationalization of employment and wage outcomes preprogram influenced findings, and determined that they did not. Results were substantively consistent with benchmark point estimates regardless of whether the baseline period was modeled with a trend (i.e., comparative short interrupted time series design) or with shortened pre-intervention averages (two and four months pre-intervention). The Evaluation Team also estimated impacts on employment and wages for the second quarter post-intervention. Results were consistent with benchmark findings. All sensitivity studies further corroborate these findings and indicate that results were not responsive to analytical decisions. In each of the sensitivity studies, the mean difference in BTG and comparison participants' first-quarter post-program probability of employment is not statistically significant.

[148] Hedges' g = 0.073.

comparatively larger average increase in wages post-program. The steeper slope, although not statistically significant, represents this difference for BTG participants.[149] Similar to findings for program effect on employment, the shorter study timeline may be limiting the analytical power for this research question (see the _Limitations_ and _Implementation Evaluation_ sections).[150]

CONCLUSIONS

At first glance, the impact results present a confusing picture. Findings suggest that students in the BTG program, on average, earn degrees at higher rates than the comparison group. However, students in the BTG program, on average, accumulate fewer credits and drop out more frequently than the comparison group. Employment and wages appear to increase for both the BTG and comparison groups over time but are not significantly higher for BTG participants. However, sensitivity studies suggest that there may be some wage growth for a subgroup of BTG students.

Early in the intervention, WVHEPC staff, BTG college leadership, WVCTCS leadership, and the Evaluation Team discussed whether the program's impact on the attainment of academic certificates/degrees might be attenuated by intermediate credentialing, which could not be tracked. The argument was that students might accept employment after obtaining an industry-recognized credential (rather than complete a certificate or associate's degree) if their financial situation compelled them to do so. This might affect BTG students differentially if career pathways and industry-relationships were substantially improved. As reported in the _Implementation Evaluation_, in some cases, grant participants entered BTG programs as a means to achieve wage gains and/or employment so once students received a job offer, they were inclined to accept without obtaining a certificate or associate's degree.[151]

The specific concerns raised by WVCTCS, BTG college leadership, and the Evaluation Team – that many BTG students may lag in obtaining degrees – did not materialize. Nevertheless, the Evaluation Team believes that these dynamics are key to interpreting the results. BTG appears to be simultaneously incentivizing some students to graduate with an academic certificate/degree, and others to leave the program early, presumably to enter the workforce. Although intermediate credentialing lies outside the scope of the data, the Evaluation Team believes that BTG may have improved an intermediate path that incentivizes some students to leave college early and resume employment (presumably with industry-recognized credentials), but without an academic certificate/degree.

The primary evidence for this interpretation rests on the countervailing impacts. If a program were simply failing to achieve its hypothesized results, the Evaluation Team would expect to see no or negative impacts for both persistence and completion domains – but this is not the case. The results show that BTG students

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[149] See Footnote 147.

[150] Most sensitivity studies further support these findings. The lone exception is the model that excludes outliers from the analytic sample. In this sensitivity study, the Evaluation Team removed cases from the analysis, which had pre- or post-intervention wages that differed from the mean average wage by more than three standard deviations. The total number of cases dropped was 119. The Evaluation Team remains confident that the benchmark sample, which retains all data and individuals in the analytic sample, is the most accurate representation of the treatment effect; however, the Evaluation Team also believes that this sensitivity study offers some valuable information. The extreme quarterly wage cases were examined and consistent over time, though a few cases in which the students were comparatively high wage earners before returning to college were present. With that in mind, the analysis shows that the impact estimate is sensitive to these 119 outlying cases. The question essentially becomes which mean value (i.e., the one that includes the outliers or the one that does not) is a more valid statistical reflection of the sample (see Wilcox, R. R. 2010. _Fundamentals of Modern Statistical Methods_. New York, NY: Springer). The Evaluation Team decided to retain the outlying values in the benchmark sample because the values seemed credible and the contrary findings were used to inform the sensitivity study, highlighted in the _Conclusions_ section.

[151] Please see _Implementation Evaluation_ section for more information.

are accumulating fewer of the required credits and are dropping out at higher rates. At the same time, findings also demonstrate that BTG students have a higher rate of obtaining an academic certificate/degree within the targeted program of study. Among the small group of students who had time to complete an academic program in the short study window, BTG students graduate at higher rates than their comparison peers.

Together, findings suggest that the program is graduating more students and may be permitting others to take an intermediate path (to leave without an academic certificate/degree for a possible economic gain). The secondary analysis of the credit accumulation and dropout impacts, which suggests that economic considerations are a significant and meaningful explanatory factor in persistence outcomes, partially corroborates this interpretation. Correspondingly, the finding that BTG students are not earning more credentials in general also supports this argument because it implies that the BTG programs are in some way motivating this difference.

If there is evidence of economic gain resulting from BTG, evidence of that gain is more equivocal. Though benchmark findings are consistently in the desired direction, there is no significant impact. Sensitivity studies, however, do suggest that there may be subtle effects on wages for a subgroup of students. Results therefore indicate that the program is not adding people to the workforce, but that a subgroup of BTG participants who do not earn exceptionally high wages before or after enrolling in college may be earning slightly higher wages after they have returned to the workforce (presumably with some sort of industry-recognized credential).

As stated in the *Limitations* section, this study is constrained by the short period of observation. Only those students who enrolled in their programs in the first semester of their respective study window had two years (six semesters) to achieve academic outcomes and one quarter to achieve employment outcomes. Most students in this study had much less time. A longer study period with more time post-college exit would have likely permitted more students to graduate and others to fully realize the benefits of their education (regardless of their graduation status).

Limitations

Given the constraints placed on the study, the Evaluation Team believes it has produced the most rigorous quasi-experimental impact analysis possible. Unweighted balance statistics reported in *Table 13* and *Table 14* indicate that the BTG and comparison groups are broadly similar in baseline characteristics. Weighting procedures make the two groups more comparable. Nevertheless, it is important to highlight how aspects of any quasi-experimental design may reduce the ability to isolate the effects of programming from potential sources of bias. These include:

> *Unobserved Variation* – Although a well-executed randomized controlled trial (RCT) is the only reliable way to consistently estimate an unbiased program impact, a RCT was deemed undesirable and impractical. The Evaluation Team therefore relied upon quasi-experimental (QED) methods to estimate program impacts. QEDs rely on statistical and after-the-fact controls on observed features to reduce the possibility that the effect that is attributed to the treatment is not conflated with other influences. However, among the potential limitations associated with QEDs, its chief weakness is that it cannot control for unobserved variation, so the Evaluation Team cannot be certain that the impact credited to the program is not also being motivated by differences in unobserved factors.

Historical and Selection Effects – The study employs an apparently equivalent comparison group that has selected into similar programs as the BTG group. The Evaluation Team believes that this is a more valid contrast than alternative selection processes. Nevertheless, it is possible that the two groups differ in ways that the Evaluation Team has not anticipated or measured. The BTG and comparison groups' labor market experiences may have been different in ways that are not fully captured by labor market statistics. It is also possible that there is meaningful variation in time-varying contextual factors that are not included in the analytic model. These differences could insinuate bias. Unobserved selection and historical effects would mean that the programmatic effects estimated by the empirical models are a blend of actual impacts and contextual and economic factors.

Propensity Score Weighting – It is possible that the propensity score weighting procedures have created a match that appears comparable on observed variables but in fact creates imbalance on unobserved factors. This is unlikely, given that unweighted analytic samples produce the same substantive findings as those with weighted samples.

Project Timeline – Due to the competing considerations of reporting requirements and sample size concerns, the Evaluation Team was compelled to measure the effects of programming over a short period of time. If they exist, completion and employment effects resulting from programs such as those in the BTG intervention would be expected to increase over time. For this study, however, the Evaluation Team was constrained to a relatively narrow window in which to observe the potential benefits of programming. As a result, the Impact Evaluation might not encompass all of the effects of programming on student outcomes.

CONCLUSIONS

CONCLUSIONS

LASTING EFFECTS OF THE GRANT

It is beyond the scope of this evaluation to make value judgments about whether the degree of tangible and intangible success obtained as a result of the BTG project was sufficient to warrant the amount of public investments made, or to otherwise draw conclusions about the benefit of BTG. Qualitative evidence suggests, however, that effects of the BTG project are likely to continue through the end of the grant and beyond.[152] Although the BTG project took more time to implement than originally anticipated, the time that has been invested has positioned the colleges, partners, and program participants for continued success.

> **Capacity Building** – The BTG project facilitated capacity building at many of the colleges by allowing staff, faculty, and instructors to test programming innovations (e.g., remote, online, and simulated learning), enhance student services to provide students with more one-on-one guidance and support, and diversify program offerings into sectors that colleges have not yet explored. While some programmatic elements of these innovations will last – training programs, programming innovations, and support service practices – even more so the effects will be on the colleges' capacity to offer enhanced and expanded technical programs.

> **Stakeholder Engagement and Collaboration** – Because project success was heavily dependent on partnerships and investments made by employers, partner BTG institutions, and other stakeholders, the grant aided in increased connections between BTG colleges and these entities. Partner engagement findings are qualitatively described within the *Implementation Evaluation: Partner Engagement* section.

> **Enhanced Programming and Services** – Significant investments in the program offerings and support services offered, including peer coaches and program equipment, and in curriculum and program development will continue to benefit BTG college staff, faculty and instructors, and students. Interviewed program participants found the expansive support services and program offerings as unique and valuable components of their program. Similarly, regional partners and faculty/instructors noted that the program offerings and support services enhanced through the grant provided relevant and much-needed training and support for the target population.

LOOKING BEYOND THE GRANT

At the end of the grant, BTG college leadership determined next steps for the grant components. Due to the funding from USDOL, and investments and donations from partners, BTG colleges were able to expand and enhance programs to offer innovative delivery models (e.g., remote, online, and simulated), comprehensive student support services through peer coaches and counselors, and meaningful learning experienced through internships, apprenticeships, and other work-based training. Because of these features, BTG colleges indicated sustaining most, if not all, of the BTG components and will continue to expand program offerings and partnerships moving forward. Moving beyond the grant, BTG college leadership anticipate the following to take place:

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[152] Training funds end in March 2017 and all other grant funding ends in September 2017.

Additional Employer Partnerships

BTG colleges established a number of connections with local employers that will likely continue post-grant. These partnerships have resulted in customized employee training programs, donations and investments, hiring commitments, and work-based training opportunities (e.g., internships and apprenticeships). BTG colleges noted employer partnership expansions as a significant success from the grant and anticipate that these relationships will continue to grow and expand beyond the grant, aiding in sustainability of BTG programs moving forward.

Enhancing and Expanding Programs

All institutions emphasized the need to continue BTG-funded technical programs beyond the grant. For many institutions, this includes expanding current technical program offerings due to the success experienced through the grant and need identified by employers and students. The ability to meet the needs of non-traditional students, a significant population of West Virginia community and technical college attendees, has been a significant advantage to technical program implementation. Colleges were able to launch short-term programs that expedited student time to completion, a need identified by non-traditional students. Moving beyond the grant, many institutions will continue to improve current technical programs and will continue exploring additional offerings.

Utilizing Support Best Practices

While some institutions anticipate sustaining support service models moving beyond the grant, for those that cannot, utilizing best practices and lessons learned from implementation of this innovative support model will be prioritized. For instance, some institutions are documenting peer coach and counselor best practices and approaches to share with all support-related staff (e.g., advisors). For those that cannot support peer coaches and counselors, or other support service components, this will enable these colleges to continue utilizing these best practices and strategies moving forward.

Additional Funding and Investments

To continue grant components beyond the grant, and to further expand and enhance components launched through the grant, many institutions are exploring other opportunities for additional funding and investments. For instance, some institutions are examining the potential for investments from local employers in the form of equipment, sending employees to customized training programs, and financial support. In addition, many institutions are relying on investments made from the college to further enhance and support components launched through the grant. Because of the benefit that these components have brought to the college (e.g., innovative support models, technical programs, diverse learning strategies, targeted recruitment efforts, and sector strategies), many institutions are willing to support grant components moving forward.

FUTURE RESEARCH OPPORTUNITIES

A review of study findings and study limitations suggests several avenues for future research. The Evaluation Team has identified four areas where further research may yield greater insight into the effects of the TAACCCT-funded community college programs. These are:

1) Whether a longer post-program observational window would reveal impacts of greater magnitude;
2) Whether impacts on intermediate credentials (if data were available) could help explain the apparently countervailing effects on persistence and completion outcomes;

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3) To conduct an exploratory analysis that further investigates the possibility that the BTG programs may have increased wages for a sub-group of participating students; and

4) To explore why the estimates for wage growth and probability of employment were of differing magnitudes.

Following the first suggestion would require extending the post-program observational period for the purposes of examining outcomes beyond the first quarter following BTG program completion. Employing an extended post-program observational period would answer questions about whether the effects of TAACCCT-funded programs were different over the short and longer terms. Hypothetically, it seems reasonable to expect that the influence of the programs would not manifest in the first quarter post completion. This empirical question would be worth investigating.

Examining the implication of the effectiveness of mixed-methods evaluations (i.e., pairing implementation – qualitative – and outcomes/impact –quantitative– evaluations) requires inquiry into the advantages of establishing a mixed-methods approach for large-scale, grant-funded projects. For this study in particular, the mixed-methods approach enhanced the relevance of the evaluation –as the formative Implementation Evaluation informed the Impact Evaluation study design, and the summative Implementation Evaluation provided context and insight into grant progress and fidelity to the original model. However, in order to implement a successful mixed-methods strategy, a significant amount of time is required to collect data from both the implementation and outcomes/impact analyses.[153] Future researchers could examine the effectiveness of this approach in greater depth, yielding more conclusive evidence on whether this approach is the best suited for large-scale, grant-funded projects.

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[153] Creswell, J. (2009). Research design: Qualitative, quantitative, and mixed-methods approaches. SAGE: Thousand Oaks, CA. Retrieved by:http://www.ceil-conicet.gov.ar/wp-content/uploads/2015/10/Creswell-Cap-10.pdf

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APPENDICES

Appendix A. USDOL-Identified TAACCCT Core Elements

Core Elements Description

Information from this section was drawn from the USDOL-TAACCCT Solicitation for Grant Applications.

Table 6: TAACCCT Core Elements

Evidence-Based Design	Implement projects that seek to use evidence to design program strategies – new or the replication of existing strategies – that are committed to using data for continuous improvement of programs that provide workers with the education and skills to succeed in high-wage, high-skill occupations.
Stacked and Latticed Credentials	Incorporate a variety of credentials, including certificates, certifications, diplomas, and degrees. These credentials should be earned in sequence and build on previously learned content, or "stacked," as students progress through their programs, allowing them to build a portfolio of credentials that can serve them well as they transition from learning to work.
Transferability and Articulation of Credit	Transferability and articulation of academic credit to create career pathways for TAA-eligible workers and other adults to further their education. This can be accomplished through increased cooperation among institutions within and across state lines, as well as through linkages with programs, such as postsecondary career and technical education, pre-apprenticeship and apprenticeship programs, and other programs that lead to credit-bearing coursework and employment.
Advanced Online and Technology-Enabled Learning	Incorporate online and/or technology-enabled learning strategies that provide adults an opportunity to balance the competing demands of work and family with acquiring new knowledge and skills at a time, place, and/or pace that is convenient for them.
Strategic Alignment	Demonstrate outreach to, and information on, relevant entities in the communities to be served by the project, including those that can provide data on the characteristics and skill needs of workers receiving TAA benefits and services in the community. Align programs to Governor efforts (Economic Development and WIOA state plans); employers and industry; public workforce systems; and philanthropic organizations, business-related and other non-profit organizations, community-based organizations, and labor organizations.
Alignment with Previously-Funded TAACCCT Projects	To help decrease duplication and to strengthen the geographic reach of the project, and coordinate efforts where possible.

APPENDIX B. BLACKBOARD DATA ANALYTICS EVALUATION

INTRODUCTION

Background and Purpose

As part of the *Bridging the Gap* (BTG) grant, a consortium-wide data analytics system was launched in an effort to streamline student-level data collection, enhance intervention strategies, and subsequently expand the colleges' abilities to make data-driven decisions. As part of the original grant plan, funding for this initiative was embedded into each college's grant budget to help expedite implementation of a consortium-wide analytics system. The goal of the system was to refine predictive models, identify high-risk students, and initiate interventions properly and consistently across these institutions.

The BTG colleges convened a group of key individuals from six BTG colleges and selected Blackboard Analytics for their consortium-wide data analytics system.[154] Blackboard Analytics seeks to deliver education technology services to promote and drive student success. The system enabled colleges to offer hybrid and online learning through the web and mobile-friendly platform, promoted collaboration through the user-friendly interface, and provided a flexible, complete learning management system for colleges.[155]

Thomas P. Miller & Associates, LLC (TPMA) was contracted by West Virginia University at Parkersburg (WVUP)[156] to conduct an evaluation of Blackboard Analytics implementation across the nine colleges in the consortium. The purpose of the evaluation was to uncover successes, challenges, use of the system, and recommendations to enhance implementation across the consortium.

Summary of Methodology

To understand the implementation of the system across the consortium, TPMA collected data from each college. The findings in this report are based on the analysis of qualitative and quantitative data collected from the following sources:

1. Communication with the Technology Transformational Leader – lead for this component of the grant – through November 2016;
2. Focus groups with BTG college faculty/instructors, administrators, and staff during the site visit in October/November 2016;
3. Survey of system users (faculty/instructors, staff, and administrators) from each BTG college in January and February 2017; and
4. Phone interviews and focus groups in February and March 2017 with faculty/instructors, staff, and administrators from each BTG college who frequently used the system and/or were heavily involved with implementation.

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[154] For more information, please see: https://www.blackboard.com/about-us/index.aspx
[155] Retrieved from: https://www.blackboard.com/about-us/what-we-do.aspx
[156] WVUP housed the Technology Transformation Leader – the lead for this component of the grant.

Summary of Findings

Colleges reported that successful implementation of Blackboard Analytics hinged on the colleges' level of leadership support, stakeholder support, and on-campus training and technical support. It was found through interviews, focus groups, and surveys that colleges with higher levels of this support progressed further with implementation, and utilized the system more frequently and across a larger number of users.

However, the nine colleges faced common barriers in system implementation. Existing data systems hindered implementation (e.g., due to inability to unify those systems and staff capacity), and the data validation process was a challenge (e.g., due to lack of staff capacity and familiarity with system). These two issues were further compounded by the lack of capacity and time college staff had to dedicate to implementation, as the system was not finalized until Year 3 of grant operations.

Considerations for future implementation of consortium-wide initiatives include early communication with college leadership and stakeholders to establish buy-in and set expectations. Institution-focused technical support could reduce barriers related to data validation processes and staff capacity, and allow for more useful training to system users. In addition, by incorporating data elements into regular college functioning, college leadership, faculty/instructors, and staff could become more familiar with the system and invested into its implementation. Lastly, the process of selecting a consortium-wide system should be completed as early as possible to ensure ample time for implementation.

Accelerators of Success
- Leadership Support and Buy-In
- Stakeholder Investment and Involvement
- Individualized Training and Technical Support

Barriers to Progress
- Existing College Systems
- Data Validation & Reporting Processes
- Staff Capacity

Recommendations
- Communication with College Leadership and Stakeholders
- Provide Institution-Specific Technical Support
- Embed Data Analytics
- Start Selection Process Early

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BLACKBOARD ANALYTICS SYSTEM IMPLEMENTATION PROGRESS

To facilitate the implementation process, a team of individuals from six[157] BTG colleges was identified to review options and capabilities from various data systems. Activities conducted by the team included determining the functions of the data system, needs of the colleges, and selecting the provider. From there, the colleges would be responsible for validating data, creating reports and dashboards, and utilizing the system.

The team selected Blackboard Analytics as the data analytics system after reviews and presentations from multiple systems/companies. The BTG grant's Technology Transformation Leader oversaw the selection process and facilitated implementation across the consortium in Year 3 through scheduling training sessions, providing one-on-one support to colleges, and serving as a liaison between the colleges and Blackboard Analytics representatives.

All community and technical colleges were encouraged to participate in the implementation activities, which occurred at the end of Year 3 and throughout the grant extension period. However, while not all colleges were actively engaged in the implementation of Blackboard Analytics (e.g., due to concerns with sustainability of the system, capacity for college staff, among others), all colleges participated in initial implementation activities such as trainings and selection of the system. Additional training provided by WVCTCS assisted colleges in addressing implementation issues, and most colleges are moving forward with the initiative. Seven of the nine consortium colleges will sustain Blackboard after the conclusion of the grant.

System Intent and Purpose

College staff and faculty/instructors reported that the system was anticipated to track student- and college-level information and trends, such as:

- Completion rates for students enrolled in specific courses and programs, and overall;
- Course delivery impacts on student success and retention;
- Transfer students' success and retention in programs;
- Student qualities that could trigger early intervention;
- Enrollment, retention, and graduation rates for students in specific courses and programs, and overall; and
- Time to completion.

The system was intended to serve students, faculty/instructors, staff, administrators, and adjunct faculty – bringing together all individuals to use one system. Additionally, most of the colleges reported that they did not have a history of using data to make decisions and saw a need for using data in a more strategic way. Colleges indicated that in order to better understand the institution's success and impact on a student, measuring and tracking student data was critical. The Technology Transformation Leader and other leadership viewed the implementation of Blackboard Analytics as more than a system, but a chance to change the culture of data measurement and use at the BTG colleges.

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[157] Other institutions were unable to participate in these discussions due, in part, to uncertainty around system implementation at their institutions.

System Selection Process

Before a Request for Proposals was released, the Technology Transformation Leader and other leadership (e.g., West Virginia Network) conducted background research focusing on the capabilities of potential systems and college success indicators. Through this research, an evaluation rubric was developed to guide the review of proposals. During the first phase of the proposal process, a review team from six of the nine BTG colleges including technical and functional users evaluated proposals from vendors based on cost and score on a rubric. The top three vendors moved on to the next phase, and were invited to write proposals and make presentations to the review team. The demonstrations targeted the functionalities of the system to help the review team visualize the system at their institutions. After this phase, the review team selected Blackboard Analytics as the system that would be used across the consortium because of the flexibility and capabilities of the system to customize it to the college's needs. The host for the system was identified as West Virginia Network (WVNET), a centralized technology center for the BTG colleges.[158]

System Trainings and Support

A range of trainings was provided by Blackboard Analytics representatives at regional locations across the state, and focused on the functionalities and set up for the system at each institution (e.g., creating reports and dashboards). While the initial trainings provided BTG colleges with a general understanding of the system, staff and faculty/instructors reported that more individualized training was needed to customize the platform for each institution's needs. With this, Blackboard Analytics representatives provided targeted training to help institutions identify their needs, create dashboards, and develop report templates. Additionally, some institutions entered into separate contracts with Blackboard Analytics to receive training and ongoing support for users at the college, throughout and beyond the grant.

System Data Validation and Report Development Processes

Following training sessions, and with the guidance of Blackboard Analytics consultants, Informational Technology and other related staff at the colleges extracted data from their Banner systems to populate and validate within Blackboard. This process was critical as it ensured accuracy of the data housed within Blackboard at each institution. Blackboard Analytics worked to create general templates for colleges to use that targeted collection of enrollment, completion, recruitment, and retention data. From this, reports and dashboards were tailored for faculty/instructors, administrators, and departments at each participating institution.

System Utilization

Based on the survey, which captured information from 21 key users[159] (completed in January and February 2017); utilization of the system was limited through the end of the grant.[160] Ten (47.6%) respondents indicated using the system less than once per month. However, five (23.8%) respondents reported using the system several times per month and three (14.3%) respondents stated they had never used the system.[161] The most common activity for respondents using the system was exploring the system's

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[158] For more information, please see: http://wvnet.edu/about/

[159] The key users were those that were heavily involved in implementation or interacted with the system. Ten (47.62%) respondents were staff, seven (33.33%) respondents were administrators, and four (19.05%) were faculty. Ten (47.62%) respondents indicated that they were employed by the college for one to five years, and seven (33.33%) indicated employment for more than ten years.

[160] Seven of the nine colleges provided responses to the user survey. Of the two institutions that did not respond, one institution did not plan to utilize Blackboard and the other institution did not have other users to survey.

[161] The response categories were often (daily), frequently (several times per week), sometimes (at least once per week), occasionally (several times per month), rarely (at least/less than once per month), or never.

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capabilities. This included creating instructor/faculty profiles, exploring the interface, and creating sample reports. Nine of 20 users (45%) reported generating student and other data reports prior to the end of the grant.

EVALUATION FINDINGS

A range of accelerators and barriers influenced implementation of Blackboard Analytics across the consortium. Accelerators enhanced the implementation of the system at institutions, while barriers may have slowed or prevented implementation. The Future Implementation section is intended for state and consortium leadership to consider the lessons learned and best practices gathered through this experience for future implementation of system-wide data systems and other large initiatives.

Accelerators of Success

- Leadership Support and Buy-In
- Stakeholder Investment and Involvement
- Individualized Training and Technical Assistance

Leadership Support and Buy-In

The colleges that reported greater leadership buy-in also reported greater progression in implementation and expressed more optimism for the sustainability of the system. One Institutional Transformation Leader emphasized that the first and most important step was getting college administrators invested in Blackboard Analytics. Leadership and colleges who valued data-informed decision-making reported that the consortium-wide implementation of Blackboard Analytics was an opportunity. Multiple colleges stated that the administrators at their institutions were supportive of data analytics software, and

> *"You should get the higher-ups invested before you spend time and energy on something you don't know if you can keep. I think that is important with software or anything."*
> *Institutional Transformational Leader*

prioritized the initiative at the institution. College staff reported that the support received by college administrators was not solely about the product, but also about creating and encouraging a culture of data-informed decision-making. However, college staff reported that leadership at several of the colleges were not invested into the system. Without support from leadership, staff indicated they were hesitant to dedicate their time to implementation as they were unsure whether the system would be fully implemented and sustained.

Stakeholder Investment and Involvement

Colleges that reported increased stakeholder investment and involvement in Blackboard Analytics reported more users and greater system utilization. For BTG colleges, these key stakeholders included Directors in Information Technology and Institutional Research departments as these departments were able to setup and better understand systems such as Blackboard Analytics. The users of the system (e.g., instructors/faculty, staff, and administrators) were critical to engage as they would be utilizing the system the most.

> *"Before the grant, we weren't looking at [Blackboard] as a tool to use. The grant allowed us to get it and explore. We wanted this product. We jumped on it. We were active."*
> *Institutional Transformational Leader*

Institutions that reported engagement and involvement in Blackboard Analytics implementation amongst these stakeholders reported an ability to expedite implementation, to more fully implement the system, and to plan for sustainability early on. At some institutions, only a few departments were highly involved

and using the system due to their anticipated interaction with the system through their college role. For instance, at one college, the student services department led the implementation of the system and were the most active users, while Informational Technology and Institutional Research staff were not as engaged with the system. However, engagement of the key users at each institution was reportedly critical to system implementation.

Individualized Training and Technical Support

Receiving individualized training and technical support from Blackboard Analytics representatives enhanced implementation of the system at several institutions, as reported by college leadership. BTG colleges that requested tailored trainings for their institutions from Blackboard Analytics representatives reported greater system use. For instance, one institution hosted training sessions at their college and reported an ability to send multiple staff and department leads to full system and end-user trainings.

Other institutions sought additional support from Blackboard Analytics representatives, executing contracts using BTG funds that would provide assistance through and beyond the grant. Within a contract agreement, a BTG institution received a number of services including an in-person visit in August 2016 from Blackboard Analytics representatives. These representatives met with each department at the institution to identify the college's data needs. From these discussions, Blackboard Analytics staff created dashboards tailored specifically to the institution, rather than making college staff responsible for template and dashboard development. In addition to these discussions, the college scheduled a three-day series of onsite trainings in early March for day-to-day system users. BTG and Informational Technology staff reported separate contracts with Blackboard Analytics as necessary for successful and timely implementation. These colleges allocated additional grant funding to support these contracts and, in some cases, colleges dedicated institution funds to support implementation of the system beyond the grant.

> *"Knowing how important Blackboard Analytics is and knowing our limited time, resources, and capacity are due to limited staff, we realized we needed additional support."*
> *Institutional Transformational Leader*

Blackboard Analytics representatives also conducted consortium-wide and regional trainings, which were more cost effective and more efficient than individual trainings. However, attendees favored trainings held at each college, tailored to the college-specific issues, and designed for varying levels of knowledge. For example, some attendees with less technical-knowledge reported difficulty in translating the broader trainings to their specific needs and difficulty following all aspects of the trainings. On the other hand, some staff, particularly those with institutional research or information technology backgrounds, hoped training would delve deeper into the system's functions and showed the mechanics on how the product operated. Additionally, several staff reported difficultly in consistently attending sessions due to long travel times and difficulty coordinating institution staff's schedules.

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Barriers to Progress

- Existing College Systems
- Data Validation & Reporting Processes
- Staff Capacity

Existing College Systems

A barrier to implementation reported by some colleges was the existence of other data systems that were in use at the colleges. BTG colleges raised concerns about overlap in functionality and duplication of efforts. In one case, the presence of an existing data system prevented Blackboard Analytics implementation entirely as it was not feasible to implement two systems with similar capabilities. The institution's leadership decided that the presence of two systems would generate confusion among staff and would likely lead to sustainability concerns for the systems.

For many institutions, there was overlap in the tools and functionality of Blackboard Analytics and Argos – a similar system that seeks to enhance data collection efforts at higher education institutions to enable them to make more informed, data-driven decisions.[162] Argos was implemented as part of another consortium-wide initiative but did not have the dashboard capabilities of Blackboard Analytics. With this in mind, BTG colleges used grant funds to explore other options that would provide a more holistic system solution. However, at these institutions, many departments relied on data from the Argos system. Processes for the system were already in place and staff valued the data already being provided to them in the Argos system. The cost and time that would be needed to transfer all data from Argos to Blackboard Analytics (including licensing or maintaining both systems) was a source of concern for interviewed and survey staff and faculty/instructors at these institutions.

Data Validation & Reporting Processes

For the colleges implementing Blackboard Analytics, challenges related to data validation processes (e.g., pulling data from Banner, unanticipated hours, lack of experience, and reliability) surfaced during system implementation.

The process to ensure the data in Blackboard Analytics was accurate was described as "unexpectedly time-consuming" by college staff, leadership, and faculty/instructors. BTG colleges reported that the number of staff with the technical expertise required to validate data and customize reports was limited, and a majority of these staff did not have previous experience with Blackboard Analytics. In many cases, the staff with this expertise were Information Technology and Institutional Research staff, who did not have the capacity to dedicate significant time to system implementation and report/dashboard customization.

> *"We didn't have a clue about the product and were then expected to look at data in the product and look at data in our system."*
> *Chief Information Officer*

Additionally, some colleges reported challenges with Blackboard Analytics reports, as they did not align with Banner – a comprehensive student information system that was being used by many institutions.[163] Canned reports (or standard reports) developed by Blackboard Analytics representatives were typically

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[162] For more information, please see: https://evisions.com/products/higher-education/argos/
[163] For more information, please see: http://www.ellucian.com/Software/Banner-Student/

altered and customized by the colleges as they were not tailored for the college's needs. While colleges utilized Blackboard Analytics representatives for customized training sessions to develop more tailored reports, the reports received initially required significant modifications. One Informational Technology department indicated that developing a report to measure enrollment required customization for more than 20 different items.

Staff Capacity

Concerns about existing systems and data validation were further complicated by limited availability of critical personnel. While the system was selected due to its usability, ideally limiting the need for Information Technology expertise after the initial setup, most colleges reported issues with having the time to dedicate to Blackboard Analytics. With small Informational Technology and Institutional Research staff, system setup and implementation became the responsibility of individuals with already full workloads. With a short implementation timeline and no one person at each college dedicated to implementation, other priorities often trumped system implementation.

> *"A big factor was no one having enough time to put into this. Everyone at our institution already had a full plate before this implementation."*
>
> *Director of Institutional Research*

Future Implementation

- Communicate with College Leadership and Stakeholders
- Provide Institution-Centered Support
- Embed Data Analytics into Work Processes
- Start Selection Process Early

Communicate with College Leadership and Stakeholders

Early and frequent communication between consortium leaders, college leadership, and stakeholders is a critical part of establishing buy-in and facilitating successful implementation of a consortium-wide initiative/system. Offering in-person, individualized communication with colleges from system representatives and other leadership regarding the system, its functions and capabilities, expectations for implementation, and anticipated next steps can help users better understand the system and how it fits into their everyday responsibilities and operations.

Communication must occur in a number of ways including in-person meetings, conference calls, and email in order to facilitate buy-in and investment in the system (i.e., individuals have multiple avenues of receiving and sharing information). Communicating early in implementation also encourages dialogue about implementation plans and the college's individual needs. With an understanding of implementation plans and college needs, stakeholders and staff could have had a better understanding of the time commitment and expectations for system implementation. These discussions generate buy-in as stakeholders feel engaged in and part of system implementation, which can expedite and facilitate successful implementation.

Provide Institution-Specific Technical Support

Opportunities for institution-specific technical support can relieve some burdens of workload, allow for more customized trainings, and improve staff's trust in and comfort with the system. Institution-specific technical support can also help colleges with the technical aspects of creating reports, setting up dashboards, and validating data. With colleges progressing through implementation at varying speeds, institution-level trainings rather than consortium-level trainings help ensure the presented content

matches the current needs of staff and users. Additionally, institution-specific technical support can help resolve issues earlier as users have access to the system representatives. For instance, if staff cannot setup or run a report appropriately, the system representatives would be available to assist.

Embed Data Analytics

Embedding system data into everyday college operations (e.g., meetings and reports) can help facilitate use of the system among other users that may not be using the system as frequently. If possible, incorporating data findings and reports into meetings within departments can help expose staff to the functions and capabilities of the system, and increase familiarity with the system. In order for a system to be valuable, it needs to be used by its intended users. Embedding system data and familiarizing staff with the system is a potential solution to generate buy-in and familiarize staff with the system.

Start Selection Process Early

While not always feasible given project timelines and delays, beginning the process of selecting a consortium-wide data analytics system as early as possible could be beneficial to system implementation. With the process started early, colleges can reallocate grant funding early in the project and begin to plan for sustainability of the system. Staff and faculty at the colleges can interact and learn about the system early in the grant period, which can expedite implementation, as there is time to interact with the system and funding to support the assistance that would be needed to navigate the system.

APPENDIX C. IMPLEMENTATION EVALUATION METHODS

INTRODUCTION

The Implementation Evaluation began in October 2013 and continued through March 2017[164] to document program progress, to monitor program outcomes, and to provide recommendations for continuous improvement of program operations. Throughout the execution of the evaluation, and especially through the Implementation Evaluation, the Evaluation Team employed principles of a utilization-focused framework.[165] The substantiated assumptions[166] of utilization-focused evaluations are: (1) intended users are more likely to utilize evaluation findings if they understand and value the evaluation's process; (2) intended users are more likely to understand and value the evaluation's process if they are engaged in evaluation decisions; (3) engaged intended users both enhance the credibility of evaluation findings and possess greater capacity for utilizing findings to improve the project; and (4) capacity for utilizing findings relies heavily on a collaborative, functional relationship between intended users and evaluators.

Additionally, the formative component of the Implementation Evaluation offered real-time feedback as the project rolled out; as opposed to only offering information retrospectively, through frequent calls and annual reports following evaluation site visits. This provided the opportunity to identify early evidence of strengths and areas for growth throughout the development of the project.

RESEARCH QUESTIONS

Table 7 summarizes the research questions examined through the Implementation Evaluation, including ties to data sources and collection tools/protocols, and analysis methods. Further details on data sources and collection plans, analysis methods, and potential limitations of the Implementation Evaluation are detailed in subsequent sections.

Table 7: Implementation Evaluation Research Questions

Research Question	Data Sources and Collection	Analysis Methods
How was the particular curriculum selected, used, and/or created?	• Monthly and bimonthly evaluation update calls • On-site and phone interviews and focus groups • Artifact reviews • On-site curriculum retreat[167]	• Document themes, interpret, and report on qualitative data provided by BTG college leadership and staff, faculty, and instructors
How were programs and program designs improved or expanded using grant funds? What delivery methods were	• Monthly and bimonthly evaluation update calls • On-site and phone interviews and focus groups	• Document themes, interpret, and report on qualitative data provided by employers/partners; staff, faculty, and instructors; BTG college

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[164] Grant implementation occurred through March 31, 2017 with April 1, 2017 through September 30, 2017 reserved for evaluation activities.

[165] Patton, M.Q. (2012) *Essentials of Utilization-Focused Evaluation*. Thousand Oaks, CA: Sage.

[166] Brandon, P., Smith, N., Trenholm, C., and Devaney, B. (2010). "The Critical Importance of Stakeholder Relations in a National, Experimental Abstinence Education Evaluation." *American Journal of Evaluation*, 31, 4: 517-531.

Patton, M. Q. (2012). *Essentials of utilization-focused evaluation*. Thousand Oaks, CA: Sage.

Taut, S. (2008). What have we learned about stakeholder involvement in program evaluation? *Studies in Educational Evaluation,* 34.

[167] See *Appendix F* for the full curriculum review report.

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Research Question	Data Sources and Collection	Analysis Methods
offered? What was the program administrative structure? What support services and other services were offered?	• Artifact reviews • Survey and interviews from Advanced Manufacturing Recruitment Study[168]	leadership; and program participants • Review artifacts including program materials to verify changes and progress
Was an in-depth assessment of participants' abilities, skills, and interests conducted to select participants into the grant program? What assessment tools and processes were used? Who conducted the assessment? How were the assessment results used? Were the assessment results useful in determining the appropriate program and course sequence for participants? Was career guidance provided, and if so, through what methods?	• Monthly and bimonthly evaluation update calls • On-site and phone interviews and focus groups	• Document themes and report on qualitative data provided by BTG college leadership, staff, faculty, instructors, and program participants
What contributions did each of the partners (employers, workforce system, other training providers and educators, philanthropic organizations, and others as applicable) make in terms of (1) program design; (2) curriculum development; (3) recruitment; (4) training; (5) placement; (6) program management; (7) leveraging of resources; and (8) commitment to program sustainability? What factors contributed to partners' involvement or lack of involvement in the program? Which contributions from partners were most critical to the success of the grant project? Which contributions from partners had less of an impact?	• On-site and phone interviews and focus groups • Monthly and bimonthly evaluation update calls • Phone and in-person interviews for Workforce Collaboration Study[169]	• Document themes and report on qualitative data provided by employers/partners and BTG college leadership
How satisfied are program partners, staff, and participants with the program? Why?[170]	• On-site and phone interviews and focus groups	• Document themes and report on qualitative data provided by

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[168] See *Appendix E* for more information.
[169] See *Appendix G* for more information.
[170] Note that this question, within the *Implementation Evaluation* section, is separated into three questions.

Research Question	Data Sources and Collection	Analysis Methods
	• Monthly and bimonthly evaluation update calls	employers/partners, staff/faculty, participants, and BTG leadership
What program outputs have been generated throughout the life of the grant? What barriers hindered output achievement? What factors unexpectedly improvement output achievement? Why?[171]	• On-site interviews • Implementation Evaluation update calls • Artifact reviews	• Review artifacts including quarterly program reports to verify output production • Discuss outputs with BTG college leadership, staff, faculty, and instructors
What have been successes and obstacles to program performance?	• Monthly and bimonthly evaluation update calls • On-site and phone interviews and focus groups	• Document and synthesize general themes and details from interviews and interpret and summarize qualitative data in report format
How can program processes, tools, and/or systems be modified to improve performance?	• On-site and phone interviews and focus groups • Monthly and bimonthly evaluation update calls	• Document themes, interpret, and report on qualitative data provided by BTG college leadership, staff, faculty, instructors, and participants
How can the program expand or enhance institutional capacity? What are the most promising programmatic components to use institution-wide? Why?	• On-site and phone interviews and focus groups • Monthly and bimonthly evaluation update calls	• Document and synthesize general themes and details from interviews, focus groups, and discussions and interpret and summarize qualitative data in report format
How have results varied across institutions? Why?	• On-site and phone interviews and focus groups • Monthly and bimonthly evaluation update calls • Artifact reviews • Survey and interviews from Advanced Manufacturing Recruitment Study[172]	• Document and synthesize general themes and details from interviews, focus groups, and discussions and interpret and summarize qualitative data in report format

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[171] Note that this question, within the *Implementation Evaluation* section, is separated into three questions.
[172] See *Appendix E* for more information.

DATA SOURCES AND COLLECTION

Data for the Implementation Evaluation was collected from the following data sources:

- Monthly and bimonthly evaluation update calls with BTG college leadership, faculty, staff, instructors, and WVCTCS leadership
- On-site and phone interviews with BTG leadership and college leadership, staff, faculty, instructors, and community partners (including workforce development board staff), and focus groups with BTG program participants
- BTG documents and artifacts from colleges, including quarterly program reports, program-related documents and promotional materials, curriculum, and other documents

Evaluation Update Calls

Evaluation update calls between the Evaluation Team and BTG college leadership, staff, faculty, and instructors from each community and technical college took place monthly until March 2015, when calls switched to bimonthly for the remainder of the project. Members of the BTG implementation team at each college participated in these calls. Monthly and bimonthly calls with WVCTCS leadership also occurred throughout the project.

The evaluation update calls enabled BTG college leadership, staff, faculty, and instructors as well as WVCTCS leadership to provide the Evaluation Team with timely information regarding the project's processes, progress, obstacles, and successes at each of the nine institutions. These findings were elaborated upon during site visit interviews but calls provided BTG college leadership, staff, faculty, and instructors as well as WVCTCS leadership with an opportunity to recall events and challenges more frequently than the annual site visits.

Members of the Evaluation Team maintained detailed notes from each call. These notes were stored on TPMA servers and provided a timeline of relevant occurrences used as a reference point for staff, faculty, instructor, and employer interviews as well as participant focus groups. Call summaries synthesizing information from each call were provided to call participants for internal records. When USDOL granted the six-month extension, the Evaluation Team incorporated additional update calls to supplement the final site visit so that ample qualitative data was being collected.

On-Site and Phone Interviews and Focus Groups

Site visit plans included a series of annual site visits for one-on-one interviews and focus groups in March and April 2015, and October and November 2016. The Evaluation Team visited each of the nine community and technical colleges within the BTG consortium as well as WVCTCS. The Evaluation Team developed interview discussion guides that directed each of the site visits. These guides were originally deployed during the March and April 2015 site visit and then modified for the October and November 2016 site visit to target themes and issues that had emerged throughout implementation, as well as program sustainability and lessons learned. Site and phone interviews were also utilized as part of the Advanced Manufacturing Recruitment Study targeting enrollment patterns at two community and technical colleges,[173] and the Community and Technical College and Workforce Collaboration Study examining collaborative efforts between the two entities and identifying areas for improvement.[174]

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[173] For more information on this study, see *Appendix G*.
[174] For more information on this study, see *Appendix E*.

The Evaluation Team visited the nine community and technical colleges and conducted interviews with stakeholder groups outlined in Table 8. This table outlines a cumulative estimate for all nine colleges, including WVCTCS.

Table 8: Implementation Evaluation Stakeholders

Stakeholder	Description	Totals
BTG college leadership (ITLs) and WVCTCS	The Evaluation Team conducted semi-structured 60-90 minute interviews with BTG college leadership and WVCTCS leadership on program activities and integration, collaboration/partnerships, resources, lessons learned, and sustainability. This group, in some cases, also included college Presidents and other administrators.	>20 interviews
Support services staff	Semi-structured 30-60 minute small-group and individual interviews were held with support services staff, covering activities, participant flow, resources, lessons learned, and sustainability.	>20 interviews
Developmental education staff	Semi-structured 30-minute small-group and individual interviews were held with developmental education staff, covering activities, participant flow, sustainability, lessons learned and resources.	>20 interviews
BTG faculty and instructors	As available, 30-60 minute semi-structured small group and individual interviews were conducted with BTG faculty and instructors from different sectors (i.e., Advanced Manufacturing, Energy, Information Technology, and Construction). Discussions centered on program activities, collaboration/partnerships, resources, and lessons learned.	>40 interviews
Recruitment and marketing staff	Semi-structured 30-minute small-group and individual interviews were held with recruitment and marketing staff, covering activities, sustainability, and lessons learned.	>20 interviews
Industry outreach staff	Semi-structured 30-minute small-group and individual interviews were held with industry outreach staff discussing activities, sustainability, and lessons learned.	>20 interviews
Regional employers and partners	Semi-structured 30-60 minute interviews were held with regional employers and partners. These interviews took place at the college campuses. Employer discussions focused on program engagement, impacts to the business, and overall satisfaction.	>10 interviews
BTG participants	The Evaluation Team held semi-structured 30 to 60-minute focus groups with grant participants while on site. Discussions focused on the individual's goals, program experience and satisfaction to date, and overall program feedback.	>20 focus groups

Interviews were semi-structured with open-ended questions for probing and conversational inquiry. In line with the principles of applied thematic research, this interview approach enabled participants to speak about experiences in their own words, free of the constraints imposed by fixed-response questions. Inductive probing allowed the Evaluation Team to clarify statements, meaning, and the feelings associated with the experiences, to promote accuracy in detailed observational notes. This interview framework also provided the means to "[learn] from the participants' talk and dynamically [seek] to guide the inquiry in response to what is being learned."[175]

To increase validity of the interviews, the Project Managers were present for every site visit and participated in the Implementation Evaluation update calls, artifact reviews, and report writing. This consistency helped build and preserve institutional knowledge across site visits. In addition, these methods are consistent with recommendations made by qualitative researchers,[176] allowing a member of the Evaluation Team to focus on facilitation and a second and third member to take detailed notes.

Document and Artifact Review

The Evaluation Team review a variety of program artifacts including, but not limited to:

- Quarterly program narrative reports sent by BTG college leadership to USDOL;
- Promotional materials highlighting BTG programs (e.g., brochures, flyers, and handouts);
- Curriculum materials presented at the curriculum review retreat;[177]
- Documents posted to Teamwork[178] – the consortium's project management tool; and
- Training, process flow, and marketing and outreach plans prepared internally by BTG college leadership, staff, faculty, and instructors.

These documents provided additional context and information to evaluate project implementation at each stage – challenges, successes, unintended consequences (both positive and negative), and the reasons for accelerated or delayed progress at each BTG college. Context from these documents informed questions for the monthly and bimonthly evaluation update calls, quarterly summaries, on-site and phone interviews and focus groups, and informed context within evaluation reports.

ANALYSIS METHODS

Thematic Analysis

A general inductive thematic approach,[179] with influences of applied phenomenology,[180] was used to analyze the qualitative data generated from the interviews and focus groups. This approach was selected because of its usefulness in drawing clear links between research questions or objectives and data collection results, and because it provides a theoretical foundation for subjective meaning to be interpreted and extrapolated from discourse. The analytical framework used for the analysis included a time-

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[175] Guest, G., MacQueen, K.M., and Namey, E.E. (2011). *Applied Thematic Analysis*. Thousand Oaks, CA: Sage.

[176] Kidd, P. S. & Parshall, M. B. (2000). Getting the focus and the group: Enhancing analytical rigor in focus group research. *Qualitative Health Research*, 10, 3: 293-308.

[177] A curriculum review retreat was hosted to provide a forum for colleges to discuss their curricula, challenges, and successes. See *Appendix F* for the fully report.

[178] For more information, see: https://www.teamwork.com/

[179] Thomas D. R. (2006). A general inductive thematic approach for analyzing qualitative evaluation data. *American Journal of Evaluation*, 27: 237-245.

[180] Guest, G., MacQueen, K.M., & Namey, E.E. (2011). *Applied thematic analysis*. Thousand Oaks, CA: Sage.

dependent gradient (before the project, changes occurring in each year of project implementation, and post-project scaling) and a program-dependent gradient (analyzing the program components).

Units of analysis included the programs; BTG college leadership; WVCTCS leadership; staff, faculty, and instructors; employers and community partners; and participants.

Emerging themes were developed according to the analytical framework and through a review of (1) the notes taken during monthly and bimonthly calls; (2) grant and college documents and artifacts; (3) detailed notes taken during site visits; and (4) the Evaluation Team's extensive experience with technical training programs and the body of evaluation knowledge built through their work. Guidance about what was important came from the grant narrative, Evaluation Plan, and calls that had occurred throughout the grant period. Following the initial theme development, additional Evaluation Team members reviewed the results, adding contextual details and examples. These themes were divided into five categories:

- *Interim Progress* – Documentable steps that had been taken to advance or achieve grant outcomes, deliverables, milestones, and/or goals;
- *Accelerators/Strengths of Progress* – Factors that had enhanced grant progress and improved the ability of grant staff to carry out grant initiatives, focused on internal factors (program design, modifications, implementation, and application);
- *Barriers and Challenges to Progress* – Persistent difficulties grant staff faced in accomplishing grant initiatives;
- *Recommendations* – Opportunities the Evaluation Team identified for improving progress toward grant outcomes (in Interim Reports), and recommendations for other educational institutions looking to start similar programs and initiatives; and
- *Sustainability* – Components of the project that will continue once funding ends.

The results were again compared to the analytical framework and the anticipated reporting elements. The final step in the analysis was to send the summarized results to college and WVCTCS leadership for clarification and additional contextual details.

To strengthen the accuracy and credibility of implementation study findings, the Evaluation Team relied on triangulation and collaborative inquiry. By comparing findings based on different data sources and using approaches that incorporated both evidence and negative evidence, the Evaluation Team created a robust and dynamic depiction of implementation.[181] By presenting findings to BTG stakeholders for elaboration, corroboration, and modification, the Evaluation Team confirmed and updated analyses. Additionally, by sharing findings with intended users as they emerged, the Evaluation Team built a collaborative relationship with stakeholders that encouraged higher quality first-person data and increased the likelihood the evaluation could produce timely, user-relevant findings.[182]

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[181] Brewer, J. and Hunter, A. (2006). *Foundations of multimethod research: Synthesizing styles.* Thousand Oaks, CA: Sage.

[182] Cousins, J.B. and Earl, L. M. (1992) *The Case for Participatory Evaluation*. Educational Evaluation and Policy Analysis, 14(4), 397-418.

Cousins, J. B. and Whitmore, E. (1998). Framing participatory evaluation. *New Directors for Evaluation*, 80. 5-23.

Greene, J.G. (1998). Stakeholder participation and utilization in program evaluation. *Evaluation Review*, 12. 91-116.

Reineke, R. A. (1991). Stakeholder involvement in evaluation: Suggestions for practice. *American Journal of Evaluation*, 12. 39-44.

Sturges, K.M. (2013). *Building consensus in (not so) hostile territory: Applying anthropology to strategic planning*. Practicing Anthropology, 35, 1: 35-39.

Reporting

Data were interpreted, analyzed, and included in two interim reports (in May 2015 and December 2016) and the final report (drafted in early-mid 2017 and finalized by September 2017). The reports contained the results of the analysis, recommendations for improvements, rationale for recommended modifications, and any threats or challenges that may have arisen as a result of recommended modifications. These results were compared over time. The colleges and WVCTCS leadership conducted an in-depth review of these reports for member checking, factual verification, and elaboration on findings and recommendations. Subsequently, the reports were submitted to the USDOL.

LIMITATIONS

Limitations for the Implementation Evaluation included three main elements:

Partial and Biased Findings – Qualitative and perceptual research methods offer good insights, but are, by nature, partial and biased. To attempt to address this limitation, the Evaluation Team took advantage of opportunities embedded in mixed-methods evaluation – the triangulation of data.[183] Triangulating results from multiple sources, such as comparing findings among stakeholder interviews and with document reviews, creates more credible evaluation results, and is considered critical to the validity and reliability of findings. Findings that have been corroborated through triangulation tend to be sufficiently robust and credible.[184]

Selection Bias – To address the threat of non-response and non-consent and to improve the likelihood that sufficient data could be collected to draw valid conclusions, the Evaluation Team relied on purposive and convenience sampling coordinate by project staff. Through this, however, the approach introduced selection bias into the findings. Participants and employers more interested in providing feedback or more involved in the program may have chosen to participate in interviews at a higher rate than less interested or less engaged participants and employers, and project staff responsible for coordinating interviews may have selected only those cases where they anticipated favorable responses to interview questions. These biases were strengthened due to the nature of the BTG project, as it was a grant targeted non-traditional students in rural areas of West Virginia, meaning these individuals are difficult to reach. Therefore, selection bias could have become more apparent as project staff may have selected participants that were more engaged and/or on campus at the time. Neutral and critical feedback from participants and employers, however, supported the notion that these research participants were chosen primarily for their willingness to participate in the study rather than the likelihood that they would cast the program in a favorable light.

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[183] Brewer, J. and Hunter, A. (2006). *Foundations of multidimensional research: Synthesizing styles*. Thousand Oaks, CA: Sage.

[184] Denzin, N. K. (1978). *The research act: A theoretical introduction to sociological methods (2nd edition).* New York, NY. McGraw-Hill.

Harry, B., Sturges, K.M., & Klinger, J.K. (2005). *Mapping the process: An exemplar of process and challenge in grounded theory analysis*. Educational Researcher, 34, 2: 3-13.

Patton, M.Q. (2001). *Evaluation, Knowledge Management, Best Practices, and High Quality Lessons Learned*. American Journal of Evaluation. 22(3). 329-336

Patton, M.Q. *Qualitative Research & Evaluation Methods* (4th edition). Thousand Oaks, CA. SAGE Publications, Inc.,. 2015.

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Researcher Extrapolation – Analyses conducted with an interpretive and analytical framework, influenced by phenomenology, suffer from the threat that researcher extrapolation and interpretation may go too far beyond what is present in, and supported by, data.[185] Indeed, the recommendations provided in this report are based on a combination of what was learned and supported by data, and the experiences and findings of the evaluator's previous knowledge designing, implementing, and evaluating various training programs.

Respondent Order Effect – For site visits, the Evaluation Team conducted a group interview for all participants within the chosen BTG classes. During these group interviews, participants more interested in sharing their opinions of the program may have spoken up at a greater rate than other students. This may have created a pecking order bias by participants self-selecting their response order (i.e. certain participants go first and others go last). Receiving a range of feedback from participants, from positive to critical, supports the notion and that a spectrum of student experiences was captured, however, it is possible that bias related to the participant response ordering was introduced into the evaluation.

INFORMING IMPACT EVALUATION

The Implementation Evaluation findings provided context for the Impact Evaluation by documenting the timing and nature of adjustments to program design. The Impact Evaluation utilized this documentation to understand whether changes to the project might affect various participants.

Impact Evaluation Revisions

Benchmark Approach

For the benchmark approach, the Evaluation Team studied credit acquisition in the target field. This is an adjustment to the original research question, which planned to study credit hours acquired overall. Given that the aim of the program was to graduate students from specific programs and into targeted industries, the Evaluation Team wanted the benchmark measure to reflect credits that were earned while the student was enrolled in the targeted field of study. The Evaluation Team also investigated the impact of the program on the proportion of total credit hours earned (not just in the target field, which was the original research question) using the same benchmark approach. Findings became statistically insignificant (but point estimates remained negative).

Employment and Wage Outcomes

The original Evaluation Plan stated that the Evaluation Team would assess baseline employment and wage outcomes based on two quarters prior to enrollment in the program. The Evaluation Team shifted their approach to include eight quarters of pre-program data, when they realized that these data were available. This is more consistent with research that investigated the effectiveness of training programs using quasi-experimental techniques. The additional six quarters added useful information, and permitted the Evaluation Team to diagnose pre-program trends in wage growth and employment status. These trends were included with the expectation that they would permit findings that were more robust. The Evaluation Team conducted sensitivity analyses using the original two quarters of pre-program baseline data (and results were substantively identical to the benchmark findings reported here).

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[185] Guest, G., MacQueen, K.M. & Namey, E.E. (2011). *Applied thematic analysis*. Thousand Oaks, CA. SAGE Publications, Inc.

Treatment Study

The original Evaluation Plan defined the treatment study window as August 1, 2014 through July 31, 2016. As the Evaluation Team learned more about the BTG programs and when BTG-funded changes were implemented, it was determined that some programs began implementing changes as early as January 2014. Therefore, the Evaluation Team extended the treatment study window to January 1, 2014.

Multi-Level Model

The Evaluation Team did not estimate a fully nested multi-level model as specified in the original Evaluation Plan. Preliminary investigation into the structure of programs offered within and across colleges suggested that this approach would have been a misspecification of the clustering of the participants. The Evaluation Team was unable to estimate a fully crossed effects model with inverse probability of treatment weights included in the procedure, so, examined several alternative multilevel specifications instead.[186] The approach that was settled on accounts for cross-nesting with random effects and was computationally simpler than a three-level model; it reduced the levels by one and created a level for campus in which the program factor could vary randomly, but was not modeled as a fixed main effect. The Evaluation Team also considered but, for practical reasons, decided against the fixed-effect specification of higher-level clustering. Benchmark results were mostly robust to these decisions.[187]

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[186] The Evaluation Team also confirmed the robustness of the modeling procedures by examining unweighted models and comparing the results of a crossed random effects nested structure with the two alternative approaches. Findings were identical to the selected approach and substantively indistinguishable from the fully nested model.

[187] Sensitivity studies that retain the full analytic sample and employed fixed campus and program effects produced estimates that were substantively identical to the benchmark findings.

APPENDIX D. IMPACT EVALUATION METHODS

INTRODUCTION

Purpose and Background

The purpose of the Impact Evaluation was to assess whether the implementation of Trade Adjustment Assistance Community College and Career Training (TAACCCT)-funded programs at *Bridging the Gap* (BTG) consortium colleges improved student persistence, completion, and short-term employment outcomes using a quasi-experimental design (QED). Specifically, as detailed in the Analysis Plan,[188] the Evaluation Team was interested in estimating the impact of BTG across all eligible academic programs that received TAACCCT funding. That is, instead of gauging the impact of TAACCCT funding on a specific program, campus, or college, the objective of this Impact Evaluation was to estimate the average impact of BTG across the nine colleges that were part of the BTG consortium.[189]

The Impact Evaluation compared students who enrolled in TAACCCT-funded BTG programs at a given college with another group of students who enrolled in the same programs (at the same college) before the institution received the TAACCCT funding. Data for this study were collected from three sources: (1) administrative data collected by the West Virginia Higher Education Policy Commission (WVHEPC), (2) individual-level economic data from WorkForce West Virginia (WorkForce WV), and (3) contextual economic data from the United States Bureau of Labor Statistics (BLS). Using this information, the Evaluation Team finalized definitions of key data to guide the analysis. These definitions, which align to the research questions, included:

- **Credits earned in target field (persistence domain):** measured as the proportion of credits that a student earned toward the required number of credits for the certificate or associates degree indicated by their degree objective code in their first semester of enrollment.
- **Dropout (persistence domain):** categorized if (1) the data indicate an official withdrawal, (2) the student has a gap of two or more semesters following enrollment and has no graduation data, or (3) the student exited the program and failed to enroll for two or more semesters following enrollment and has no graduation data.
- **Degree acquisition in target field (completion domain):** measured as the probability of earning a certificate or associates degree in their field as indicated by the student's degree objective code in their first semester of enrollment.
- **Change in employment status (employment domain):** measured as the change in employment status from baseline (pre-enrollment) to one quarter post-exit from a BTG or comparison program. Employment is indicated if the individual has any amount of wages in the quarter(s) being measured.
- **Change in earnings (employment domain):** measured as the change in wages from baseline (pre-enrollment) to one quarter post-exit from a BTG or comparison program.

This appendix includes a detailed account of the data, methods, and samples used in the Impact Evaluation, as well as findings from the benchmark analyses and sensitivity studies.

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[188] The Analysis Plan was developed in 2015 and presented an outline of proposed data collection, design, and analysis procedures.
[189] The BTG initiative as it was evaluated in the Impact Evaluation consisted of 48 (educational outcomes) or 47 (employment outcomes) degree programs, offered across 19 campuses, within nine colleges.

Research Questions

The Impact Evaluation's general hypothesis was that exposure to BTG should improve educational persistence, educational completion, and employment outcomes. It was anticipated that the enhanced academic instruction, student support, and career pathways would improve access to, support for, and motivation toward remaining in and graduating from target academic programs, which would be observable as improved persistence and completion outcomes. The Evaluation Team also hypothesized that, in addition to these educational improvements, placement enhancements, industry partnerships, and other improvements to career pathways would result in improved labor market outcomes for participating students. These expectations were formalized in the following five Impact Evaluation questions.

Educational Outcomes

- **Research Question 1:** (Persistence Domain) Did individuals who received the BTG intervention earn **more credits** than those in the retrospective comparison group who were in the same or similar programs of study but did not receive the defined intervention?[190]
- **Research Question 2:** (Persistence Domain) Did individuals who received the BTG intervention demonstrate lower likelihood of **dropping out** than those in the retrospective comparison group who were in the same or similar programs of study but did not receive the defined intervention?
- **Research Question 3:** (Completion Domain) Did individuals who received the BTG intervention demonstrate higher likelihood of **academic certificate/degree acquisition** in their target field than those in the retrospective comparison group who were in the same or similar programs of study but did not receive the defined intervention?

Employment Outcomes

- **Research Question 4:** (Employment Domain) Did individuals who received the BTG intervention demonstrate higher likelihood of improving their **employment status** from pre- to post-program than those in the retrospective comparison group who were in the same or similar programs of study but did not receive the defined intervention?
- **Research Question 5:** (Employment Domain) Did individuals who received the BTG intervention demonstrate greater increases in **quarterly wages** from pre- to post-program than those in the retrospective comparison group who were in the same or similar programs of study but did not receive the defined intervention?

DATA METHODS

Data Collection

While no original data were collected for the Impact Evaluation, individual-level outcome data, covariate data, and contextual/regional economic data were collected from WVHEPC, Workforce WV, and BLS. Therefore, all data for propensity score matching and analytical modeling were obtained from WVHEPC, WorkForce WV, and BLS.

The Impact Evaluation required receipt of pre- and post-exposure individual-level Unemployment Insurance (UI) wage data (i.e., quarterly wages) for individuals who enrolled in treatment or comparison programming during the study window. To gain access to these data, the Evaluation Team engaged in all

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[190] For the benchmark approach, the Evaluation Team studied credit acquisition in the target field. This was an adjustment to the original research question. Details on the operationalization of outcome variables are highlighted in this appendix.

necessary precautions to ensure confidentiality, complied with all requirements from the State of West Virginia regarding data security practices, and developed data sharing agreements to obtain access to the data. Data requests were submitted to WVHEPC and WorkForce WV after all enrollment had ended. Data sharing agreements were arranged and the Evaluation Team was given access to data that became its final analytic sample in June 2017.

The Evaluation Team received wage data (i.e., employment outcomes) for each BTG and comparison program participant for each of the eight quarters that preceded exposure to either the treatment or comparison program (i.e., baseline data collection) and, where applicable, for up to four quarters following exit from either the treatment or comparison program.[191] Only first quarter post-program wage data were analyzed for the benchmark analysis, as data for all participants were more complete.[192] While the specific pre-program quarterly observations varied for each individual, depending on when they were enrolled relative to the study window, the range of data received fell between the eight quarters prior to January 1, 2012 (start date of the comparison study window) through one quarter after July 31, 2016 (end date of the treatment study window). Data collection procedures were identical for all treatment and comparison group members.

WorkForce WV provided individual-level UI wage record data for students that aligned with WVHEPC's administrative data, through use of the student's Social Security Number (SSN). While the UI wage data reflecting quarterly wages and employment status were mostly complete for the eight quarters prior to each student's participation, the Evaluation Team only had complete UI wage data for the economic quarter that immediately followed each student's date of program completion, exit, or end of the study window.

The student-level WVHEPC data included demographic and background data on individuals who were newly enrolled in one of the BTG programs during the treatment study window or in one of the comparison programs during the comparison study window. Overall, background data received from WVHEPC were complete.

Data Procedures

As data were obtained from multiple sources, a unique identifier was used to create a composite dataset. The student's Social Security Number (SSN) was used by WVHEPC staff to link UI wage data to administrative data. Data sharing and merging procedures with WVHEPC were as follows:

Evaluation Team requested de-identified student administrative data for treatment and comparison groups. A unique student ID (not SSN) was used to link back to the student's SSN.	Evaluation Team requested UI wage data for the treatment and comparison groups. Data were submitted to WorkForce WV for UI wage data matching.	Once UI wage data were merged with student SSN variable, WorkForce WV sent matched data to WVHEPC (to remove the student SSN variable). Data were submitted to the Evaluation Team, who merged the UI wage data with the student administrative data for analysis.

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[191] If a student was still enrolled at the end of the study window, their post-program wage data consisted of up to four quarters following the end of the study window.

[192] The Evaluation Team initially requested four quarters of post-program economic data; however, due to various limitations – including time constraints for reporting, delays in program implementation, and a three- to six-month lag that was necessary to construct reliably complete data – only data from the immediate post-program quarter were complete enough for analysis.

The data were submitted in an individual-level, person-period format, wherein each time point (i.e., semester or quarter) had one record and each student had multiple observations depending on the number of semesters they were enrolled. The full data request timeline is shown in Table 9 below.[193]

Table 9: Data Request Timeline

Group includes students with enrollment dates from:	Step 1 Evaluation Team requested data for all students from WVHEPC	Step 2 WVHEPC submitted data for all students to Evaluation Team	Step 3 WVHEPC requested data for analytic sample from WorkForce WV	Step 4 WorkForce WV submitted de-identified data for analytic sample to Evaluation Team
Jan 1, 2012–Jul 31, 2014 (Comparison)	3/14/2017	5/3/2017	6/5/2017	6/14/2017
Jan 1, 2014–Jul 31, 2016 (Treatment)	3/14/2017	5/3/2017	6/5/2017	6/14/2017

Data Sources

All data transfers between WVHEPC and the Evaluation Team were conducted using Citrix ShareFile, a secure data sharing service.[194] Prior to the first data submission deadline, the Evaluation Team provided the appropriate staff from WVHEPC with guidance on how to upload data to Citrix ShareFile, to ensure successful and secure transfer of data. Data transfers between WVHEPC and WorkForce WV were conducted using WVHEPC's secure file sharing site.

WVHEPC Student Dataset

All student background data were obtained from existing administrative data, available through WVHEPC.[195] The Evaluation Team requested data for both BTG and comparison group students. These data were regularly collected by the colleges and submitted to WVHEPC. With the exception of day and month of birth and entrance exam scores, the Evaluation Team received all agreed-upon data elements for students who enrolled in one of the treatment or comparison programs during the study periods. The Evaluation Team used these data to identify the analytic sample for all treatment and comparison groups.

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[193] This timeline details the dates of the final data request. Over the life of the grant, other interim data requests were made so that the Evaluation Team could become familiar with the data transfer process and the structure and completeness of the data.

[194] For more information, please see: https://www.sharefile.com/

[195] Data elements requested from WVHEPC included ID variable; institutional code; reporting year and semester; year of birth; gender; county of residence; state or foreign country; student's degree objective; student level; disadvantaged indicator (economically or academically); English deficiency indicator; disability indicator; residency for fee purposes; ACT scores (English, math, science, reading, writing, and composite); high school Grade Point Average (GPA); year of high school graduation; previous institution; current semester GPA; withdrawal indicator; cumulative hours earned; cumulative GPA; hours earned at another institution; college hours earned in high school; race/ethnicity; unmet need; Federal Pell Grant – disbursed amount; Federal Supplemental Educational Opportunity Grant (FSEOG) – disbursed amount; Higher Education Adult Part-time Student (HEAPS) Grant Program (with and without workforce component) – disbursed amount; Federal Perkins Loan – disbursed amount; academic area of major field (at this institution, when degree awarded); undergraduate credit hours attempted (at this institution, when degree awarded); and undergraduate credit hours earned (at this institution, when degree awarded).

WorkForce WV UI Wage Data

WorkForce WV provided the Evaluation Team with individual-level UI wage data for each treatment and comparison participant in the analytic sample, including eight quarters of pre-program and up to four quarters of post-program quarterly UI wage data.[196] Individual, student-level pre-program wages were operationally defined as the wages earned by a student during each of the eight economic quarters preceding the economic quarter during which the student enrolled in a treatment or comparison program. Pre-program employment status was defined as the condition of employment or unemployment for each student during each of the economic quarters that preceded the economic quarter during which a student enrolled.[197] Although the Evaluation Team requested four quarters of post-program UI wage data, much of the post-program economic data were incomplete due to the lag time associated with compiling, cleaning, and disseminating complete UI wage data.[198] As such, the Evaluation Team only had access to reliably complete individual-level post-program data for the first quarter immediately following the quarter during which each student exited the program.[199, 200, 201] Individual-level post-program wages were operationally defined as the wages earned by a student during the economic quarter immediately following each student's date of program exit.

United States BLS

In addition to student administrative data collected by WVHEPC staff and UI wage data collected by WorkForce WV, the Evaluation Team collected publicly available data from the United States Department of Labor (USDOL) Bureau of Labor Statistics (BLS).[202] These data incorporated results from the Local Area Unemployment Statistics (LAUS) program. The Evaluation Team compiled data made available by BLS on the following contextual economic indicators: unemployment rate, total labor force, total employed, and total unemployed for each economic quarter between the first quarter of 2011 and the first quarter of 2017. The Evaluation Team identified economic conditions for the Metropolitan Statistics Area (MSA) or, if that was not available, for the county in which the student attended college for the quarter directly preceding the student's enrollment quarter, as well as the quarter directly following the student's exit quarter.

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[196] Economic quarters began on January 1, April 1, July 1, and October 1 of each year. Economic quarters closed on March 31, June 30, September 30, and December 31 of each year.

[197] Employment was indicated if the individual had any amount of wages in the quarter(s) being measured.

[198] It took three to six months from the time WorkForce WV received reports from employers before reliably data became available.

[199] Data were complete for a given quarter when that quarter reliably and accurately reflected the employment status and average wage earned for each student included in the analytic sample, regardless of when they began or completed programming.

[200] Program exit is operationally defined as the occurrence of one of the following three scenarios: graduation, withdrawal/dropout, or the end of the study window.

[201] The Evaluation Team had individual-level second-quarter post-program wage data for students who exited or completed programming earlier (rather than later) in the study windows. While the Evaluation Team used second-quarter post-program wage data for sensitivity analyses, the Evaluation Team did not include these data in the benchmark analyses. The decision was made because too few students had completed programming early enough in the study period to have been reliably measured and reported upon using second quarter post-program UI wage data. As such, the Evaluation Team chose to look only at the economic quarter for which the data were complete, as using both post-program quarters would significantly reduce the sample size in a systematic way, and the internal and external validity of the Impact Evaluation would be threatened.

[202] Monthly labor force estimates are prepared by state agencies and submitted to BLS.

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Variables

The Evaluation Team presents a discussion and description of the individual-level covariates, the time-variant economic and contextual variables, and the outcome variables used.

Covariates

Table 10 (below) provides a description of the individual-level covariates that were considered for inclusion into the propensity score estimating models and the analytic models. The completeness of covariate data varied across programs and across time periods.[203, 204] The Evaluation Team only used data that were complete or mostly complete.[205]

Table 10: Covariate Variables

Variable Name	Description of Variable
Gender	Gender is reported as either male or female. **Source**: WVHEPC student dataset
Age at beginning of study window	Age at beginning of study window is calculated as the length of time between the beginning of the study window (2012 or 2014 for comparison and treatment, respectively) and the student's year of birth. Day and month of birth were not provided due to confidentiality requirements. **Source**: WVHEPC student dataset
Race	Race is reported as American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or other Pacific Islander, White, and/or unknown race. **Source**: WVHEPC student dataset
Ethnicity	Ethnicity is reported as Hispanic/Latino. **Source**: WVHEPC student dataset
Academically disadvantaged	Academically Disadvantaged refers to persons who (1) lack reading and writing skills, (2) lack mathematical skills, or (3) perform below grade level. Operationally, students enrolled in remedial instruction or who are on academic probation may be reported as academically disadvantaged. **Source**: WVHEPC student dataset

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[203] Background variables that were requested but that the Evaluation Team was unable to use due to a high number of missing values were ACT score (not a required variable for students attending two-year institutions; missing for 69% of the sample) and high school GPA (missing for 25% of the sample). Entrance exam scores (e.g., Accuplacer, Compass) were not available, and day and month of birth were not provided due to confidentiality requirements. Only three variables used in the matching procedures required imputations: Hispanic (69 cases imputed), time from high school graduation to study window open (3 cases imputed), and disability status (3 cases imputed). See the *Missing Data* section for more information.

[204] Over the course of the study period, WVHEPC altered the way that financial aid data were reported. WVHEPC did not submit any financial aid data prior to 2011. For 2011 and 2012, financial aid data reflected an annual total, and from 2013 going forward, schools began reporting financial aid data by semester. The Evaluation Team used the financial aid data provided, as well as which semesters the students were enrolled, to create baseline financial aid variables that reflect the amount of unmet need or amount of financial aid awarded for the student's first up-to-three consecutive semesters (i.e., one academic year) of enrollment. Financial aid baseline variables were not used in the analytic model or propensity score matching procedures because they were not true baseline measures.

[205] Any variable that was less than 95% complete was not used in the analysis.

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Variable Name	Description of Variable
Economically disadvantaged	Economically Disadvantaged refers to any of the following: (1) the student, parent(s), or guardian of the student is a recipient of public assistance; (2) the student is institutionalized or under state guardianship; (3) the student qualifies (by virtue of a needs test such as the Pell Grant Application, FSS, the Financial Aid Form, or a state needs test such as PHEAA) for Pell Grant, SEOG, NDSL, CWSP, or West Virginia Higher Education Grant Program. Operationally, the records of Pell Grants or similar financial aid programs may be used to determine whether a student is economically disadvantaged. **Source**: WVHEPC student dataset
Limited English proficiency	A "Person of Limited English Proficiency" (LEP) means any member of a national origin minority who does not speak and understand the English language in an instructional setting well enough to benefit from studies to the same extent as a student whose primary language is English. **Source**: WVHEPC student dataset
Disability status	This field indicates whether the student has one of the following specific disadvantages: mentally impaired, hard of hearing, deaf, speech impaired, visually handicapped, seriously emotionally disturbed, orthopedically impaired, other health impaired, deaf-blind, multi-handicapped, or specific learning disability.[206] **Source**: WVHEPC student dataset
Mean pre-program wages	UI Wage data for eight quarters prior to enrollment in a BTG or comparison program. **Source**: WorkForce WV UI wage dataset
Pre-program employment status	UI employment data for eight quarters prior to enrollment in a BTG or comparison program. **Source**: WorkForce WV UI wage dataset
Number of days from beginning of study window to enrollment	A continuous variable (range: 0 to 851 days) calculated as the length of time between the beginning of the study window and the approximate date that the student enrolled in the BTG or comparison program.[207] **Source**: WVHEPC student dataset

[206] WVHEPC provides definitions for the following specific disabilities: Mentally Impaired – significantly sub-average, general intellectual functioning existing concurrently with deficits in adaptive behavior and manifested during the developmental period (adversely affects the person's performance); Hard of Hearing –a hearing impairment, whether permanent or fluctuating (affects the person's performance), but is not included under the definition of "deaf;" Deaf –a hearing impairment so severe that the person is impaired in processing linguistic information through hearing, with or without amplification (adversely affects performance); Speech Impaired –a communication disorder, such as stuttering, impaired articulation, a language impairment, or a voice impairment (adversely affects the person's performance); Visually Handicapped – a visual impairment which, even with correction, adversely affects the person's performance (includes both partially seeing and blind persons); and Seriously Emotionally Disturbed –a condition exhibiting one or more of the following characteristics over a long period of time and to a marked degree, which adversely affects performance: (1) an inability to learn which cannot be explained by intellectual, sensory, or health factors; (2) an inability to build or maintain satisfactory interpersonal relationships with peers; (3) inappropriate types of behavior or feeling under normal circumstances; (4) a general pervasive mood of unhappiness or depression; or (5) a tendency to develop physical symptoms or fears associated with personal problems. (The term includes persons who are schizophrenic or autistic but does not include persons who are socially maladjusted, unless it is determined that they are seriously emotionally disturbed).

[207] The WVHEPC student dataset includes the year and semester of enrollment. Using the calendars accessed on the college websites, the Evaluation Team estimated enrollment dates based on the period that each semester generally begins. For fall semesters, a date of August 1 is used; for spring semesters, January 1 is used; and for summer semesters, May 1 is used. The beginning dates of the comparison and BTG periods are estimated as January 1, 2012 and January 1, 2014, respectively. The latest dates that a student could enroll in a comparison or BTG program and be included in the study was estimated as May 1, 2014 and May 1, 2016.

Variable Name	Description of Variable
Semester of entry	Semester of entry refers to the semester (fall, spring, or summer) that a student first enrolled in a BTG or comparison program. **Source**: WVHEPC student dataset
Amount of unmet need[208]	This is the dollar amount of unmet need for a student who demonstrates financial need but who fails to receive assistance or is awarded aid that covers only part of need. The Evaluation Team used the financial aid data provided, as well as the semesters students were enrolled, to create baseline financial aid variables that reflect the amount of unmet need for the student's first up-to-three consecutive semesters (i.e., one academic year) of enrollment. **Source**: WVHEPC student dataset; WVHEPC financial aid dataset

Time-Variant Economic and Contextual Indicators

Time-variant economic and contextual variables captured second-order processes existing outside of the control of the study design that may have influenced outcomes for students who were beginning and ending different programs, at different times, and in different locations. For instance, time-variant and contextual variables attempted to capture differences in labor market conditions at different points in time during the study period. Including these variables can help diminish any potential bias stemming from variable economic conditions across time and geographic location. The time-variant and contextual indicators are detailed in Table 11 below.

Table 11: Time-Variant Economic and Contextual Variables

Variable Name	Description of Variable
MSA/County unemployment rate for quarter preceding enrollment	A continuous variable describing the unemployment rate for the MSA/county where the student enrolled in the BTG or comparison program for the quarter preceding the student's enrollment. **Source**: U.S. Bureau of Labor Statistics; WVHEPC student dataset
MSA/County unemployment rate for first quarter post-exit	A continuous variable describing the unemployment rate for the MSA/county where the student enrolled in the BTG or comparison program for the quarter following the student's exit. **Source**: U.S. Bureau of Labor Statistics; WVHEPC student dataset
MSA/County labor force for quarter preceding enrollment	A continuous variable describing the labor force for the MSA/county where the student enrolled in the BTG or comparison program for the quarter preceding the student's enrollment. The labor force is the sum of employed and unemployed persons. **Source**: U.S. Bureau of Labor Statistics; WVHEPC student dataset
MSA/County labor force for first quarter post-exit	A continuous variable describing the labor force for the MSA/county where the student enrolled in the BTG or comparison program for the quarter following the student's exit. The labor force is the sum of employed and unemployed persons. **Source**: U.S. Bureau of Labor Statistics; WVHEPC student dataset

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[208] See Footnote 204.

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Variable Name	Description of Variable
MSA/County number employed for quarter preceding enrollment	A continuous variable describing the number of employed persons for the MSA/county where the student enrolled in the BTG or comparison program for the quarter preceding the student's enrollment. **Source**: U.S. Bureau of Labor Statistics; WVHEPC student dataset
MSA/County number employed for first quarter post-exit	A continuous variable describing the number of employed persons for the MSA/county where the student enrolled in the BTG or comparison program for the quarter following the student's exit. **Source**: U.S. Bureau of Labor Statistics; WVHEPC student dataset
Average wages for the eight quarters prior to program enrollment for all participants who attend each campus	A continuous, campus-level variable detailing the average preprogram wages for the eight quarters pre-enrollment for all students enrolled in a BTG or comparison program at each campus location. **Source**: WorkForce WV UI wage dataset; WVHEPC student dataset

Outcome Variables

Educational outcomes in two domains were operationalized with three measures: (1) proportion of required credits earned in target field, (2) withdrawal/dropout, and (3) attainment of academic certificate/degree in target field.[209] Employment outcomes were assessed with two measures: (1) employment status (i.e., whether one was employed during a given quarter) and (2) wages (i.e., the total wages earned in a quarter). Table 12 below outlines how these outcome measures were constructed.

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[209] Academic certificate/degree refers to a Certificate of Applied Science or Associate of Applied Science degree.

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Table 12: Outcome Measures

Outcome Name	Description of Outcome	Timing of Measure
Persistence: Credits earned in target field[210]	The outcome was measured as the proportion of credits that a student has earned toward the required number of credits for the academic certificate/degree indicated by their degree objective code in their first semester of enrollment. The outcome variable was constructed using the following data elements in the WVHEPC student dataset: • Cumulative hours earned • Degree objective code • Semester • Year The Evaluation Team collected the number of required hours per program from BTG college leadership at each institution. This was used to calculate the proportion.[211] The resulting variable is a continuous proportion with values that range from 0 to 1, where 0 means the student earned none of the hours required to attain the academic certificate/degree and 1 means the student earned all (100%) of the hours required to attain the academic certificate/degree. Only hours earned in semesters when a student was enrolled in the same field of study as their first semester were included in the cumulative totals. If a student earned more hours than were required for the academic certificate/degree in their target field, their outcome measure was recoded to 1 (100%). If a student earned hours while enrolled in a field of study different from their initial program of enrollment, those hours were subtracted from the cumulative hours.	Measured in final semester of enrollment during the BTG or comparison period.
Persistence: Dropout	This outcome was measured as the probability of officially withdrawing from the college or ceasing to be enrolled in the college without earning an academic certificate/degree. The outcome variable was constructed using the following data elements in the WVHEPC student dataset: • Withdraw • Semester • Year	Measured in final semester of enrollment or at the end of the BTG or comparison period.

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[210] Since the intent of the TAACCCT program is to develop student potential in targeted degree programs that serve specific target industries, the Evaluation Team reasoned that the outcome of interest should be credits earned in the BTG field of study and not credits earned in any field. Field of study is defined as the major that the student declared in their first semester of enrollment in a BTG program. The Evaluation Team defined credits in the target field as credits earned when a student's declared major for that semester matched that of their first semester. The target fields of study for the BTG grant are Advanced Manufacturing, Energy, Information Technology, and Construction.

[211] In one case, a course was used to identify students for a comparison program. In this instance, the number of required hours equivalent to the matched BTG program was imputed for the comparison students.

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Outcome Name	Description of Outcome	Timing of Measure
	If a student had data in the WVHEPC graduate dataset, they were considered to have earned an academic certificate/degree (and not dropped out) for the purposes of constructing the dropout outcome variable. The resulting variable is a dummy variable with values of 0 or 1, where 0 means the student did not drop out and 1 means the student dropped out. A student was considered dropped out if (1) the data indicated an official withdrawal, (2) they had a gap of two of more semesters following enrollment and had no graduation data, or (3) they exited the program and failed to enroll for two or more semesters following enrollment, and had no graduation data.[212]	
Completion: Academic certificate/degree acquisition in target field[213]	This outcome was measured as the probability of earning a degree or certificate in their field as indicated by the student's degree objective code in their first semester of enrollment. The outcome variable was constructed using the following data elements in the WVHEPC student dataset: • Degree objective code • Semester • Year And the following data elements in the WVHEPC graduate dataset: • Degree objective code when degree awarded • Semester • Year The resulting variable is a dummy variable with values of 0 or 1, where 0 means the student did not earn a degree or certificate in their field and 1 means the student received a degree or certificate in their field. For this outcome, any CAS or AAS degree in the same field that the student initially enrolled in was considered an academic program in their field. Other credentials (i.e., certifications) were not recorded in the WVHEPC graduate dataset and were therefore not included in the analysis.	Measured in final semester of enrollment or at the end of the BTG or comparison period.

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[212] Dropout was defined based on two non-enrolled semesters instead of one because the data show that many students do not enroll in the summer semester.

[213] Since the intent of the TAACCCT program was to develop student potential in targeted degree programs that served specific target industries, the outcome of interest became an academic certificate or degree in the BTG field of study, rather than any credential. Field of study is defined as the major that the student declared in their first semester of enrollment in a BTG program.

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Outcome Name	Description of Outcome	Timing of Measure
Employment: Change in employment status	This outcome was measured as the change in employment status from baseline (pre-enrollment) to one quarter post-exit from a BTG or comparison program. Employment was indicated if the individual has any amount of wages in the quarter(s) being measured. The outcome variables were constructed using quarterly UI Wage data from Workforce WV. The resulting variables are dummy variables with values of 0 or 1. Pre-enrollment: the variable has a value of 1 if the student was employed in any of the eight contiguous quarters immediately preceding enrollment and 0 otherwise. Post-program: the variable has a value of 1 if participant was employed in the quarter immediately following the intervention/comparison period and 0 otherwise.	Operationalized as the average of eight quarters prior to enrollment and the first quarter after exit from the program or end of the BTG or comparison period.
Employment: Change in earnings	This outcome was measured as the change in wages from baseline (pre-enrollment) to one quarter post-exit from a BTG or comparison program. The outcome variables were constructed using quarterly UI Wage data from Workforce WV. The resulting baseline variable is a continuous variable that takes the average value of the quarterly wages reported for the eight contiguous quarters immediately preceding enrollment. The resulting post-exit variable is a continuous variable that takes the value of the quarterly wages reported for the quarter immediately following the student's exit from the program or the end of the BTG or comparison period.	Operationalized as the average of eight quarters prior to enrollment and the first quarter after exit from the program or end of the BTG or comparison period.

Missing Data

Missing outcome data were not imputed. All cases with missing outcome data were dropped from the analytic sample. Only mostly complete covariate data (i.e., those with a small number of missing cases) were included in matching and analytic models. See the *Covariate Variables* section in this appendix for a discussion of selected variables. Only three variables used in the matching procedures required imputations: Hispanic (69 cases imputed), time from high school graduation to study window open (3 cases imputed), and disability status (3 cases imputed).[214]

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[214] The procedure was to impute missing values of these variables to the grand mean.

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ANALYSIS METHODS

Analytic Approach

The purpose of the Impact Evaluation was to assess whether the implementation of TAACCCT-funded programs at BTG consortium colleges improved student persistence, completion, and short-term employment outcomes. These questions are investigated using an observational or quasi-experimental design (QED). As specified in the Analysis Plan, the Evaluation Team was interested in estimating the impact of the BTG initiative across all eligible degree programs that received TAACCCT funding.[215] That is, instead of gauging the impact of TAACCCT funding on a specific program, campus, or college, the objective of the Impact Evaluation was to estimate the average impact of BTG across the nine colleges that were part of the BTG consortium.[216]

Study Design

The Impact Evaluation compared students who enrolled in TAACCCT-funded BTG programs at a given college with another group of students who enrolled in the same programs at the same college before the institution received the TAACCCT funding. In cases when TAACCCCT funding supported the development of new programs rather than modified existing programs, the Evaluation Team compared BTG students with students enrolled in a similar program at the same college.[217] By doing so the Evaluation Team directly compared students who selected to participate in the same program (i.e., programs that were virtually identical except for the intervention of TAACCCT funding.[218, 219] The intervention that was investigated – the use of TAACCCT funds to improve specified fields of study within nine colleges – was an external change to the program that would not likely change who elected to enroll in the program. Moreover, comparing the BTG program with the same program before TAACCCT-funded improvements was the most sensible observational contrast available.

The only complication and limitation to this approach was that the Evaluation Team was comparing groups of students who were exposed to different economic and contextual conditions during their respective exposures to the contrasted programs. Different economic and contextual experiences can influence educational and employment outcomes. The Evaluation Team maintains, however, that these conditions were observable; by including labor force statistics in the matching considerations and analytic models, the Evaluation Team controlled for these economic and contextual experienced and statistically removed their effects from the impact estimates.

The Evaluation Team balanced the analytic sample through quasi-experimental matching procedures. Specifically, a two-stage procedure was used that "matched" treatment students with a group of similar students who pursued the same academic program paths within a period of identical length, positioned

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[215] BTG college leadership identified the programs at their schools that were the recipients of TAACCCT funding. See the *Identification of Treatment Group* section for more information.

[216] BTG, as it is evaluated in the Impact Evaluation, consisted of up to 48 (educational outcomes) or 47 (employment outcomes) degree programs, offered across 19 campuses, within nine colleges.

[217] For a complete list of BTG programs and comparison programs that were considered for the Impact Evaluation, see *Table 18.*

[218] A n alternative approach was to compare BTG program students with students from a different program at the same college. The Evaluation Team avoided this approach for two reasons. First, students who have selected into different programs are motivationally dissimilar. Second, it contrasts programs that not only differ in terms of the features of interest (i.e., TAACCCT funded versus not) but also in terms of the program itself. The evaluated contrast therefore is not the intervention of interest (e.g., TAACCCT improvements) but the intervention of interest plus the difference in programs. The net result is that any estimate of program impact is sandwiched with these selection effects and contrast confounds.

[219] The Impact Evaluation considered students who were newly enrolled in a BTG or comparison program.

similarly in the academic year, but at a time up to two years prior to the start of the BTG intervention. The Evaluation Team then employed propensity score procedures to weight the analytic sample to maximize the equivalence of both groups on observed characteristics.[220] The Evaluation Team used a selection algorithm to identify a set of observed variables that best predicted treatment status.[221] This model was used to produce a predicted probability of being in the treatment group, and to "weight" each individual in the analytic models. The weighting procedures essentially augmented the balance achieved in the first stage by up-weighting individuals in both the BTG and comparison groups that were similar and down-weighting those that were different.

Next, balance was assessed by comparing the difference in summary statistics for BTG students and their matched comparison counterparts. For the purposes of validating the retrospective matching approach, the Evaluation Team compared balance statistics for the first- and second-stage samples. Finally, analytic statistical models were constructed to estimate the impact of BTG. When outcome data were pre/post in structure (employment outcomes), the impact of the defined intervention was estimated by way of a multilevel difference-in-differences (DID) method.[222] DID is a statistical technique that calculates the effect of an intervention by subtracting the average change observed for the treatment group from the average change for the comparison group.[223] When only post-program outcome data were available (i.e., persistence and completion), impact was estimated through a multilevel regression that modeled outcomes as a function of treatment status.[224] This statistical model estimates a treatment effect as the difference in post-intervention outcomes for both the treatment and comparison groups.[225]

BTG Intervention Period

The BTG study window was the period between the initiation of BTG within each institution and up to two years later, extending no later than July 31, 2016.[226, 227] Although most colleges implemented BTG-funded changes beginning in Fall 2014, some academic programs initiated BTG as early as Spring 2014. As such, the potential exposure period for all academic programs varied, according to when the BTG program was initiated for that academic objective, but for the purposes of the Impact Evaluation, the window is not greater than two years.[228]

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[220] Guo, S., & Fraser, M. W. (2010). *Propensity score analysis: Statistical methods and applications*. Thousand Oaks, CA: Sage.

[221] Imbens, G., & Rubin, D. (2015). *Causal inference for statistics, social, and biomedical sciences, an introduction.* New York, NY: Cambridge University Press.

[222] Angrist, J. D., & Pischke, J. S. (2009). *Mostly harmless econometrics: An empiricist's companion*. Princeton, NJ: Princeton University Press. Schlotter, M., Schwerdt, G., & Woessmann, L. (2010). *Econometric methods for causal evaluation of education policies and practices: A non-technical guide* (Institute for the Study of Labor [IZA] Discussion Paper No. 3478). Available online: http://ftp.iza.org/dp4725.pdf. Antonakis, J., Bendahan, S. Jacquart, P., & Lalive, R. (2010). On making causal claims: A review and recommendations. *The Leadership Quarterly*, *21*, 1086–1120. Murnane, R. J., & Willett, J. B. (2011). *Methods matter: Improving causal inference in educational and social science research*. New York: Oxford University Press.

[223] For a detailed description of this method, see *Analytic Model Specifications.*

[224] An RCT was deemed impracticable prior to the creation of the Analysis Plan.

[225] For a detailed description of this method, see *Analytic Model Specifications*.

[226] This was the end date for most but not all programs. Some programs started prior to August 1, 2014. The end date for these programs was therefore 24 months (two years) after the start date. For the purposes of the Impact Evaluation, the Evaluation Team kept the end date as July 31, 2016; this was to ensure the Evaluation Team had complete administrative and employment data to conduct the impact analysis.

[227] The United States Department of Labor extended the period of implementation from September 30, 2016 to March 31, 2017. For the purposes of the Impact Evaluation, the Evaluation Team kept the end date as July 31, 2016; this was to ensure the Evaluation Team had complete administrative and employment data to conduct the impact analysis.

[228] The actual exposure to the intervention varied according to when the student enrolled in the BTG course of study (as defined in the *Identification of Treatment Group* section). Exposure for each participating student was from the semester of enrollment to the end of the intervention period for a period not to exceed two years.

The comparison study window was an identical period as the BTG study window that preceded the initiation of BTG for that program, and started and ended at the same time of year as the intervention period (important for comparative purposes). For clarification, in Figure 11 below, four hypothetical BTG and comparison study windows are presented.

Figure 11: BTG and Comparison Study Windows

2012	2013	2014	2015	2016

(A) Comparison Study Window = 24 months

(A) BTG Study Window = 24 months

(B) Comparison Study Window = 21 months

(B) BTG Study Window = 21 months

(C) Comparison Study Window = 15 months

(C) BTG Study Window = 15 months

(D) Comparison Study Window = 24 months

(D) BTG Study Window = 24 months
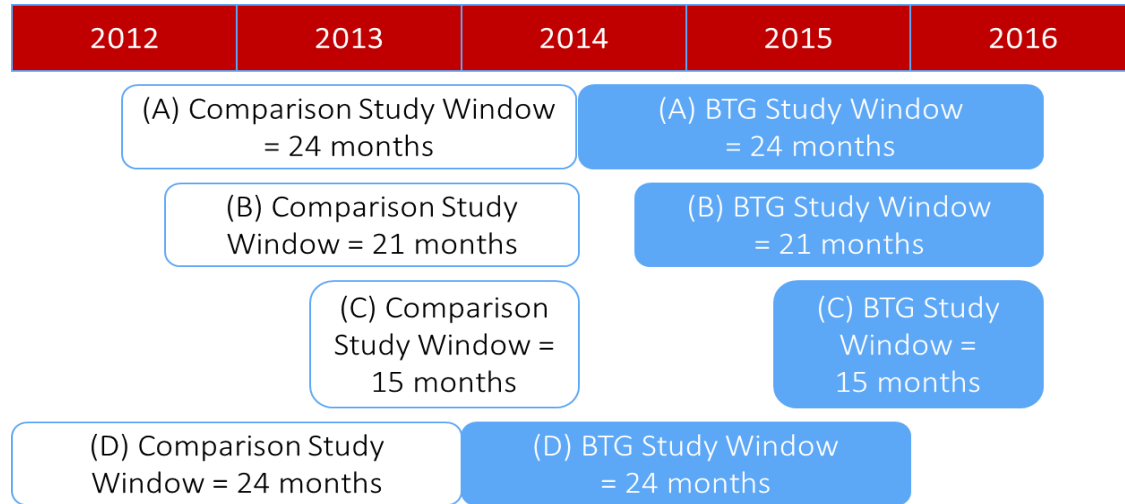
In the first case (A), the BTG study window started August 1, 2014, ended July 31, 2016, and was exactly two years in length. The comparison study window was of identical length, and started and ended in the same time of year as the BTG study window. In cases (B) and (C), the BTG study window started later, shortening the length of the window to 21 and 15 months. To maximize the equivalence of the comparison condition, the comparison study windows were made equal in length, and started and ended at the same point in the academic year. The final case (D) is one in which the BTG study window started earlier than fall of 2014. In this case, both the treatment and comparison study windows could be the full two years. This structure ensured a basic equivalence in study windows between the BTG and comparison conditions.

Identification of Treatment Group

At the onset of the grant, the Evaluation Team held meetings with WVCTCS with the goal of defining a participant for the Impact Evaluation. It was determined that a participant would be defined as (1) a "for-credit" student who had data maintained in WVHEPC student dataset and (2) who enrolled in an academic program that was defined as a BTG program of study. This initial definition was broad as it conceptualized a "treated" student as one who had the potential to be exposed to some but not necessarily all of the BTG components.[229] The student was, at a minimum, taking part in academic instruction that had been implemented as part of BTG and had the opportunity to benefit from other BTG components (e.g., enhanced career pathways and student support strategies), though a student's actual exposure to these components would not be measured or required. In July 2014, a memo defining a participant was shared with and approved by the TAACCCT Grant Project Manager.

With this definition in place, the Evaluation Team began gathering information on the programs that would be included in the Impact Evaluation. Initially, the Evaluation Team compiled a list of programs and relevant

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[229] The Evaluation Team later added the following stipulations to the definition of a participant: the student must be newly enrolled and must be 22 years of age or older, or 18 to 21 years of age with a high school diploma or GED.

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information for each college using information provided by the TAACCCT Grant Project Manager. Information gathered included program name, degree objective (CIP) code, projected cohort total, percentage of cohort that was certificate-focused only, cohort start/end date, and possible credentials (including certificate degrees, associate degrees, and other certifications). Over several months, the Evaluation Team communicated with the TAACCCT Grant Project Manager to gather any missing information about each of these programs.

The next step was to operationalize the treatment group inclusion criteria for the Impact Evaluation and ensure that the variables used were collected in existing datasets, and would be consistent and complete across all colleges. The Evaluation Team further defined a treatment group participant as a newly enrolled, adult student in any BTG-funded program during the treatment group period (January 1, 2014 through July 31, 2016).[230] An adult student was defined as a student who was (1) 22 years of age or older or (2) 18 to 21 years of age with a high school diploma or GED.[231] Data on the date of enrollment, the student's degree objective code, the student's year of birth (used to determine age at the beginning of the study window), and whether or not the student had a high school diploma or GED were included in the WVHEPC student dataset and these data were used to select the treatment group participants.

Over the course of the grant, the list of BTG-funded programs changed slightly as programs were added and dropped which may have been due, in part, to enrollment trends and employer needs. At the end of the grant implementation period, the Evaluation Team communicated with BTG college leadership to confirm the programs that were affected by BTG funding. These discussions also confirmed the degree objective number, date BTG-funded changes were implemented, approximate number of students enrolled during the study window, program duration, credit hours required for completion and the campus/campuses where each program was located.[232] The final list of treatment programs considered for the impact analysis can be found in *Table 18*.

Identification of Comparison Group

The Impact Evaluation aimed to make causal claims about the impact of BTG, but because the study was not an RCT, the self-selection inherent in treatment assignment could not be ignored. Without balancing the sample in some way that approximated randomization, impact estimates would be biased and inconsistent.[233] The Evaluation Team balanced the sample, in part, through multistage matching procedures that are common in evaluation literature.[234] The effectiveness of this proposed balancing procedure rests, in obtain sufficient matching variables that would part, on the ability to arguably remove selection bias. It also rests on identifying an initial pool of participants for whom the potential for selection bias is minimized. Since many of the factors that motivate selection are unobservable, theory and past empirical research were used to guide attempts to reduce bias. The efficacy of the matching procedures

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[230] The original Evaluation Plan defined the treatment study window as August 1, 2014 through July 31, 2016. As the team learned more about the BTG programs and when BTG-funded changes were implemented, it was determined that some programs began implementing changes as early as January 2014. Therefore, the Evaluation Team extended the treatment study window forward to January 1, 2014. It remains that any given program's treatment study window is no longer than two years.

[231] Two students did not fit these criteria and were dropped from the analysis. One was 16 years old and another 19 years old; neither had a high school diploma or GED.

[232] Identical information was requested for the comparison programs, except for the date when BTG-funded changes were implemented because that is not applicable to the comparison programs.

[233] Guo, S., & Fraser, M. W. (2010). *Propensity score analysis: Statistical methods and applications*. Thousand Oaks, CA: Sage.

[234] Stuart, E. A. (2010). Matching methods for causal inference: A review and a look forward. *Statistical Science*, 25, 1–21. Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference.* New York, NY: Houghton Mifflin Company. Cook, T. D., Shadish, W. R., & Wong, V. (2008). Three conditions under which experiments and observational studies produce comparable causal estimates: New findings from within-study comparisons. *Journal of Policy Analysis and Management*, *27*(4) 724–750.

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on observed variables was partially verified by establishing baseline equivalence of BTG and comparison groups for each outcome contrast.

The solution to this challenge was a two-stage procedure that "matched" BTG students with a group of similar students who pursued the same or similar academic program within a period of identical length, positioned similarly in the academic year, but at a time up to two years prior to the start of the BTG study window. The Evaluation Team employed propensity score procedures to weight the analytic sample to maximize the observed balance of both groups on observed characteristics. These two stages are described briefly below.

Stage One

In the first stage, the objective was to identify a pool of comparison students that were as similar as possible to the treatment group in terms of the selection processes that could explain (nonrandom) treatment assignment (i.e., selecting a course of study within the BTG program) and the identified outcomes. Since the BTG program was implemented in nine community and technical colleges, and in multiple academic program pathways within those colleges, the procedure necessitated an iterative and detailed approach in which comparison pools of students were selected for each academic program within each college. The primary considerations were:

1) Comparison students had the same eligibility requirements as the treatment group (i.e., newly enrolled students, and students 22 years of age or older or 18 to 21 years of age with high school diploma or GED);
2) Comparison students were engaged in equivalent academic programs, leading to the same target industries;
3) The potential duration and placement (in the academic year) of the comparison period was identical to the treatment period; and
4) There were no inherent differences in selection that differentiates the two groups.[235]

The Evaluation Team utilized a historical comparison group that was composed of students who attended the same college and pursued the same (or equivalent) courses of study, but did so in the comparison study window (of identical length and placement) prior to the start of BTG. Retrospective comparisons required additional statistical controls for changing market conditions, but it was believed that these adjustments were preferable to selection effects that were unknown and unobservable. The details of the first-stage identification procedures are outlined below.

Comparison group participants were adult students who were newly enrolled in programs identified as comparison programs.[236] To identify the comparison programs, a list of all BTG programs (i.e., the treatment programs) from each college was developed. To gather additional details, confirm the BTG program listings, and identify comparison groups, the Evaluation Team participated in calls with BTG college

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[235] Any selection process into or out of BTG that also influenced the outcome of interest could bias the resulting estimate of program impact. The observed impact would be conflated with the unmeasured influence of the characteristics that motivated the selection. For this reason, it was more valid to compare individuals in the treatment condition with a group of individuals who had not deliberately selected out of that same program. Instead of comparing BTG students with those who had selected out of BTG pathways (i.e., contemporaneous comparison group), they were being compared with those who were taking the same academic program pathways but made this same selection before the BTG program was offered (i.e., retrospective comparison group).

[236] As previously stated, adult students are 22 years of age or older or 18 to 21 years of age with a high school diploma or GED. Two students were dropped from the analysis because they did not meet these requirements.

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leadership from each institution and provided guidance to BTG college leadership on comparison group selection. If the treatment program was in existence two years prior to the time when TAACCCT-funded changes were introduced, and if data were available for the program, then the same program was selected as the comparison. If the treatment program was not in existence for the previous two years or if it was a new program, then a proxy comparison group was chosen. All comparison groups (proxy or otherwise) were chosen with the input of BTG college leadership, but it was advised that these programs have a similar student base, subject area, and credit hour requirements as the treatment program.[237] *Table 18* details the treatment and comparison group programs, and the beginning, end, and length of the study window for each program.

After grant implementation ended and administrative data were received from WVHEPC, the Evaluation Team compiled a summary of the data for each college and sent the summary to BTG college leadership for review. The Evaluation Team requested final confirmation of the BTG programs, comparison programs, and number of students in each BTG program and comparison program as indicated in the data from WVHEPC. The date when TAACCCT-funded changes were implemented (and description of that change), program duration, number of credit hours required for completion, and campus location for each program were also collected from BTG college leadership.

In the final data sample, several of the comparison programs and some BTG programs did not have new students enrolled in Certificate of Applied Science (CAS) or Associate of Applied Science (AAS) academic programs during the treatment or comparison study window so those programs were dropped from the Impact Evaluation.[238] *Table 19* provides the final list of BTG programs and comparison programs, the number of students in the treatment and comparison groups per program, and an indicator of whether or not the program pair (treatment/comparison) was included in the Impact Evaluation.

Stage Two

In the second stage, propensity scores that would be employed as weights in the analytic models were estimated to maximize treatment and comparison group equivalence on observed variables. Propensity scores predict the probability of being selected into the treatment group, based on an array of variables that were theoretically or empirically predictive of treatment assignment. The balancing procedure essentially involved the identification of variables to use in the creation of a propensity score, the estimation of the propensity score, and then a creation of a propensity score weight that was included in the analytic models.[239] Variables considered for the propensity score models were obtained from WVHEPC,

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[237] In two cases, BTG college leadership and the Evaluation Team were not able to identify a proxy comparison group. This occurred when the treatment program was in a new field that was not offered at the college before, and there was not an equivalent program that could be used as a comparison. In two cases, more than one comparison group was used because the initial comparison group chosen did not go back two full years before the BTG funding started. In four cases, different comparison groups were used to compare academic and employment outcomes for the same treatment group. In one case, a proxy comparison course was used because, prior to the start of BTG, students enrolled in that program of study were classified as general studies students. See Table 19 for a complete list of BTG and comparison programs included in the Impact Evaluation.

[238] However, the Evaluation Team did not receive data on students enrolled in nonacademic training programs so it is possible that the programs with no CAS or AAS students had non-academic certificate/degree-seeking students enrolled.

[239] Recent guidance from propensity score literature encourages researchers to give priority to covariates that are related to the outcome rather than treatment assignment. Stuart, E. A. (2010). Matching methods for causal inference: A review and a look forward. *Statistical Science*, 25, 1–21. Song, M., & Herman, R. (2010). Critical issues and common pitfalls in designing and conducting impact studies in education. *Educational Evaluation and Policy Analysis*, *32*, 351–371. Guo, S., & Fraser, M. W. (2010). *Propensity score analysis: Statistical methods and applications*. Thousand Oaks, CA: Sage. Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. New York, NY: Houghton Mifflin Company. Imbens, G. (2004). Nonparametric estimation of average treatment effects under exogeneity: A review. *Review of Economics and Statistics*, *86*, 4–30.

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WorkForce WV, and BLS. Balance diagnostics were produced in terms of the standardized mean difference of relevant and available covariates. These procedures are outlined below.

Propensity Score Modeling

For each outcome of interest, the Evaluation Team estimated propensity scores that predict the likelihood of being in the treatment group. The procedure was to predict group membership as a function of a set of variables that were theoretically and empirically explanatory of the outcome variable. Separate models, with different predictor variables, were estimated for each unique analytic sample. Because of variations in the outcomes and programs considered as relevant comparison for each outcome, the educational outcomes and employment outcomes had slightly different samples. The Evaluation Team estimated separate propensity score models for each.

Past guidance from propensity score matching literature encourages researchers to include all variables that are theoretically expected to be related to the treatment assignment and the outcome in the matching procedure.[240] Some encourage the researcher to be more inclusive in selecting matching variables.[241] However, there is disagreement on this matter, and the more recent literature suggests that when faced with restrictions, researchers should give priority to covariates that are related to the outcome rather than treatment assignment.[242] At a minimum, where available, "matching should be done on a pre-intervention measure of the outcome or a close proxy measure for the pretest."[243, 244]

More recently, a stepwise procedure has been outlined for selecting the covariates and interactions to include in the model that estimates the propensity score.[245] The iterative procedure was to select theoretically or substantively relevant covariates and then add any empirically relevant covariates, one-by-one, based on likelihood ratio tests. Quadratic and interaction terms were likewise selected if they added explanatory information to the estimating model. The Evaluation Team then constructed strata based on the propensity score and assessed balance across and within strata. Balance diagnostics (produced in *Table 13* and *Table 14*) provide statistics of sample equivalence for the full analytic sample in terms of standardized mean differences. A list of baseline variables that were considered for each model is identified as follows:

- Gender
- Age at beginning of study window
- Race

- Ethnicity
- Academically disadvantaged
- Economically disadvantaged

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[240] Guo, S., & Fraser, M. W. (2010). *Propensity score analysis: Statistical methods and applications*. Thousand Oaks, CA: Sage. Stuart, E. A. (2010). Matching methods for causal inference: A review and a look forward. *Statistical Science*, 25, 1–21.

[241] Rubin, D. B., & Thomas, N. (1996). Matching using estimated propensity scores, relating theory to practice. *Biometrics*, *52*, 249–264. Hill, J., Reiter, J., & Zanutto, E. (2004). A comparison of experimental and observational data analyses. In A. Gelman & X. L. Meng (Eds.), *Applied Bayesian modeling and causal inference from an incomplete-data perspective* (pp. 44–56). New York, NY: John Wiley. Stuart, E. A. & Rubin, D. B. (2007). Best practices in quasi-experimental designs: Matching methods for causal inference. In J. Osborne (Ed.), *Best practices in quantitative social science* (Chap. 11, pp. 155–176). Thousand Oaks, CA: Sage Publications. Stuart, E. A. (2010). Matching methods for causal inference: A review and a look forward. *Statistical Science*, 25, 1–21.

[242] Guo, S., & Fraser, M. W. (2010). *Propensity score analysis: Statistical methods and applications*. Thousand Oaks, CA: Sage. Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference.* New York, NY: Houghton Mifflin Company. Stuart, E. A. (2010). Matching methods for causal inference: A review and a look forward. *Statistical Science*, 25, 1–21.

[243] Song, M., & Herman, R. (2010). Critical issues and common pitfalls in designing and conducting impact studies in education. *Educational Evaluation and Policy Analysis*, *32*, 351–371.

[244] The only variables that research suggests one should not include are those that may have been affected by the treatment of interest, as this can lead to bias in the estimated treatment effect. See Imbens, G. (2004). Nonparametric estimation of average treatment effects under exogeneity: A review. *Review of Economics and Statistics*, *86*, 4–30.

[245] Imbens, G., & Rubin, D. (2015). *Causal inference for statistics, social, and biomedical sciences, an introduction*. New York, NY: Cambridge University Press.

- Limited English proficiency
- Disability status
- Number of days from beginning of study window to enrollment
- Semester of entry
- Mean preprogram wages
- Mean preprogram employment status
- Preprogram wages for eight quarters preenrollment
- Preprogram employment status for eight quarters preenrollment
- Amount of unmet need
- MSA/County unemployment rate for quarter preceding enrollment

- MSA/County unemployment rate for first quarter post-exit
- MSA/County labor force for quarter preceding enrollment
- MSA/County labor force for first quarter post-exit
- MSA/County number employed for quarter preceding enrollment
- MSA/County number employed for first quarter post-exit
- Average wages for the eight quarters prior to program enrollment for all participants who attend each campus

The propensity score modeling strategy was to use a single-level logistic regression, which is conventional. The nested structure of the data[246] was accounted for in the analytic model.[247] The benchmark analytic model included random effects for the campus and program levels, specified in the *Analytic Model Specifications* section. The Evaluation Team also ran a sensitivity test for all models with fixed program effects. Alternative multilevel matching procedures produced poorer baseline equivalence but substantively similar findings to the benchmark approach.

Although the algorithm selected different variables for each sample, the general model specification was identical for each outcome. It is a multilevel model that accounts for the nested structure of the students within college career pathways:

$$T_i = Logit^{-1}(\alpha_0 + \beta_n(X_n) + \varepsilon_i)$$

where T_i equals the treatment status (treatment = 1; comparison = 0) for each case and X_n is the list of selected variables. The propensity score itself is the predicted value of the outcome variable.

Weights included in Analytic Models

With propensity score models fully specified and propensity scores estimated, the propensity scores were included in the analytic model as inverse probability weights (IPWs).

Baseline Equivalence

Baseline equivalence is reported for the set of covariates identified as explanatory of each outcome variable. Balance was diagnosed based on standardized mean differences of covariates. These statistics are produced in *Table 13* and *Table 14* for both analytic samples, for both stage one (matched by program and study window) and stage two (weighting) balancing procedures.[248]

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[246] "Structure of the data" refers to the clustering of BTG and comparison students within programs, campuses, and colleges.

[247] Li, F., Zaslavsky, A. M., & Landrum, M. B. (2013) Propensity score weighting with multilevel data. *Statistics in Medicine*, *32*(19), 3373–3387.

[248] Significance testing is inappropriate for this diagnostic task because it conflates balance with statistical power (Austin, 2007; Imai et al., 2008; Austin, 2009; Stuart, 2010).

The procedure to produce the standardized mean difference (SMD) varied according to whether the covariate (dependent variable in the baseline testing equation) was continuous or categorical. First, a simple model-based estimate of the difference between treatment and comparison groups on the pre-intervention equivalence measures was calculated. Separate estimates were produced for each variable in each analytic sample. The empirical model that produced this estimate was a regression of the variable of interest on the treatment status variable. The single parameter of interest was the coefficient for the treatment variable. This represents the adjusted (but not standardized) mean difference in the baseline equivalency variable between treatment and control participants.

If the baseline equivalence variable was a continuous variable, the following formula was used to compute the pooled standard deviation of the pre-intervention measure as follows:

$$S_p = \sqrt{\frac{(n_t - 1)S_t^2 + (n_c - 1)S_c^2}{(n_t + n_c - 2)}}$$

where n_t and n_c are the sample sizes, and S_t and S_c are the participant-level standard deviations for the pre-intervention measures for the analytic treatment and comparison groups. Separate calculations of the pooled standardized deviation for each variable were used to establish baseline equivalence.

The standardized difference was also calculated. If the baseline equivalence variable was a continuous variable, the following formula was used:[249]

$$g = \frac{\beta_1}{S_p}$$

where β_1 is the adjusted mean difference in the variable selected to establish baseline equivalence for the treatment and comparison groups (calculated by the regression of the variable on treatment status) and S_p is the pooled standard deviation. If the baseline equivalence variable was dichotomous, the standardized difference was calculated as follows:

$$\frac{p_t - p_c}{\sqrt{\frac{p_{t(1-p_t)} + p_{c(1-p_c)}}{2}}}$$

where p_t and p_c represent the probability of occurrence of the event within the treatment and comparison group respectively.

Analytic Model Specifications

All analytic models were multilevel to statistically accommodate the nested structure of the data. For employment outcomes, observations were nested within individuals who attended academic programs, and within campuses that operated within colleges. For educational outcomes, observations were students nested within academic programs, within campuses, within colleges.

Some complications to the structure of the data became evident after the Evaluation Team investigated the academic programs, and where they were offered. The structure was not simply nested, but because the same academic program could be offered at multiple campuses within a college, and multiple academic

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[249] This is the formula for Hedges' *g*.

programs could be offered within the same campus, the data were cross-nested. This was a concern because it could have led to bias in estimates from improperly modeled variance at each of these levels, and because imbalance in treatment-comparison ratios in each of the colleges could have led to misspecification of the treatment effect.

Although there was overlap in most of the analytic sample – treatment and comparison groups tended to enroll in the same program that was offered at the same campus (within the same institution), – there was variation here when a program was offered at multiple campuses because individual students in a program field could attend different campuses (within the same college). From a descriptive perspective, the overlap in BTG and comparison program students within each campus was reasonable. Only at Kanawha Valley Community and Technical College's main campus was there a situation where there were BTG program students but no comparison students.[250, 251] The benchmark multilevel models, and the sensitivity studies, accounted for this nested structure (students within programs, within colleges, within institutions) and variation in program offerings (proxy or not). The models also accounted for any difference in the contextual economic conditions that existed at the campus level at entry and exit, and accounted for campus-level variation in student economic earnings at baseline. Other factors that were controlled for included the time of entry into the respective study windows (because the amount of time that a student had to incur outcomes will undoubtedly be associated with those outcomes) and, if necessary, available individual background characteristics (e.g., age, race, and gender). The Evaluation Team provides full details of the analytic models for each research question in the _Analysis Methods_ section.

The Evaluation Team was unable to estimate a fully crossed effects model with inverse probability of treatment weights included in the procedure, so several alternative multilevel specifications were examined.[252] The first was a two- or three-level specification in the education and employment models, in which time-varying instances (wages or employment pre- and post-program) were nested within persons, who were fully nested in programs, and fully nested in campuses, which was the model originally specified in the Evaluation Plan. The Evaluation Team decided against this model, however, because the model was unnecessarily computationally complex (it failed to converge when outcomes were rare). Therefore, the Evaluation Team judged that it represented the most inaccurate reflection of the nesting structure, and the estimates produced were the least consistent across sensitivity analyses.

The second was to model campus and program fixed effects directly.[253] There is no agreement across the relevant research literature – education and economics – as to which approach is preferable. The Evaluation Team decided against the fixed-effect specification of higher-level clustering for practical reasons. The fixed-effects approach forced the dropping of cases in the outcomes with rare events, which resulted in a reduced (and different) sample. It also created interpretation concerns with the DID models because the shift in the constant that accompanied the inclusion of 18 fixed-effects dummies (and 48

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[250] In the fall of 2014, Bridgemont Community and Technical College and Kanawha Valley Community and Technical College merged and became BridgeValley Community and Technical College. According to program staff, this was an administrative merge and did not affect the location of the programs that were included in the Impact Evaluation. Because this merge took place in between the comparison and treatment study windows, the Evaluation Team has continued to consider the two colleges as separate colleges.

[251] Kanawha Valley CTC did not have any newly enrolled students during the comparison study window in the programs identified by the BTG college leadership as suitable comparison programs. The leadership at BridgeValley CTC confirmed this.

[252] The Evaluation Team also confirmed the robustness of the modeling procedures by examining unweighted models and comparing the results of a crossed random effects nested structure with the two alternative approaches outlined above. Findings were identical to the selected approach and substantively indistinguishable from the fully nested model.

[253] There is no agreement across the relevant research literature – education and economics – as to which approach is preferable.

program pair dummies) reduced the equivalence of the BTG and comparison groups at baseline. Alternative specifications of the fixed-effects approach would have confused the meaning of the point estimates.

The final approach accounted for cross-nesting with random effects and is computationally simpler, as it reduced the levels by one and simply created a level for campus in which the program factor could vary randomly, but not modeled as a fixed main effect. The two models are outlined below – one for employment and one for educational outcomes. Based on a preliminary analysis with the benchmark model results, all but one produced substantively similar findings.[254] As with other sensitivity analyses, any discrepancies with the benchmark model are noted in the _Findings Overview_ section.

In addition to accounting the structure of the data in the models, the Evaluation Team also included control variables at the campus level that should improve the precision of the impact estimates and controll for economic or general campus-level variation that could hypothetically influence outcomes. Economic contextual variables, including regional unemployment rate, regional labor force, and regional number employed figures were included to account for the shifting economic context that was different for the BTG and comparison groups because they occurred during different study windows. For illustrative and diagnostic purposes, in _Figure 13_ at the end of this appendix, the Evaluation Team included comparative graphical plots of the changing unemployment rates for each region included in the study by treatment status. In these charts, the blue line illustrates the unemployment rate experienced by the comparison group during their study window; the red line illustrates the unemployment rate experienced by the BTG group during their study window. The extent that the lines diverge operationalizes the difference in economic context for the two groups. In most cases, the seasonal variation, especially around the first quarter of each year, is more variable within group than the between group difference.

The decision criteria for including individual-level covariates in the analytic model were to include any covariate whose SMD is greater than 0.10 in magnitude in the weighted sample. The empirical models themselves for educational and employment outcomes are different. In the latter case, the Evaluation Team used baseline data to construct a (DID) estimator for employment outcomes. This is a common and robust approach to estimating causal impacts in observational data that allows for the removal of secular trend or other maturation effects that could bias results. The DID model estimates an average change in outcomes for the comparison group and uses this baseline change as a contrast for the average change in outcomes observed in the treatment group. The difference of the two (DID) is the estimate of the program impact. A Comparative Short Interrupted Time Series (CSITS) Model was considered, which is similar to DID except that it can incorporate different baseline trends. The Evaluation Team produced baseline trends for both employment and wage outcomes in _Figure 12_. While the pre-intervention wages did not demonstrate a linear trend, the employment outcomes did appear to be linear. The Evaluation Team opted for the DID model because results from both models (for both employment outcomes) were substantively identical and the DID model is more parsimonious.

For educational outcomes, no such baseline data existed so estimates of program impact as the regression-adjusted difference in outcomes for the treatment and comparison groups were constructed. If the two groups were balanced in their unobserved and observed background characteristics, and the models were

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[254] The only exception is the academic program outcome model, which produces findings that are not statistically significant when campus attended is modeled as a fixed effect. This variation, however, is likely an artifact of the dropping of cases from the analytic sample (n = 1435).

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correctly specified, then this should provide an unbiased estimate of the effect of the BTG program on the outcome of interest.

In terms of model fitting, a multilevel regression procedure (mixed) was used if outcomes were continuous, which was the case with credits and wages outcomes. The Evaluation Team used the same command to fit the Linear Probability Model (LPM) if the outcomes were dichotomous but the predicted probabilities were between 0.20 and 0.80, which was the case for employment outcomes. Finally, the Evaluation Team employed a multilevel logistic equation (*melogit*) to estimate program effects if outcomes were dichotomous and events were comparatively rare (<0.20) or frequent (>0.80). All empirical models were estimated with Stata.

Employment and Wage Outcomes

The basic multilevel DID regression model specification is as follows:

Level 1: Student – Time Variant

$$O_{ijk} = \beta_0 + \beta_1\big(TIME_{ijk}\big) + \varepsilon_{ijk}$$

Level 2: Student – Time Invariant

$$\beta_0 = \gamma_{00} + \gamma_{01}\big(TX_{jk}\big) + \gamma_{0p}\big(X_{pjk}\big) + \gamma_{02}\big(Cohort_{jk}\big) + \mu_{0jk}$$

$$\beta_1 = \gamma_{10} + \gamma_{11}\big(TX_{jk}\big)$$

Level 3: Campus

$$\gamma_{00} = \pi_{000} + \pi_{001}(C_k) + \pi_{002}(EB_k) + \pi_{003}(EA_k) + r_{00k}$$

$$\gamma_{01} = \pi_{010}$$

$$\gamma_{02} = \pi_{020}$$

$$\gamma_{0p} = \pi_{0p0}$$

$$\gamma_{10} = \pi_{100} + r_{10k}$$

$$\gamma_{11} = \pi_{110}$$

where *O* represents the observed outcome for student *j,* in period *i,* in campus *k, and TIME* is the time-variant indicator of pre- to post-treatment. In the second level, *Cohort* is the time-invariant variable that captures the time of exposure to the study window, calculated as the time elapsed from the beginning of the study window to the date at which the student enrolls in a program and becomes part of the study. This value (calculated in days) is then grand-mean centered. *TX* is the time-invariant treatment group indicator (treatment =1, comparison =0), and *X* is a vector of relevant participant-level covariates that would be included if balance statistics indicated that the BTG and comparison groups were different enough to require baseline adjustment. The third level accounts for campus variation, where *C* is a fixed effect that captures baseline college-level variation, operationalized as the college-average baseline value in the average quarterly wage for students in the analytic sample who attend this campus (and then grand-mean centered). *EB and EA* represent economic condition control variables – unemployment rate, size of the labor force, number employed – in each region where the student attended college. These values are calculated by obtaining the values for the quarter directly preceding the student's enrollment and the

quarter directly following the student's graduation or exit from the program. The variance components, r_{00k} and r_{10k}, which are not directly modeled in the fixed portion of the equation, allow for variation in the intercept to account for college- and program-level variation.

The DID coefficient (π_{110}) should estimate the mean outcome differential between treatment and control students from pre- to post-test for each of the outcomes.[255]

Educational Outcomes

The multilevel regression model specification is as follows:

Level 1: Student

$$\beta_0 = \gamma_{00} + \gamma_{01}(TX_{jk}) + \gamma_{0p}(X_{pjk}) + \gamma_{02}(Cohort_{jk}) + \mu_{0jk}$$

$$\beta_1 = \gamma_{10} + \gamma_{11}(TX_{jk})$$

Level 2: Campus

$$\gamma_{00} = \pi_{000} + \pi_{001}(C_k) + \pi_{002}(EB_k) + \pi_{003}(EA_k) + r_{00k}$$

$$\gamma_{01} = \pi_{010}$$

$$\gamma_{02} = \pi_{020}$$

$$\gamma_{0p} = \pi_{0p0}$$

$$\gamma_{10} = \pi_{100} + r_{10k}$$

$$\gamma_{11} = \pi_{110}$$

where *O* represents the observed outcome for student *j,* in campus *k*, and *TX* is the time treatment group indicator (treatment = 1, comparison = 0). *Cohort* is the variable that captures the cohort effects of exposure, calculated as the time elapsed from the beginning of the study window to the date at which the student enrolls in a program and becomes part of the study. This value (calculated in days) is then grand-mean centered. *TX* is the treatment group indicator (treatment =1, comparison =0); and *X* is a vector of relevant participant-level covariates that would be included if balance statistics indicated that the BTG and comparison groups were different enough to require baseline adjustment. The second level accounts for campus variation, where *C* is a fixed effect that captures baseline college-level variation, operationalized as the college-average baseline value in the average quarterly wage for students in the analytic sample who attend this campus (and then grand-mean centered). *EB and EA* represent economic condition control variables (i.e., unemployment rate, size of the labor force, number employed) in each region where the student attended college. These values are calculated by obtaining the values for the quarter directly preceding the student's enrollment and the quarter directly following the student's graduation or exit from the program. The variance components, r_{00k} and r_{10k}, which are not directly modeled in the fixed portion

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[255] Puhani shows that if the outcome is dichotomous and the non-linear logit model is used, the interaction term is still the DID estimator of interest. As noted in Puhani (2008), Puhani concludes, "researchers carrying out 'differences-in-differences' estimates in nonlinear models like probit, logit or tobit are correct to focus their attention on the coefficient of the interaction term of the group and time dummy" (p. 7). Puhani, P. A. (2008). *The treatment effect, the cross difference, and the interaction term in nonlinear 'difference-in-differences' models*. (Institute for the Study of Labor [IZA] Discussion Paper No. 3478). Available online: http://ftp.iza.org/dp3478.pdf

of the equation, allow for variation in the intercept to account for college- and program-level variation. In this model, the coefficient associated with the *TX* variable (π_{010}) captures the estimated treatment effect.

Sensitivity Studies

The Evaluation Team conducted several additional analyses to test the extent to which the benchmark findings reported here were robust to alternative assumptions and analytic specifications. The benchmark findings reflect the Evaluation Team's preferred design and analytic approaches, the ones that they believe to be the most defensible. These additional sensitivity studies included alternative modeling, matching, and measurement approaches that were discarded because they did not fit the data as well, incorporated unmet assumptions, were too complex, or would not work with the full analytic sample. The results of these studies were not reported in detail; this would unnecessarily complicate the presentation of the results. Nevertheless, the Evaluation Team has conducted these studies and included them in the consideration of the findings, as a means of testing the extent to which the benchmark results persist. The benchmark approach is outlined in the *Analytic Model Specifications* section. Below is a brief overview of the sensitivity studies that were performed to test this approach:

- Trimming of the propensity score: analysis is conducted on reduced samples of individuals whose linearized propensity scores were within a range of acceptable propensity scores.
- Multilevel propensity score: analysis is conducted using the IPW that is estimated with a multilevel equation that incorporates the cross-nesting of programs within campuses.
- No propensity score weighting: analysis is conducted on an unweighted sample.
- Program fixed effects: program effects are included in the analytic model as a vector of $n-1$ dummy variables.
- Campus fixed effects: campus effects are included in the analytic model as a vector of $n-1$ dummy variables.
- Including campus-level predictors that are the average treatment assignment for each campus to account for the imbalance in the probability of treatment assignment at the campus level.
- Including a dummy variable that indicates whether a program-comparison match (stage one) was with a proxy program (and not the same exact program).
- Including all available individual-level baseline characteristics variables as controls in the analytic model.
- Removing outliers: all observations with outcomes or baseline observations of the outcome variable are outliers (>three standard deviations) are removed from the analytic sample.
- Modeling the multilevel analytic models as a fully nested structure, where program pairs are fully nested within campuses.
- Modeling the multilevel analytic model as a fully crossed structure. (This necessitates dropping the propensity score weights from the model.)[256]
- Modeling the benchmark logistic model as the Linear Probability Model.
- For DID models, modeling the preprogram wage and employment observations as a CSITS. Instead of using the average value of the preprogram observations, both groups' average prior histories are modeled as linear trends and the impact is estimated as the differential in deviations from those trends.

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[256] These models failed to converge for the dropout and credential outcomes.

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- For DID models, modeling the preprogram averages as shorter periods of time – two and four months pre-intervention instead of eight.
- Estimating impacts on alternative educational outcomes – formal withdrawal (instead of dropout), total credits earned (instead of proportion of credits toward degree program), and any credential (instead of credential in field).
- Conducting a Firth logit for the credential outcome because the event (credential acquisition) is very rare.

As noted elsewhere, the vast majority of the sensitivity studies produced results that were consistent with those produced in the benchmark analyses. Five sensitivity studies across three outcomes did not substantively reproduce benchmark model findings. They are noted in the *Findings Overview* section.

ANALYTIC SAMPLES

Baseline Equivalence

Baseline equivalence statistics are reported in *Table 13* and *Table 14* below. *Figure 12* also presents a graphical plot of unweighted available baseline data – wages and employment – over time.

The unweighted balance statistics in the left-hand columns of *Table 13* and *Table 14* below – presented as the standardized mean difference (SMD) – suggest that the first-stage matching procedures appear to have been successful in identifying a comparison group that was equivalent to the BTG group. This statement is qualified somewhat with the reminder that, in a quasi-experimental study, the Evaluation Team can only know how similar the groups are in observed characteristics. In other words, the inter-group equivalence of unobserved characteristics, which are balanced in an experiment, remain unknown in quasi-experiments.

The SMD of both the education and employment outcome samples were balanced without any synthetic adjustment or matching. All but two variables were within 0.25 standardized units of each other.[257] For the variable that did not demonstrate balance at baseline – unemployment rate (an external contextual factor), – it was controlled for in the model.

The trends of participants' wage and employment histories over time were also similar. Looking at *Figure 12,* the wage trends for BTG students describe a similar curve to those in the comparison group. This pattern of similarity was repeated in the employment histories. In this case, the trend was linear in pattern. These graphs suggest that the procedures employed in this study appear to have identified a comparison group with past employment trajectories that are very similar to the BTG group.

The right-hand columns in *Table 13* and *Table 14* below provide the same balanced statistics for the two samples after they have been adjusted by propensity score weights, which were the samples used in the analyses. The small SMD statistics indicate that both BTG and comparison groups are equivalent across the full range of the observed baseline variables that are available.

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[257] It has become conventional to consider a sample balanced (but requiring covariate adjustment) if the SMD is less than 0.25 units. Without employing stage-two weighting procedures, the sample already satisfies this criterion in all but two cases.

Table 13: Unweighted and Weighted Baseline Equivalence of BTG and Comparison Samples, Educational Outcomes

	Unweighted			Weighted		
	Comparison	Treatment	Standardized Mean Difference	Comparison	Treatment	Standardized Mean Difference
Gender	(*n* = 958)	(*n* = 850)		(*n* = 958)	(*n* = 850)	
Female	0.07	0.08	0.03	0.07	0.08	0.01
Age	(*n* = 958)	(*n* = 850)		(*n* = 958)	(*n* = 850)	
Age at beginning of study window	24.16	23.26	−0.10	23.70	23.67	0.00
Race/Ethnicity	(*n* = 958)	(*n* = 850)		(*n* = 958)	(*n* = 850)	
Hispanic/Latino	0.01	0.01	−0.01	0.01	0.01	0.03
African American	0.06	0.05	−0.05	0.06	0.05	−0.01
Asian	0.01	0.00	−0.07	0.01	0.00	−0.05
Native American	0.01	0.01	−0.01	0.01	0.01	0.02
Native Hawaiian	0.00	0.00	−0.04	0.00	0.00	−0.01
White	0.89	0.94	0.16	0.91	0.91	0.01
Disadvantage/ Disability Indicators	(*n* = 958)	(*n* = 850)		(*n* = 958)	(*n* = 850)	
Academically Disadvantaged	0.62	0.49	−0.26	0.55	0.54	−0.01
Economically Disadvantaged	0.71	0.65	−0.14	0.68	0.69	0.01
Limited English Proficiency	0.05	0.06	0.03	0.05	0.05	0.00
Disability Status	0.02	0.01	−0.10	0.01	0.01	0.01

	Unweighted			Weighted		
	Comparison	Treatment	Standardized Mean Difference	Comparison	Treatment	Standardized Mean Difference
Mean Quarterly Wages Pre-program	(*n* = 958)	(*n* = 850)		(*n* = 958)	(*n* = 850)	
1st Quarter	1235.32	1919.92	0.22	1578.68	1552.18	−0.01
2nd Quarter	1465.44	2098.95	0.16	1654.01	1756.34	0.03
3rd Quarter	1602.82	2239.06	0.15	1850.24	1931.17	0.02
4th Quarter	1685.60	2079.98	0.10	1914.00	1809.42	−0.03
5th Quarter	1647.12	2081.80	0.11	1897.13	1851.28	−0.01
6th Quarter	1525.91	1862.63	0.09	1681.99	1639.37	−0.01
7th Quarter	1336.72	1879.14	0.13	1604.41	1647.34	0.01
8th Quarter	1220.99	1748.59	0.14	1463.51	1546.69	0.02
Mean Wages[258]	**1464.99**	**1988.76**	**0.15**	**1705.50**	**1716.72**	**0.00**
Proportion Employed Pre-program	(*n* = 958)	(*n* = 850)		(*n* = 958)	(*n* = 850)	
1st Quarter	0.41	0.47	0.12	0.44	0.43	−0.01
2nd Quarter	0.39	0.42	0.06	0.40	0.39	−0.01
3rd Quarter	0.38	0.43	0.11	0.40	0.40	0.00
4th Quarter	0.38	0.42	0.09	0.40	0.40	−0.01
5th Quarter	0.35	0.39	0.08	0.38	0.37	−0.02
6th Quarter	0.32	0.35	0.06	0.33	0.33	−0.01
7th Quarter	0.25	0.33	0.18	0.29	0.29	0.00
8th Quarter	0.25	0.32	0.15	0.28	0.29	0.02
Proportion Employed	**0.34**	**0.39**	**0.13**	**0.36**	**0.36**	**−0.01**

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[258] This is calculated as the average wages for eight quarters prior to enrollment.

	Unweighted			Weighted		
	Comparison	Treatment	Standardized Mean Difference	Comparison	Treatment	Standardized Mean Difference
Study Entry	**(n = 958)**	**(n = 850)**		**(n = 958)**	**(n = 850)**	
Mean Days from High School Graduation to Beginning of Study Window	1585.44	1439.98	−0.05	1492.09	1501.93	0.00
Mean Days from Beginning of Study Window to Enrollment	477.63	471.97	−0.03	478.70	480.92	0.01
Semester of Entry is Fall	0.64	0.68	0.09	0.65	0.67	0.03
Semester of Entry is Spring	0.26	0.24	−0.04	0.26	0.24	−0.03
Semester of Entry is Summer	0.10	0.08	−0.08	0.09	0.09	−0.01
Baseline Labor Statistics	**(n = 958)**	**(n = 850)**		**(n = 958)**	**(n = 850)**	
Mean Pre-program Unemployment Rate	7.72	7.28	−0.26	7.58	7.66	0.04
Mean Pre-program Labor Force	44189.19	48099.85	0.11	45243.81	43574.40	−0.05
Mean Pre-program Number Employed	40963.55	44992.17	0.12	41980.95	40704.84	−0.04
Baseline Financial Aid Indicators[259]	**(n = 958)**	**(n = 850)**		**(n = 958)**	**(n = 850)**	
Mean Amount of Unmet Need	2614.97	3553.21	0.20	2531.14	3674.96	0.24
Mean Amount of Pell Grant Funding Awarded	2144.80	1791.81	−0.15	2052.64	1898.92	−0.06
Mean Amount of SEOG Funding Awarded	19.24	23.63	0.03	18.12	23.31	0.04
Mean Amount of HEAPS Funding Awarded	23.08	25.47	0.01	22.92	24.44	0.01

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[259] Over the course of the study period, WVHEPC altered the way that financial aid data were reported. WVHEPC did not submit any financial aid data prior to 2011. For 2011 and 2012, financial aid data reflected an annual total, and from 2013 going forward, colleges began reporting financial aid data by semester. The Evaluation Team used the financial aid data provided, as well as which semesters the students were enrolled, to create baseline financial aid variables that reflect the amount of unmet need or amount of financial aid awarded for the student's first up-to-three consecutive semesters (i.e., one academic year) of enrollment. Financial aid baseline variables are not used in the analytic model or propensity score matching procedures because they are not true baseline measures.

Table 14: Unweighted and Weighted Baseline Equivalence of BTG and Comparison Samples, Employment Outcomes

	Unweighted			Weighted		
	Comparison	Treatment	Standardized Mean Difference	Comparison	Treatment	Standardized Mean Difference
Gender	(*n* = 961)	(*n* = 845)		(*n* = 961)	(*n* = 845)	
Female	0.07	0.08	0.04	0.07	0.08	0.02
Age	(*n* = 961)	(*n* = 845)		(*n* = 961)	(*n* = 845)	
Age at beginning of study window	24.20	23.29	−0.10	23.73	23.70	0.00
Race/Ethnicity	(*n* = 961)	(*n* = 845)		(*n* = 961)	(*n* = 845)	
Hispanic/Latino	0.01	0.01	−0.01	0.01	0.01	0.04
African American	0.06	0.05	−0.06	0.06	0.05	−0.01
Asian	0.01	0.00	−0.07	0.01	0.00	−0.04
Native American	0.01	0.01	−0.03	0.01	0.01	0.02
Native Hawaiian	0.00	0.00	−0.04	0.00	0.00	0.00
White	0.89	0.94	0.17	0.91	0.91	0.01
Disadvantage/Disability Indicators	(*n* = 961)	(*n* = 845)		(*n* = 961)	(*n* = 845)	
Academically Disadvantaged	0.62	0.49	−0.26	0.55	0.54	−0.01
Economically Disadvantaged	0.71	0.65	−0.15	0.68	0.69	0.01
Limited English Proficiency	0.05	0.06	0.03	0.05	0.05	0.00
Disability Status	0.02	0.01	−0.10	0.01	0.01	0.01

	Unweighted			Weighted		
	Comparison	Treatment	Standardized Mean Difference	Comparison	Treatment	Standardized Mean Difference
Mean Quarterly Wages Pre-program	(n = 961)	(n = 845)		(n = 961)	(n = 845)	
1st Quarter	1233.67	1930.47	0.22	1587.41	1557.96	−0.01
2nd Quarter	1468.71	2111.37	0.16	1674.06	1755.64	0.02
3rd Quarter	1600.15	2252.31	0.16	1853.46	1934.08	0.02
4th Quarter	1679.67	2092.29	0.10	1901.71	1816.86	−0.02
5th Quarter	1630.81	2094.12	0.11	1884.20	1852.89	−0.01
6th Quarter	1517.97	1872.00	0.09	1680.62	1630.33	−0.01
7th Quarter	1324.37	1890.26	0.14	1607.10	1637.34	0.01
8th Quarter	1207.09	1758.94	0.14	1471.76	1525.43	0.01
Mean Wages[260]	**1457.80**	**2000.22**	**0.16**	**1707.04**	**1713.82**	**0.00**
Proportion Employed Pre-program	(n = 961)	(n = 845)		(n = 961)	(n = 845)	
1st Quarter	0.41	0.47	0.12	0.43	0.43	0.00
2nd Quarter	0.39	0.42	0.07	0.40	0.39	−0.01
3rd Quarter	0.38	0.44	0.12	0.39	0.40	0.02
4th Quarter	0.38	0.43	0.10	0.40	0.40	0.01
5th Quarter	0.35	0.40	0.09	0.37	0.37	0.00
6th Quarter	0.32	0.35	0.06	0.33	0.33	−0.01
7th Quarter	0.25	0.34	0.18	0.29	0.29	0.00
8th Quarter	0.25	0.32	0.16	0.28	0.29	0.01
Proportion Employed	**0.34**	**0.40**	**0.14**	**0.36**	**0.36**	**0.00**

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[260] See Footnote 258.

	Unweighted			Weighted		
	Comparison	Treatment	Standardized Mean Difference	Comparison	Treatment	Standardized Mean Difference
Study Entry	(*n* = 961)	(*n* = 845)		(*n* = 961)	(*n* = 845)	
Mean Days from High School Graduation to Beginning of Study Window	1593.80	1447.13	−0.05	1498.01	1507.42	0.00
Mean Days from Beginning of Study Window to Enrollment	477.78	472.90	−0.03	479.46	481.62	0.01
Semester of Entry is Fall	0.64	0.68	0.09	0.65	0.67	0.04
Semester of Entry is Spring	0.26	0.24	−0.04	0.26	0.24	−0.04
Semester of Entry is Summer	0.10	0.08	−0.08	0.09	0.09	0.00
Baseline Labor Statistics	(*n* = 961)	(*n* = 845)		(*n* = 961)	(*n* = 845)	
Mean Pre-program Unemployment Rate	7.72	7.29	−0.26	7.59	7.66	0.04
Mean Pre-program Labor Force	44193.56	47789.26	0.10	45305.52	43243.51	−0.06
Mean Pre-program Number Employed	40967.38	44699.70	0.11	42038.30	40394.14	−0.05
Baseline Financial Aid Indicators[261]	(*n* = 961)	(*n* = 845)		(*n* = 961)	(*n* = 845)	
Mean Amount of Unmet Need	2622.68	3528.86	0.19	2535.63	3659.80	0.24
Mean Amount of Pell Grant Funding Awarded	2136.51	1787.97	−0.15	2039.04	1900.52	−0.06
Mean Amount of SEOG Funding Awarded	19.07	23.77	0.03	17.62	23.50	0.04
Mean Amount of HEAPS Funding Awarded	23.00	25.62	0.02	22.70	24.47	0.01

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[261] See Footnote 259.

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Figure 12:   Average Unadjusted Quarterly Wage and Employment Outcomes Pre-intervention for BTG and Comparison Sample[262]

BTG Group Wages

(Mean Wages vs. Economic Quarter Prior to Program Enrollment: 8, 7, 6, 5, 4, 3, 2, 1)

Comparison Group Wages

(Mean Wages vs. Economic Quarter Prior to Program Enrollment: 8, 7, 6, 5, 4, 3, 2, 1)

BTG Group Employment Status

(Mean Employment Status vs. Economic Quarter Prior to Program Enrollment: 8, 7, 6, 5, 4, 3, 2, 1)

Comparison Group Employment Status

(Mean Employment Status vs. Economic Quarter Prior to Program Enrollment: 8, 7, 6, 5, 4, 3, 2, 1)

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[262] The trend lines presented in these figures are not regression adjusted. These are the baseline trends of mean values at each pre-intervention quarter.

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BENCHMARK ANALYTIC RESULTS

Table 15: Unadjusted Outcomes

	Pre-program		Post-program		Number Reporting	
	BTG	Comparison	BTG	Comparison	BTG	Comparison
Wages (Average)	2000.22(3953.25)	1457.80(3008.10)	2609.19(3964.46)	1834.87(2913.20)	845	961
Proportion Employed (Average)	0.40(0.39)	0.34(0.36)	0.57(0.49)	0.51(0.50)	845	961
Proportion of Credits Required in Field	-	-	0.34(0.31)	0.31(0.30)	850	958
Received Certificate or Associate's Degree in Field	-	-	0.06(0.25)	0.02(0.15)	850	958
Dropout	-	-	0.42(0.49)	0.47(0.50)	850	958

Table 16: Benchmark Analytic Model Results, Educational Outcomes (n=1808)

	Estimate	Standard Error
Credit Acquisition		
Estimate of Program Impact	−0.06*****	0.03
Dropout		
Logistic Model Estimate	1.10*****	0.48
Estimate of Program Impact (Marginal Effect)	0.14*****	
Certificate or Associate's Degree		
Logistic Model Estimate	0.88*****	0.43
Estimate of Program Impact (Marginal Effect)	0.01*****	

Note: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

Table 17: Benchmark Analytic Model Results, Employment Outcomes (n=1806)

	Wages		Employment	
	Estimate	Standard Error	Estimate	Standard Error
Comparison Group at Baseline	1881.48	239.58	0.35	0.02
Difference Between BTG Group and Comparison Group at Baseline	−292.26	444.75	0.01	0.04
Value of Comparison Group at Post-program	2200.08		0.51	
Value of BTG Group at Post-program	2194.14		0.54	
Estimate of Program Impact	286.32	258.76	0.02	0.03

Note: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

Table 18: List of Programs Including Study Window and Length of Study Window

College	Treatment Program	Comparison Program	Treatment Study Window	Comparison Study Window	Length of Study Window (Semesters)
Blue Ridge Community and Technical College	Electrical Distribution Technology CAS	Electrical Distribution Technology CAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
Blue Ridge Community and Technical College	Electrical Distribution Technology AAS	Electrical Distribution Technology AAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
Blue Ridge Community and Technical College	Mechatronics AAS	Mechatronics AAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
Blue Ridge Community and Technical College	Cisco Certified Network Associate CAS	Cisco Certified Network Associate CAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
Blue Ridge Community and Technical College	Cisco Certified Network Professional CAS	Cisco Certified Network Professional CAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
Blue Ridge Community and Technical College	Converged Networking CAS	Converged Networking CAS	Fall 2015 through Summer 2016	Fall 2013 through Summer 2014	3
Blue Ridge Community and Technical College	Information Security CAS	Information Security CAS	Fall 2015 through Summer 2016	Fall 2013 through Summer 2014	3
Blue Ridge Community and Technical College	Systems Networking CAS	Systems Networking CAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6

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College	Treatment Program	Comparison Program	Treatment Study Window	Comparison Study Window	Length of Study Window (Semesters)
Blue Ridge Community and Technical College	Virtualization CAS	Virtualization CAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
Blue Ridge Community and Technical College	Information Technology AAS	Information Technology AAS	Fall 2015 through Summer 2016	Fall 2013 through Summer 2014	3
Blue Ridge Community and Technical College	Computer Network Engineering Technologies AAS	Computer Network Engineering Technologies AAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
Blue Ridge Community and Technical College	Cybersecurity AAS	Cybersecurity AAS	Spring 2015 through Summer 2016	Spring 2013 through Summer 2014	5
Blue Ridge Community and Technical College	Electric Utility Technology AAS	Electrical Distribution Technology AAS	Fall 2015 through Summer 2016	Fall 2013 through Summer 2014	3
BridgeValley Community and Technical College	Chemical Operations CAS	Chemical Operations CAS	Spring 2014 through Fall 2015	Spring 2012 through Fall 2013	6
BridgeValley Community and Technical College	Applied Process Technology (Chemical) AAS	Applied Process Technology (Chemical) AAS	Spring 2014 through Fall 2015	Spring 2012 through Fall 2013	6
BridgeValley Community and Technical College	Computer Management Information Systems AAS	Computer Management Information Systems AAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6

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College	Treatment Program	Comparison Program	Treatment Study Window	Comparison Study Window	Length of Study Window (Semesters)
BridgeValley Community and Technical College	Computer Science Technology Software Developer AAS	Computer Science Technology Software Developer AAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
BridgeValley Community and Technical College	Computer Technology Web Design Concentration AAS	Computer Technology Web Design Concentration AAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
BridgeValley Community and Technical College	Computer Maintenance and Networking CAS	Computer Maintenance and Networking CAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
BridgeValley Community and Technical College	Diesel Technology CAS	Diesel Technology CAS	Spring 2014 through Fall 2015	Spring 2012 through Fall 2013	6
BridgeValley Community and Technical College	Diesel Technology AAS	Diesel Technology AAS	Spring 2014 through Fall 2015	Spring 2012 through Fall 2013	6
BridgeValley Community and Technical College	Simulation, Gaming & Apps Development CAS	Completion: Computer Maintenance and Networking CAS; Employment: Software Developer AAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6

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College	Treatment Program	Comparison Program	Treatment Study Window	Comparison Study Window	Length of Study Window (Semesters)
BridgeValley Community and Technical College	Advanced Manufacturing AAS	Advanced Manufacturing AAS	Spring 2014 through Fall 2015	Spring 2012 through Fall 2013	6
BridgeValley Community and Technical College	Cyber Security AAS	Cyber Security AAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
BridgeValley Community and Technical College	Welding AAS	Welding AAS	Spring 2014 through Fall 2015	Spring 2012 through Fall 2013	6
BridgeValley Community and Technical College	Civil Engineering Technology AAS	Civil Engineering Technology AAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
BridgeValley Community and Technical College	Drafting and Design Engineering Technology AAS	Drafting and Design Engineering Technology AAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
BridgeValley Community and Technical College	Electrical Engineering & Technology AAS	Electrical Engineering & Technology AAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
BridgeValley Community and Technical College	Mechanical Engineering Technology AAS	Mechanical Engineering Technology AAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
BridgeValley Community and Technical College	Machine Tool Technology AAS	Welding AAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6

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College	Treatment Program	Comparison Program	Treatment Study Window	Comparison Study Window	Length of Study Window (Semesters)
BridgeValley Community and Technical College	Machine Tool Technology CAS	Completion: Diesel Tool Technology CAS; Employment: Welding AAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
BridgeValley Community and Technical College	Industrial Pipe Design AAS	Drafting and Design Engineering Technology AAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
BridgeValley Community and Technical College	Industrial Pipe Design CAS	Employment: Drafting and Design Engineering AAS (B); Completion: Pre-Engineering CAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
BridgeValley Community and Technical College	Building Design and Construction AAS	Employment: Sustainability Design Technology CAS (B); Completion: Drafting and Design Engineering Technology AAS (B)	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6

College	Treatment Program	Comparison Program	Treatment Study Window	Comparison Study Window	Length of Study Window (Semesters)
Eastern West Virginia Community and Technical College	Information Technology AAS	Information Technology AAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
Eastern West Virginia Community and Technical College	Information Technology CAS	Information Technology CAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
Eastern West Virginia Community and Technical College	Electromechanical Technology CAS	Electromechanical Technology CAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
Eastern West Virginia Community and Technical College	Wind Energy Technology CAS	Wind Energy Technology CAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
Eastern West Virginia Community and Technical College	Wind Energy Technology AAS	Wind Energy Technology AAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
Mountwest Community and Technical College	Information Technology Networking Fast-Track AAS	Information Technology Network Administration and Development AAS	Spring 2015 through Summer 2016	Spring 2013 through Summer 2014	5
Mountwest Community and Technical College	Engineering Design Technology AAS	Engineering Design Technology AAS	Fall 2015 through Summer 2016	Fall 2013 through Summer 2014	3

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College	Treatment Program	Comparison Program	Treatment Study Window	Comparison Study Window	Length of Study Window (Semesters)
New River Community and Technical College	Welding Technology CAS	Welding Technology CAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
New River Community and Technical College	Welding Technology Structural/Pipe Welding AAS	Welding Technology Structural/Pipe Welding AAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
New River Community and Technical College	Computer Science/ Information Technology AAS	Computer Science/ Information Technology AAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
New River Community and Technical College	Electrical Distribution Engineering CAS	Introduction to Line Worker Course	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
New River Community and Technical College	Industrial Technology AAS	Industrial Technology AAS	Spring 2015 through Summer 2016	Spring 2013 through Summer 2014	5
Pierpont Community and Technical College	Power Plant Technology AAS	Power Plant Technology AAS; Mechatronics AAS	Spring 2014 through Fall 2015	Spring 2012 through Fall 2013	6
Pierpont Community and Technical College	Power Plant Technology CAS	Power Plant Technology CAS	Spring 2014 through Fall 2015	Spring 2012 through Fall 2013	6
Pierpont Community and Technical College	Mechatronics AAS	Mechatronics AAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6

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College	Treatment Program	Comparison Program	Treatment Study Window	Comparison Study Window	Length of Study Window (Semesters)
Pierpont Community and Technical College	Applied Process Technology AAS	Power Plant Technology AAS; Mechatronics AAS	Fall 2015 through Summer 2016	Fall 2013 through Summer 2014	3
Southern West Virginia Community and Technical College	Electrical Engineering Technology AAS	Electrical Engineering Technology AAS	Spring 2015 through Summer 2016	Spring 2013 through Summer 2014	5
Southern West Virginia Community and Technical College	Electrical Engineering Technology CAS	Electrical Engineering Technology CAS	Spring 2015 through Summer 2016	Spring 2013 through Summer 2014	5
Southern West Virginia Community and Technical College	Industrial Technology – Mechatronics/ Welding CAS	Electrical Engineering Technology CAS	Spring 2015 through Summer 2016	Spring 2013 through Summer 2014	5
Southern West Virginia Community and Technical College	Information Technology AAS	Information Technology AAS	Spring 2015 through Summer 2016	Spring 2013 through Summer 2014	5
Southern West Virginia Community and Technical College	Information Technology AAS	Information Technology AAS	Spring 2015 through Summer 2016	Spring 2013 through Summer 2014	5
Southern West Virginia Community and Technical College	Mechatronics AAS	Electrical Engineering Technology AAS	Spring 2015 through Summer 2016	Spring 2013 through Summer 2014	5

College	Treatment Program	Comparison Program	Treatment Study Window	Comparison Study Window	Length of Study Window (Semesters)
Southern West Virginia Community and Technical College	Occupational Development AAS	Electrical Engineering Technology AAS	Spring 2015 through Summer 2016	Spring 2013 through Summer 2014	5
Southern West Virginia Community and Technical College	Welding Technology AAS	Electrical Engineering Technology AAS	Spring 2015 through Summer 2016	Spring 2013 through Summer 2014	5
West Virginia Northern Community College	Mechatronics AAS	Mechatronics AAS	Spring 2014 through Fall 2015	Spring 2012 through Fall 2013	6
West Virginia Northern Community College	Petroleum Technology AAS	Mechatronics AAS	Spring 2014 through Fall 2015	Spring 2012 through Fall 2013	6
West Virginia Northern Community College	Petroleum Technology CAS	Industrial Maintenance Technology CAS	Spring 2014 through Fall 2015	Spring 2012 through Fall 2013	6
West Virginia Northern Community College	Information Technology AAS	Information Technology AAS	Spring 2015 through Summer 2016	Spring 2013 through Summer 2014	5
West Virginia Northern Community College	Information Technology CAS	Information Technology CAS	Spring 2015 through Summer 2016	Spring 2013 through Summer 2014	5
West Virginia University at Parkersburg	Electricity & Instrumentation CAS	Electricity & Instrumentation CAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6

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College	Treatment Program	Comparison Program	Treatment Study Window	Comparison Study Window	Length of Study Window (Semesters)
West Virginia University at Parkersburg	Multi-Craft AAS	Multi-Craft AAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
West Virginia University at Parkersburg	Chemical and Polymer Operator Tech CAS	Chemical and Polymer Operator Tech CAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
West Virginia University at Parkersburg	Welding Technology CAS	Welding Technology CAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
West Virginia University at Parkersburg	Information Technology AAS	Information Technology AAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
West Virginia University at Parkersburg	Industrial Maintenance CAS	Industrial Maintenance CAS	Fall 2014 through Summer 2016	Fall 2012 through Summer 2014	6
West Virginia University at Parkersburg	Engineering Technology AAS	Engineering Technology AAS	Spring 2015 through Summer 2016	Spring 2013 through Summer 2014	5

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Table 19: List of Programs Including Number of Students in Treatment and Comparison Programs

College	Treatment Program	Comparison Program	Treatment Group Enrollment	Comparison Group Enrollment	Included in Impact Evaluation (Yes/No)
Blue Ridge Community and Technical College	Electrical Distribution Technology CAS	Electrical Distribution Technology CAS	13	10	Yes
Blue Ridge Community and Technical College	Electrical Distribution Technology AAS	Electrical Distribution Technology AAS	23	27	Yes
Blue Ridge Community and Technical College	Mechatronics AAS	Mechatronics AAS	25	28	Yes
Blue Ridge Community and Technical College	Cisco Certified Network Associate CAS	Cisco Certified Network Associate CAS	5	3	Yes
Blue Ridge Community and Technical College	Cisco Certified Network Professional CAS	Cisco Certified Network Professional CAS	0	2	No
Blue Ridge Community and Technical College	Converged Networking CAS	Converged Networking CAS	0	0	No
Blue Ridge Community and Technical College	Information Security CAS	Information Security CAS	0	17	No
Blue Ridge Community and Technical College	Systems Networking CAS	Systems Networking CAS	0	1	No

College	Treatment Program	Comparison Program	Treatment Group Enrollment	Comparison Group Enrollment	Included in Impact Evaluation (Yes/No)
Blue Ridge Community and Technical College	Virtualization CAS	Virtualization CAS	0	0	No
Blue Ridge Community and Technical College	Information Technology AAS	Information Technology AAS	13	19	Yes
Blue Ridge Community and Technical College	Computer Network Engineering Technologies AAS	Computer Network Engineering Technologies AAS	22	26	Yes
Blue Ridge Community and Technical College	Cybersecurity AAS	Cybersecurity AAS	43	40	Yes
Blue Ridge Community and Technical College	Electric Utility Technology AAS	Electrical Distribution Technology AAS	11	11	Yes
BridgeValley Community and Technical College	Chemical Operations CAS	Chemical Operations CAS	13	0	No
BridgeValley Community and Technical College	Applied Process Technology (Chemical) AAS	Applied Process Technology (Chemical) AAS	9	0	No
BridgeValley Community and Technical College	Computer Management Information Systems AAS	Computer Management Information Systems AAS	23	0	No

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College	Treatment Program	Comparison Program	Treatment Group Enrollment	Comparison Group Enrollment	Included in Impact Evaluation (Yes/No)
BridgeValley Community and Technical College	Computer Science Technology Software Developer AAS	Computer Science Technology Software Developer AAS	13	0	No
BridgeValley Community and Technical College	Computer Technology Web Design Concentration AAS	Computer Technology Web Design Concentration AAS	3	0	No
BridgeValley Community and Technical College	Computer Maintenance and Networking CAS	Computer Maintenance and Networking CAS	6	3	Yes
BridgeValley Community and Technical College	Diesel Technology CAS	Diesel Technology CAS	9	2	Yes
BridgeValley Community and Technical College	Diesel Technology AAS	Diesel Technology AAS	37	49	Yes
BridgeValley Community and Technical College	Simulation, Gaming & Apps Development CAS	Completion: Computer Maintenance and Networking CAS	5	3	Yes
		Employment: Software Developer AAS		0	No

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College	Treatment Program	Comparison Program	Treatment Group Enrollment	Comparison Group Enrollment	Included in Impact Evaluation (Yes/No)
BridgeValley Community and Technical College	Advanced Manufacturing AAS	Advanced Manufacturing AAS	19	19	Yes
BridgeValley Community and Technical College	Cyber Security AAS	Cyber Security AAS	9	0	No
BridgeValley Community and Technical College	Welding AAS	Welding AAS	18	16	Yes
BridgeValley Community and Technical College	Civil Engineering Technology AAS	Civil Engineering Technology AAS	7	10	Yes
BridgeValley Community and Technical College	Drafting and Design Engineering Technology AAS	Drafting and Design Engineering Technology AAS	9	8	Yes
BridgeValley Community and Technical College	Electrical Engineering & Technology AAS	Electrical Engineering & Technology AAS	33	18	Yes
BridgeValley Community and Technical College	Mechanical Engineering Technology AAS	Mechanical Engineering Technology AAS	11	0	No
BridgeValley Community and Technical College	Machine Tool Technology AAS	Welding AAS	19	15	Yes

College	Treatment Program	Comparison Program	Treatment Group Enrollment	Comparison Group Enrollment	Included in Impact Evaluation (Yes/No)
BridgeValley Community and Technical College	Machine Tool Technology CAS	Completion: Diesel Tool Technology CAS	4	2	Yes
		Employment: Welding AAS		15	Yes
BridgeValley Community and Technical College	Industrial Pipe Design AAS	Drafting and Design Engineering Technology AAS	1	8	Yes
BridgeValley Community and Technical College	Industrial Pipe Design CAS	Employment: Drafting and Design Engineering AAS	0	8	No
		Completion: Pre-Engineering CAS		7	No
BridgeValley Community and Technical College	Building Design and Construction AAS	Employment: Sustainability Design Technology CAS	4	1	Yes
		Completion: Drafting and Design Engineering Technology AAS		8	Yes

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College	Treatment Program	Comparison Program	Treatment Group Enrollment	Comparison Group Enrollment	Included in Impact Evaluation (Yes/No)
Eastern West Virginia Community and Technical College	Information Technology AAS	Information Technology AAS	11	12	Yes
Eastern West Virginia Community and Technical College	Information Technology CAS	Information Technology CAS	2	1	Yes
Eastern West Virginia Community and Technical College	Electromechanical Technology CAS	Electromechanical Technology CAS	3	3	Yes
Eastern West Virginia Community and Technical College	Wind Energy Technology CAS	Wind Energy Technology CAS	1	3	Yes
Eastern West Virginia Community and Technical College	Wind Energy Technology AAS	Wind Energy Technology AAS	17	19	Yes
Mountwest Community and Technical College	Information Technology Networking Fast-Track AAS	Information Technology Network Administration and Development AAS	61	47	Yes
Mountwest Community and Technical College	Engineering Design Technology AAS	Engineering Design Technology AAS	0	9	No
New River Community and Technical College	Welding Technology CAS	Welding Technology CAS	9	61	Yes

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College	Treatment Program	Comparison Program	Treatment Group Enrollment	Comparison Group Enrollment	Included in Impact Evaluation (Yes/No)
New River Community and Technical College	Welding Technology Structural/Pipe Welding AAS	Welding Technology Structural/Pipe Welding AAS	32	36	Yes
New River Community and Technical College	Computer Science/ Information Technology AAS	Computer Science/ Information Technology AAS	30	45	Yes
New River Community and Technical College	Electrical Distribution Engineering CAS	Introduction to Line Worker Course	50	40	Yes
New River Community and Technical College	Industrial Technology AAS	Industrial Technology AAS	4	0	No
Pierpont Community and Technical College	Power Plant Technology AAS	Power Plant Technology AAS	0	0	Yes
		Mechatronics AAS		7	
Pierpont Community and Technical College	Power Plant Technology CAS	Power Plant Technology CAS	9	6	Yes
Pierpont Community and Technical College	Mechatronics AAS	Mechatronics AAS	3	7	Yes
Pierpont Community and Technical College	Applied Process Technology AAS	Power Plant Technology AAS	17	0	Yes

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College	Treatment Program	Comparison Program	Treatment Group Enrollment	Comparison Group Enrollment	Included in Impact Evaluation (Yes/No)
		Mechatronics AAS		3	
Southern West Virginia Community and Technical College	Electrical Engineering Technology AAS	Electrical Engineering Technology AAS	34	23	Yes
Southern West Virginia Community and Technical College	Electrical Engineering Technology CAS	Electrical Engineering Technology CAS	1	4	Yes
Southern West Virginia Community and Technical College	Industrial Technology Mechatronics/Welding CAS	Electrical Engineering Technology CAS	7	4	Yes
Southern West Virginia Community and Technical College	Information Technology AAS	Information Technology AAS	10	13	Yes
Southern West Virginia Community and Technical College	Information Technology AAS	Information Technology AAS	0	1	No
Southern West Virginia Community and Technical College	Mechatronics AAS	Electrical Engineering Technology AAS	15	23	Yes
Southern West Virginia Community and Technical College	Occupational Development AAS	Electrical Engineering Technology AAS	0	23	No

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College	Treatment Program	Comparison Program	Treatment Group Enrollment	Comparison Group Enrollment	Included in Impact Evaluation (Yes/No)
Southern West Virginia Community and Technical College	Welding Technology AAS	Electrical Engineering Technology AAS	18	23	Yes
West Virginia Northern Community College	Mechatronics AAS	Mechatronics AAS	43	27	Yes
West Virginia Northern Community College	Petroleum Technology AAS	Mechatronics AAS	22	27	Yes
West Virginia Northern Community College	Petroleum Technology CAS	Industrial Maintenance Technology CAS	6	19	Yes
West Virginia Northern Community College	Information Technology AAS	Information Technology AAS	21	30	Yes
West Virginia Northern Community College	Information Technology CAS	Information Technology CAS	22	34	Yes
West Virginia University at Parkersburg	Electricity and Instrumentation CAS	Electricity and Instrumentation CAS	0	0	No
West Virginia University at Parkersburg	Multi-Craft AAS	Multi-Craft AAS	0	0	No
West Virginia University at Parkersburg	Chemical and Polymer Operator Tech CAS	Chemical and Polymer Operator Tech CAS	0	0	No

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College	Treatment Program	Comparison Program	Treatment Group Enrollment	Comparison Group Enrollment	Included in Impact Evaluation (Yes/No)
West Virginia University at Parkersburg	Welding Technology CAS	Welding Technology CAS	28	26	Yes
West Virginia University at Parkersburg	Information Technology AAS	Information Technology AAS	42	72	Yes
West Virginia University at Parkersburg	Industrial Maintenance CAS	Industrial Maintenance CAS	0	0	No
West Virginia University at Parkersburg	Engineering Technology AAS	Engineering Technology AAS	12	25	Yes

Table 20: Counties and MSAs Corresponding with Each BTG College/Campus for Matching BLS Data

College	Campus	County/MSA
Blue Ridge CTC	Main	Hagerstown-Martinsburg MSA
Eastern WV CTC	Main	Hardy County
Mountwest CTC	Main	Huntington-Ashland MSA
New River CTC	Main	Beckley MSA
	Greenbrier Valley	Greenbrier County
	Nicholas County	Nicholas County
	Beckley	Beckley MSA
Pierpont CTC	Main	Fairmont MSA
Southern WV CTC	Main	Logan County
	Wyoming/McDowell	Wyoming County
	Boone/Lincoln	Charleston MSA
	Williamson	Mingo County
Northern WV CC	Main	Wheeling MSA
	Weirton	Weirton-Steubenville MSA
	New Martinsville	Wetzel County
WV University of Parkersburg	Main	Parkersburg-Marietta-Vienna MSA
	Jackson County Center	Jackson County
BridgeValley CTC/Bridgemont CTC	Main	Fayette County
BridgeValley CTC/Kanawha Valley CTC	Main	Charleston MSA

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Figure 13: Unemployment Rates over Time by Area

In these charts, the blue line illustrates the unemployment rate experienced by the comparison group during their study window; the red line illustrates the unemployment rate experienced by the BTG group during their study window. The extent that the lines diverge operationalizes the difference in economic context for the two groups. See *Analytic Model Specifications* section for more information.

Hagerstown-Martinsburg MSA: Blue Ridge CTC, Main Campus
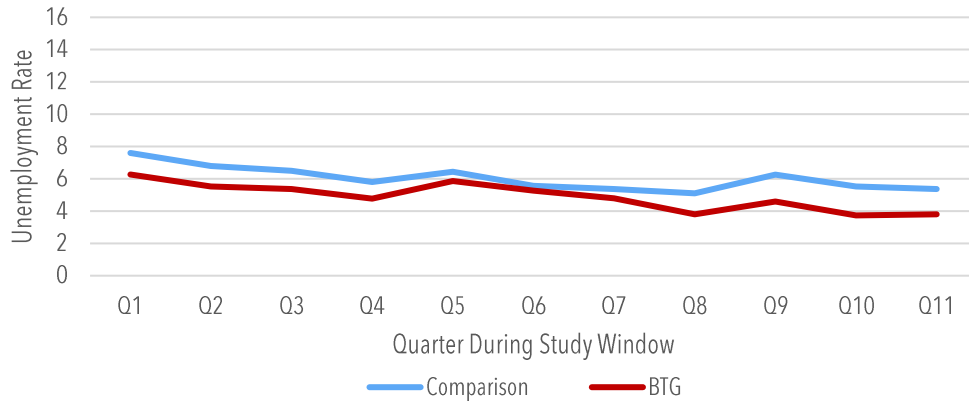
Hardy County: Eastern WV CTC, Main Campus

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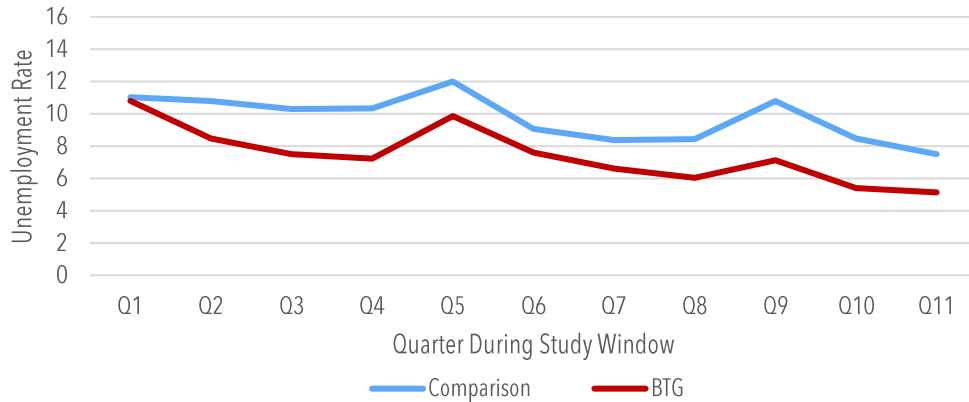
Huntington-Ashland MSA: Mountwest CTC, Main Campus
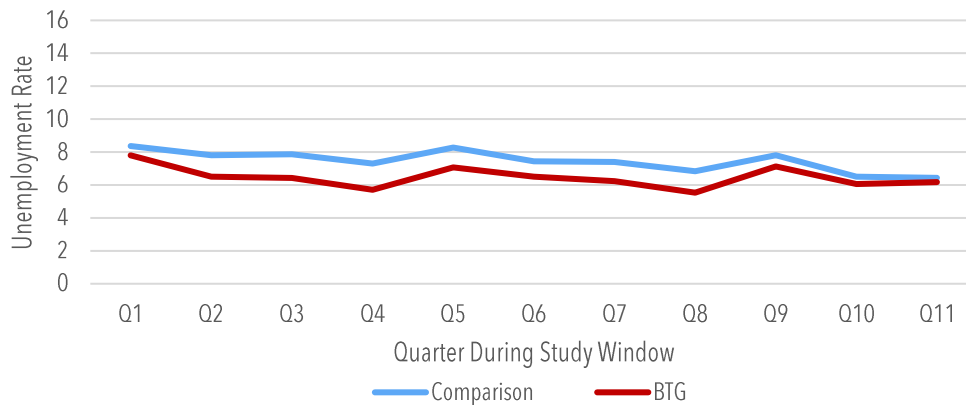
Beckley MSA: New River CTC, Main Campus
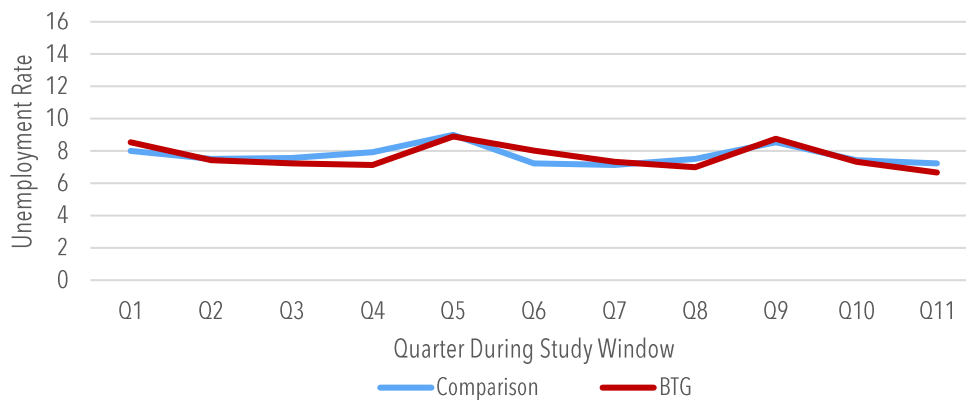
Greenbrier County: New River CTC, Greenbrier Valley Campus

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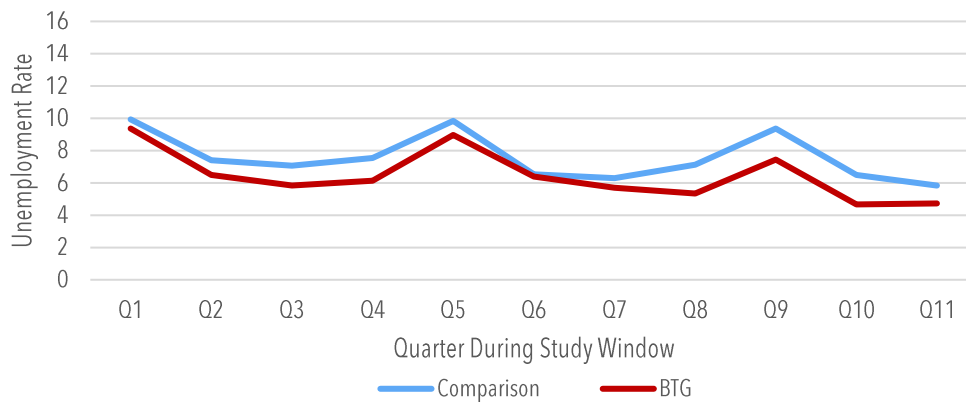
Nicholas County: New River CTC, Nicholas County Campus
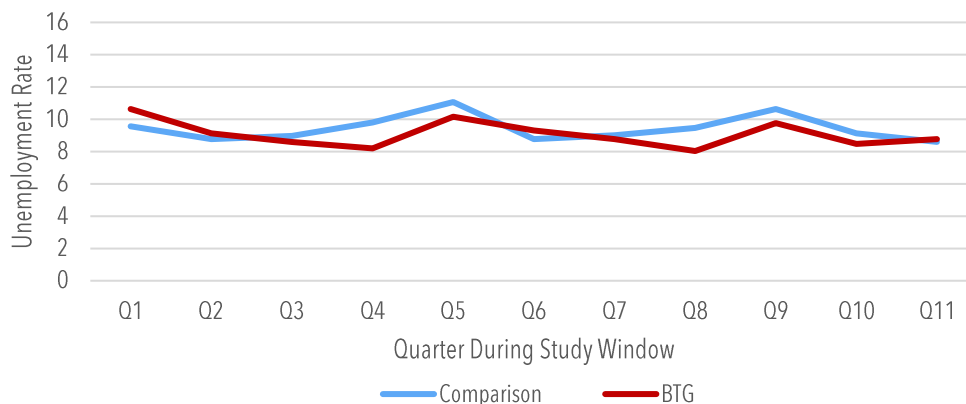
Beckley MSA: New River CTC, Beckley Campus
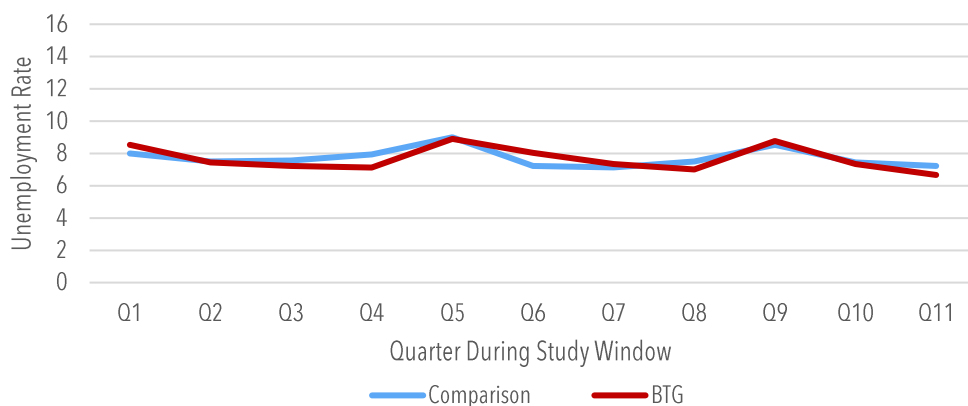
Fairmont MSA: Pierpont CTC, Main Campus

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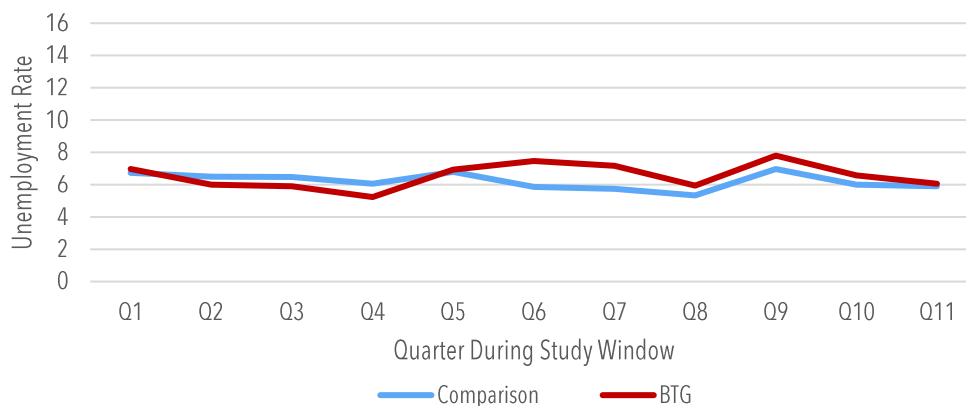
Logan County: Southern WV CTC, Main Campus
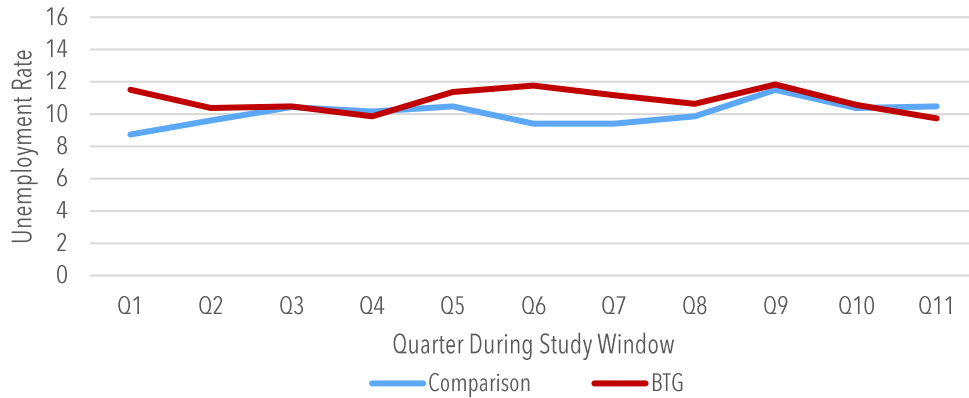
Wyoming County: Southern WV CTC, Wyoming/McDowell Campus
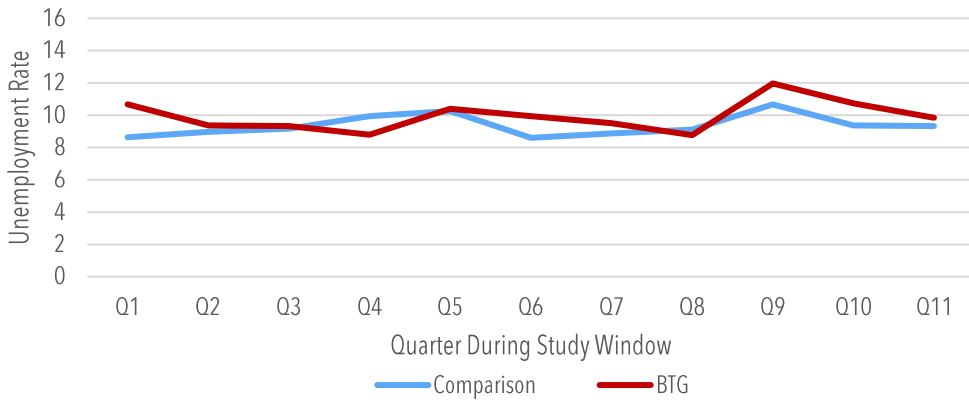
Charleston MSA: Southern WV CTC, Boone/Lincoln Campus
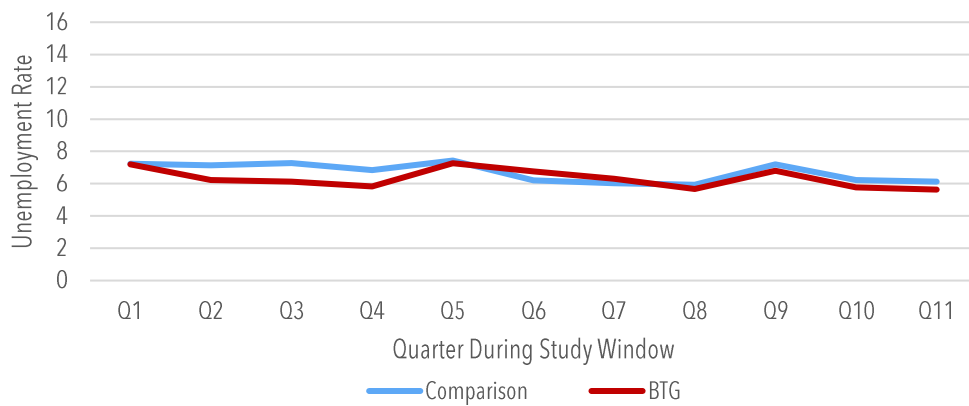
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Mingo County: Southern WV CTC, Williamson Campus
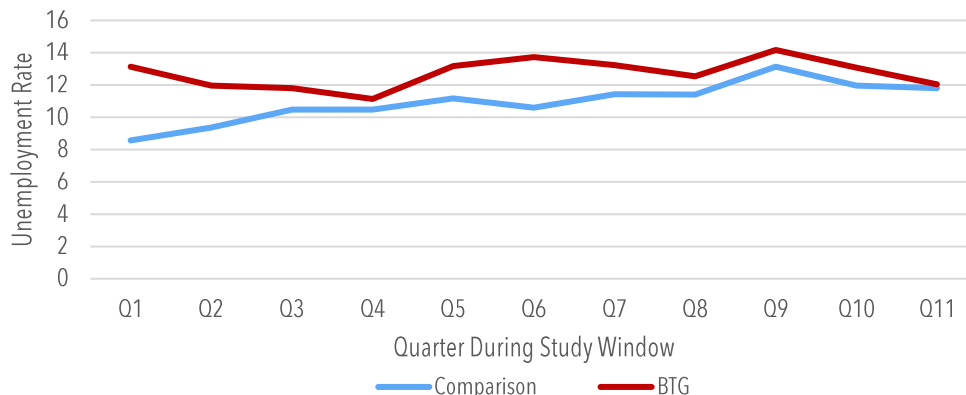
Wheeling MSA: Northern WV CC, Main Campus
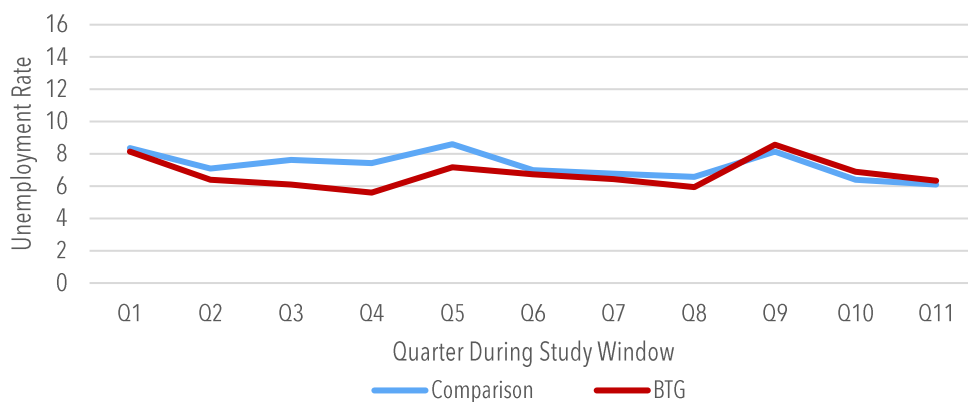
Weirton-Steubenville MSA: Northern WV CC, Weirton-Campus

THOMAS P. MILLER & ASSOCIATES WITH THE POLICY & RESEARCH GROUP
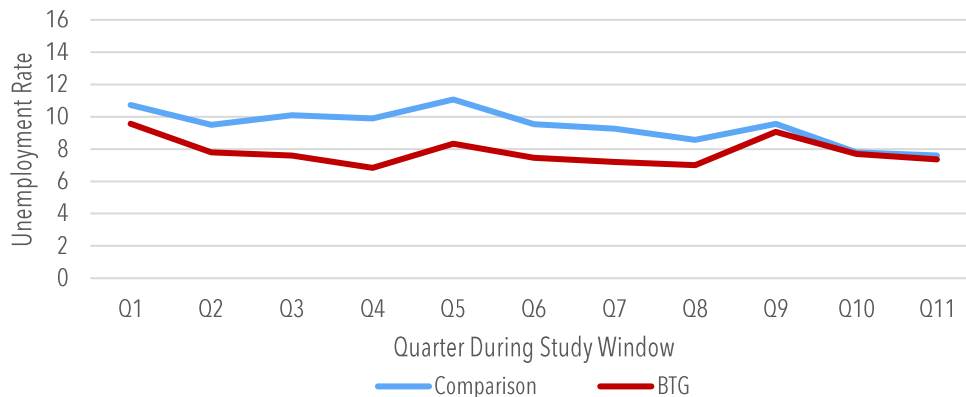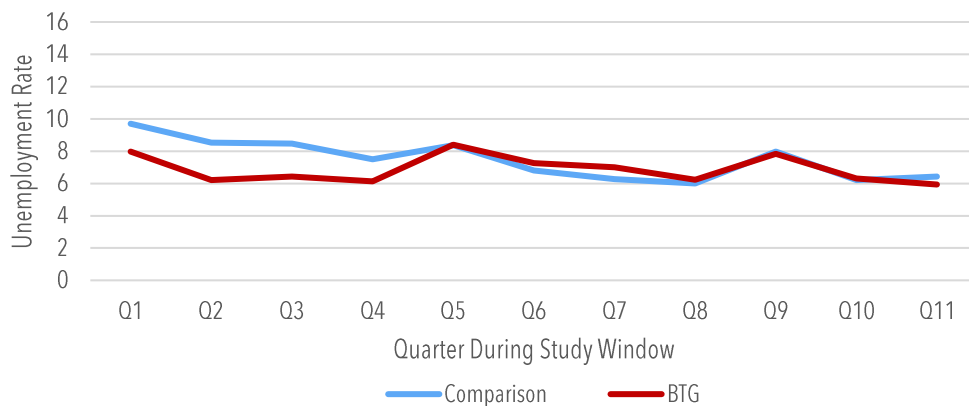
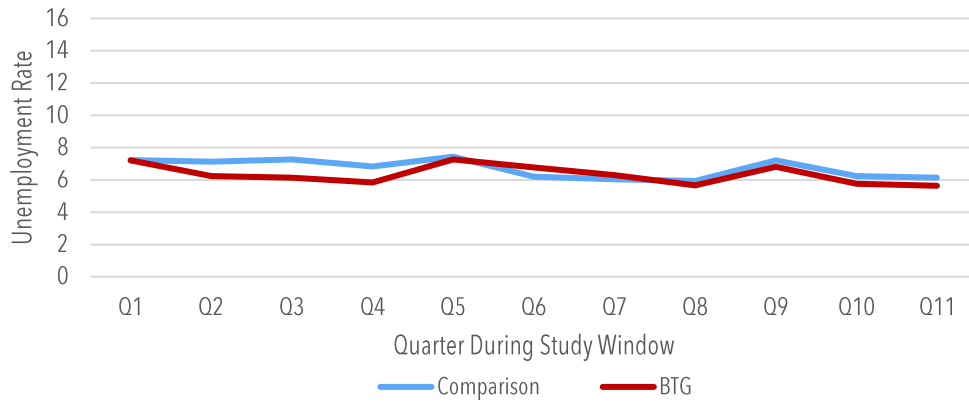## Wetzel County: Northern WV CC, New Martinsville Campus
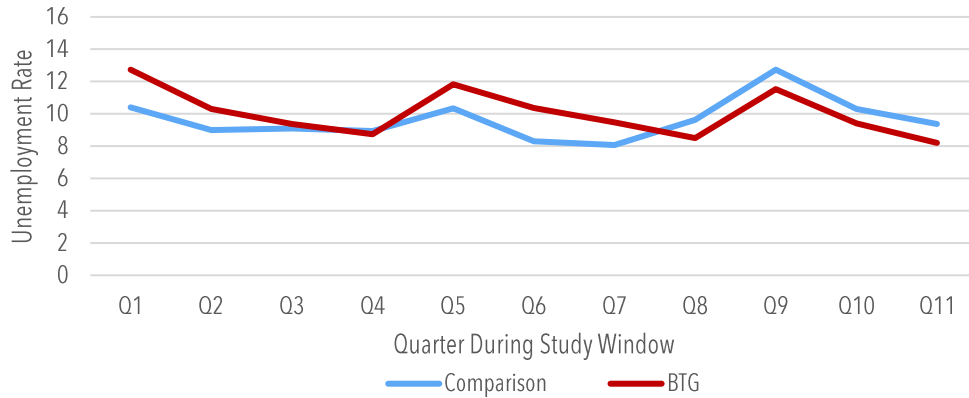
## Parkersburg-Marietta-Vienna MSA: WV University of Parkersburg, Main Campus
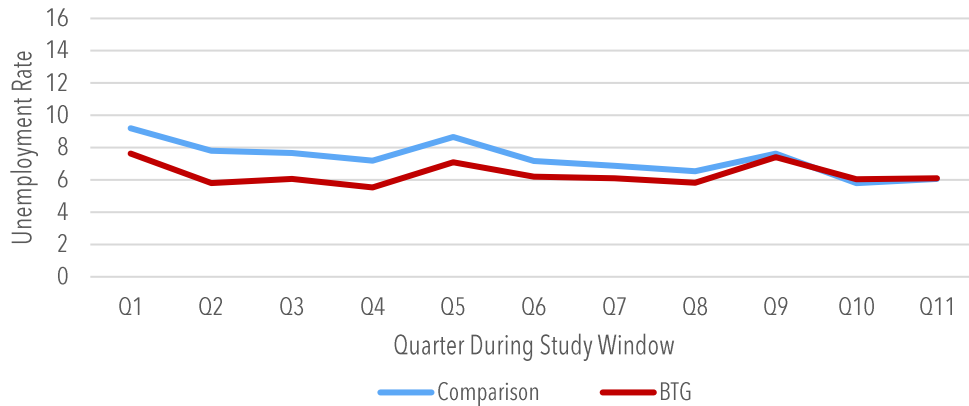
Jackson County: WV University of Parkersburg, Jackson County Center

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Charleston MSA: BridgeValley CTC/Kanawha Valley CTC, Main Campus

Fayette County: BridgeValley CTC/Bridgemont CTC, Main Campus

THOMAS P. MILLER & ASSOCIATES WITH THE POLICY & RESEARCH GROUP
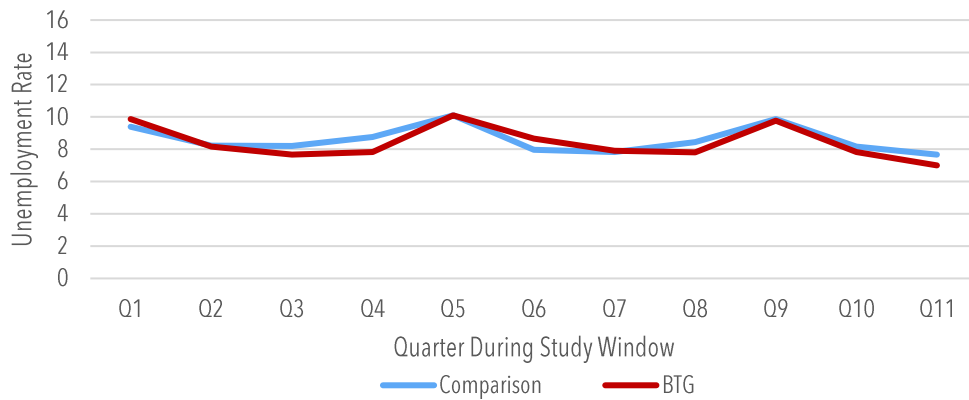
APPENDIX E. CTC AND WORKFORCE COLLABORATION STUDY

TPMA's partner, WorkED Consulting, completed the following report.[263]

INTRODUCTION

Purpose and Background

The West Virginia *Bridging the Gap* (BTG) consortium is a system-wide effort led by BridgeValley Community and Technical College (BCTC) that involves nine community and technical colleges within West Virginia. BTG focuses on the energy, advanced manufacturing, construction, and information technology (IT) sectors through development of career pathways and enhancement of academic instruction. BTG has implemented a three-pronged, evidence-based design, which includes: (1) enhanced and accelerated sector-driven career pathways; (2) contextualized, online, blended, simulated, and remote academic instruction; and (3) expanded and individualized student support strategies focused on strategic recruitment, college success courses, peer coaching, career planning, and data-driven decision making.

The BTG consortium has worked to align programs and curricula to meet national industry standards, identify overlapping skill sets, and design effective career pathways at: (1) a state level to build and strengthen sector partnerships and identify portable skill sets, programs, and credentials; and (2) a regional level through employer-driven sector partnerships to assess regional industry-specific needs and ensure credentials, programs, and courses truly meet those needs. In addition, through stacked and latticed credentials (including Prior Learning Assessments), strengthened transferability and articulation of credits, online and technology-enabled learning, and strategic alignment, the BTG consortium has focused on long-term sustainability and success.

As part of the third-party evaluation of the BTG program, the Thomas P. Miller & Associates (TPMA) Evaluation Team has assessed the level of partnership support and building, especially with regard to the working relationship between the community and technical colleges and the local workforce development system. Both community and technical colleges and the state/local public workforce system are critical partners in providing an array of workforce and training services to job seekers, workers, and businesses. The recently enacted Workforce Innovation and Opportunity Act (WIOA) anticipates a closer and more proactive relationship between these partners, and the Trade Adjustment Assistance Community College and Career Training (TAACCCT) grant program promoted a meaningful partnership between community colleges and the local workforce system.

TAACCCT partnership activities may cover a number of areas, including, but not limited to, shared business outreach strategies, coordinated job preparation and job search services, and common intake procedures. The BTG Work Plan specifically discusses the following activities:

- Regional partnership meetings
- Work-based learning through outreach to employers
- Career planning
- Recruitment and outreach
- Job placement planning and services

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[263] http://workedconsulting.com/

The purpose of this study is to gather additional, focused information, through a series of interviews and to assess to what level partnership activities have occurred under the BTG program, as well as make recommendations on opportunities for further collaboration after the grant period of performance ends.

Summary of Methodology

To gather information for the study, a series of in-person and telephone interviews were conducted with local workforce system directors. One in-person and four telephone interviews were conducted. Each community and technical college completed an emailed questionnaire that was sent back by a BTG staff member.

Five interviews were conducted with local workforce development system personnel—one interview in-person and five interviews over the telephone. One of the interviewees has worked in the system for 30 years, and others have had significant experience and understanding of the historical relationship with the college partners. Because of this extensive experience, the workforce interviews have a historical context of the impact of the BTG program and the relationship between partners over a long period.

The same interview protocol was used for all the workforce system interviews and the community and technical college staff interviews. The protocol grouped questions in a manner that requested information on (1) partnership activities prior to the BTG program; (2) partnership activities and initiatives because of the BTG program; and (3) ways that the partnership may or may not continue after BTG is over. A copy of the interview protocol is provided as *Attachment A.*

COLLABORATION STUDY FINDINGS

Community and Technical College Interviews

Partnership/Relationship Prior to BTG

In response to the question, "Prior to the *Bridging the Gap* project, did the college and workforce system partner and work consistently together," four colleges indicated a strong relationship existed, two colleges had a basic relationship, and three colleges had poor working relationships. Examples of relationships prior to BTG include the following:

- Those colleges with a **strong** relationship indicated that they provided skill enhancement services in combination with career services and job readiness assistance. One concrete example was the work the local workforce development system is doing with the college to partner on grant development activities, while also providing up to $6,000 in Workforce Innovation and Opportunity Act (WIOA) funding for students' tuition, books, and fee costs. Other activities under a strong relationship included involvement by college leadership on the Workforce Investment Board (WIB), and one college's involvement in local workforce development strategic planning.
- Those colleges with a **basic** relationship indicated that activities such as staying in contact about new initiatives or sharing outreach materials between the two systems occurred, but coordinated activities leading to more support for common participants did not happen consistently. One college mentioned that when workforce and college staff were in the same building, there was a strong relationship, but the cohesiveness ended when they separated into different facilities.

- Those colleges with a **poor** relationship indicated that an ongoing working relationship did not exist. Two colleges pointed to some short-term job placement activities, but no ongoing work on behalf of employers or workers is happening.

Partnership/Relationship During BTG

Based on the submitted interviews, the BTG program has improved the working relationship between the colleges and the local workforce development system. Respondents highlighted the following ways that partners worked together:

Referrals for BTG Services. Workforce development partners referred individuals for services who were potentially eligible as participants.

Coordinated Job Fairs/Placement Events. Roughly half the colleges indicated that they participated in job fairs and placement events with the workforce development system. While quantitative information regarding participant enrollment as a result of these events was lacking, college staff indicated that events were often successful.

Coordinated Job Counseling/Career Advising. Several colleges indicated that during BTG, the local workforce development staff and college advisors participated in coordinated job counseling/career advising. This included participation in counseling or advising sessions either at the local one-stop center or on the college campus.

Tuition Assistance. Two colleges indicated that the local workforce system assisted with costs of tuition under the BTG program. Because TAACCCT did not allow grant funds to be used for tuition costs, partnering to cover non-TAA participants with tuition costs provided more opportunities for participant enrollment.

Attending Meetings. To enhance communication, colleges indicated that staff from the workforce system and the colleges are attending each other's relevant meetings more consistently. These include meeting when topics such as sector strategies or participant counseling/advising strategies are discussed.

When asked the question, "Will the BTG project have impacted in any meaningful way the partnership between the college and local workforce system," college answers ranged from "No" to "Absolutely."

- For colleges that had a **strong** relationship with the local workforce development system, respondents generally indicated that BTG enhanced that relationship.
- For colleges that had a **basic** relationship, respondents highlighted an area such as continuity of services or better awareness of what the local workforce development system provides for services.
- For colleges that have a **poor** relationship, BTG did not seem to marginally impact that relationship in a way that overcomes legacy-type barriers to a more productive relationship.

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Sustainable Partnership Activities Under BTG

In response to questions regarding ways that the college and local workforce development system could work together after BTG, and practices to sustain, colleges made the following comments:

- "The College hopes to maintain the marketing partnership with the [local workforce partner] and the practice of sending letters to all UI claimants. The College would also like to sustain the student referrals…"

- "We should keep an active presence at the workforce office to provide information and outreach. [College] should also work regularly with workforce counselors to ensure they have accurate information about how to apply at the [College]…"

- Partnership should "increase the number of days WIA is onsite to work with students and assisting WIA clients with transitioning into college." Practices sustained should include "referrals and membership on advisory committees and executive board."

- BTG practices recommend be sustained, "Engage key stakeholders such as employers and resources in the region."

- "All that we have been doing together will remain as part of our partnership. The state government could be a little more cooperative to allow us and others to meet as part of the Rapid Response team as other states allow it. The only answer we get is this is the way we have always done it."

- "All current practices should be sustained without additional cost to the institution. We should meet semi-annually with senior staff and workforce staff to continue improving the relationship. The local workforce development board has provided excellent leadership and created a collaborative relationship. We are lucky to have them in our region. Relationships are key to success and open many doors. WIOA has also helped by having goals that require [us] to work together."

- "I would recommend additional and continued trainings of workforce personnel on [college] programs. I think the workforce system really should be doing more in the way of true and legitimate statistics. Those services are not really done now. I also think the workforce counselors need to understand the colleges programs, and know that we work with students who need developmental courses."

- "This experience did strengthen our relationship with the WIB. Even though the results were not what we expected, it did help to open doors of communication. We still have an open door with the WIB even though we do not have a representative on campus. We will keep the career webpage up and send referrals to the WIB when applicable."

Workforce System Interviews

Partnership/Relationship Prior to BTG

Local workforce development directors provided the following information regarding activities prior to BTG. Some of these activities span the past 10-12 years, or strong partnership activities happened several years ago, but the relationship was not strong just prior to BTG.

- One local workforce development area conducted a successful Summer Youth Academy in partnership with a college. Other examples of work together between this area and partner colleges include: 1) referrals of individuals to colleges for services; 2) training provider meetings and inclusion on the Eligible Training Provider List (ETPL), and 3) leadership on boards. This area has more recently worked with a college on a six-week certificate training initiative in partnership with a large employer. The local workforce development interviewee suggested that more cross training between the colleges and local workforce system would be beneficial.

- One local workforce development area indicated that training initiatives have been successful in the past that targeted training for specific employers; however, these often were time limited and not ongoing. The local workforce development interviewee stated that the local community and technical college is the first option for training—especially with customized or employer-specific training.

- One local workforce development area said their relationship has been strong for the past few years, and they have provided Individual Training Account (ITA) funds for tuition costs. When there was a changeover in college administration, the workforce staff were concerned, but found that the transition went well and the relationship was maintained.

- One local workforce development area believes they have a strong and long relationship with colleges and presented together at a recent National Association of Workforce Boards (NAWB) conference. A highlight of the partnership was onsite presence at the first one-stop center and physical staff from the college being present for 2-3 days per week.

- One local workforce development area has had an unsuccessful relationship over time. The interviewee described multiple instances of contracting with the college or providing ITA funds for participant training with weak outcomes and low training enrollment and/or completion numbers. The interviewee recognized budget cuts the college has realized over a number of recent years, but voiced frustration at the lack of an ongoing, productive relationship between the workforce system and the local college.

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Partnership/Relationship During BTG

Workforce development staff interviewees did not indicate that BTG had a positive impact overall on the relationship between their system and the colleges. One interviewee indicated that BTG was a major success regarding their partnership with a local college and named ways they worked well together:

- Developing a regional strategic plan
- Quarterly meetings including representatives from the workforce system in another state that formed the economic region
- Participant referrals made to the college for BTG services such as counseling and training, and participant activities were collectively tracked
- Developing a targeted outreach approach that focused on three sectors and how the workforce system and college could work to serve business and industry in three economic sectors

Two other workforce development interviewees highlighted some positive activities under BTG, but expressed skepticism that activities would continue once BTG ended. One interviewee highlighted partnership activities such as:

- Sector strategy meetings
- Co-branded outreach and recruitment materials
- Registration with workforce programs and assistance with job readiness, such as resume writing and interviewing to supplement college training
- Participant referrals to the college

The other interviewee indicated that a Career Counselor was on campus Mondays as part of the BTG program. There was sharing of labor market information and work on coordinated job search activities for participants.

The two other workforce development interviewees indicated that BTG was a step back in the relationship between the workforce development system and college partners. One interviewee said that they worked well with their local college historically, but under BTG things "fell apart." The perception of this local workforce leader was the college did not hire new personnel to conduct BTG activities; rather, the college gave existing employees more to do, which overburdened those employees. The local workforce area was willing to help BTG participants with financial assistance for tuition, books, and fees, but could not make inroads with the college to formalize and streamline a process for making this service available.

The second interviewee stated that they expected a "sense of urgency" on behalf of the college to work in partnership with the local workforce development system in order to meet participant outcomes for the grant funding received, but that urgency was not forthcoming. This interviewee indicated that no credible partnership or relationship happened under BTG.

Sustainable Partnership Activities Under BTG

In response to questions regarding ways that the college and local workforce development system could work together after BTG, and practices to sustain, local workforce development grantees offered the following:

- One interviewee said that the workforce system and college should continue to work together on conducting job fairs, doing combined outreach and recruitment, such as email blitzes, and having

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case managers meet with college students. This interviewee also recommended doing more cross training between the various staff so workforce development staff could better understand college processes and programs, and vice versa.

- The other four interviewees all expressed concern about the ongoing relationship with their respective colleges, mainly due to the nature of the current relationship. Interviewees typically described, even positive relationships, as being based on a relationship with an individual at a college. One workforce development interviewee has experienced a very positive relationship during BTG, but the BTG director at the college has already left, and partnership activities have virtually ceased as a result. This was a consistent comment made by workforce development interviewees—the extent of working or not working together typically was a result of <u>who</u> was at the college and that person's understanding and willingness to partner. The partnership was transactional versus institutional.

RECOMMENDATION

Summary

Based on the interview results, the core issue identified that inhibits better partnerships and ongoing relationships between the workforce development system and community and technical colleges in West Virginia is the lack of institutional processes, procedures, and relationships. Positive, value-added partnerships are lacking throughout West Virginia, and when a relationship is in place, it is typically "transactional," meaning that it is part of a short-term initiative or grant-funded program, and when the personalities and/or funding ends, the partnership ends too.

The primary recommendation coming out of this study is the following:

> The State of West Virginia should undertake a comprehensive initiative around strengthening the relationship between the state and local public workforce system and community and technical colleges. This includes identifying the relative strengths of each partner, complementary and overlapping services of each partner, and implementation of institutional processes for working together on behalf of employers and workers.

Implementation

To implement this recommendation, the following steps and activities could be undertaken:

1. With the leadership of the new governor and his administration, implement a statewide workforce development initiative that involves focus groups, analysis and discussion of the services provided by the statewide workforce system and comprehensively by the community and technical colleges, and develop specific actions that can be undertaken on behalf of employers and workers to strengthen the partnership and processes for doing business together.

2. Under the statewide initiative umbrella, hold local partnership building initiatives that have the "buy in" of both workforce development system and college leadership with a commitment to develop institutional processes for working together.

Environmental Factor Influence

The timing and specific reasons for undertaking these activities are influenced by the following:

- **Workforce Innovation and Opportunity Act (WIOA) Implementation:** States and local workforce areas are in the immediate throes of implementing WIOA. As part of implementation, there are opportunities for significant community college involvement and partnership. For instance, local workforce areas must implement a competitive process for operation of one-stop centers and a competitive process for provision of career services. Both of these areas include services that community colleges provide.

- **Sector Strategies:** The Federal Government and many large, national employers are fully engaged in working with states and local stakeholders on implementation of sector strategies (i.e., more targeted outreach and engagement). Important progress has been made as part of the BTG program, such as the development of important employer partnerships, creation of Advisory Committees and holding of Sector Partnership meetings, and alignment of college curriculum and

equipment purchases with sector and employer growth occupations. However, ongoing implementation of these sector strategies could be more consistently applied, and coordination between the community and technical colleges and the workforce development system around sector strategies could happen more comprehensively. One activity a more comprehensive partnership could undertake is integrated business and sector outreach to foster more efficient services and eliminate redundant contacts with businesses.

- **Economic Transformation in West Virginia:** With the demise of the coal industry, the West Virginia economy has struggled, and new job growth in other industries is required. Building on career pathways development occurring through BTG and other grant-funded initiatives, the local workforce development system and community and technical colleges must work together to identify the occupations—along with the knowledge, skills, abilities, and competencies needed for those occupations—to institutionalize career services and training targeted specifically at those growth occupations in various communities throughout West Virginia.

- **Budget Realities:** Both state and federal funding for workforce programs will decline both short-term and long-term. Colleges have experienced budget cuts recently, and with continuing federal budget deficits, discretionary spending that supports state and local workforce development programs will decline as well. In contrast, if a national infrastructure bill is passed, opportunities for federal grant funding may become available, but it will be contingent on the local workforce development system and colleges being able to work together.

Conclusions

In summary, where the relationship between the local workforce development system and the community and technical colleges is strong and stable in West Virginia, it is mainly reliant on a good professional relationship between the various staff. This means the relationship and partnership initiatives are transactional versus institutional. To combat this foundational issue, a concerted and committed effort to change this dynamic must be made at both the state and local levels. It is also incumbent upon leadership and staff at the organizations to understand "why" it is important to build a permanent relationship—that is, businesses and workers in West Virginia require it to rebuild the economy and promote job and economic growth in support of the private sector, over time.

APPENDIX A: INTERVIEW PROTOCOL

Introduction

Purpose and Background

Both community colleges and the state/local public workforce system are critical partners in providing an array of workforce and training services to job seekers, workers, and businesses. The recently enacted Workforce Innovation and Opportunity Act (WIOA) anticipates a closer and more proactive relationship between these partners, and the Trade Adjustment Assistance Community College and Career Training (TAACCCT) grant program promoted a meaningful partnership between community colleges and the local workforce system.

TAACCCT partnership activities may cover a number of areas, including, but not limited to, shared business outreach strategies, coordinated job preparation and job search services, and common intake procedures. The BTG Work Plan specifically discusses the following activities:

- Regional partnership meetings
- Work-based learning through outreach to employers
- Career planning
- Recruitment and outreach
- Job placement planning and services

The purpose of this interview is to ask a series of questions to both West Virginia Community and Technical College officials and local West Virginia workforce system officials to understand how the relationship locally has operated as part of BTG, what best practices may emerge from working together, and how the relationship between the two systems may, or may not, have contributed to accomplishment of activities. If there are improvements or ideas for future work that emerge, those will be included in the final report to Jim Skidmore, BTG Program Director.

Questions for BTG College-Workforce System Relationship Study

1. Prior to the *Bridging the Gap* project, did the college and workforce system partner and work consistently together? If so, how?
2. Do you have a "best practice" example of how you worked together prior to BTG?
3. Thinking back prior to implementation of BTG, were there ways you wished you could have worked better together? If so, how?
4. As part of the BTG grant project, what ways have you worked together?
5. Examples include job placement, recruitment, etc.
6. If you have not actively worked together, are there some ways you wanted or hoped to work together? If so, what hampered this from happening?
7. Will the BTG project have impacted in any meaningful way the partnership between the college and local workforce system?
8. Do you have specific quantifiable data that demonstrates workforce system involvement in the BTG project?
9. Example: Referred X number of individuals to college for intake
10. Moving forward, what BTG practices do you recommend be sustained regarding your partnership?
11. In what ways, generally, could the college and the local workforce system strengthen their collaboration?

APPENDIX F. CURRICULUM REVIEW RETREAT SUMMARY REPORT

INTRODUCTION

Purpose

The West Virginia Community and Technical College System collaborated with Thomas P. Miller and Associates, LLC (TPMA) and Mason Bishop from WorkED Consulting, LLC to conduct a Curriculum Review Retreat from August 5 to August 6, 2015 at Blue Ridge Community and Technical College. The purpose of this Retreat was to gather faculty and staff from the *Bridging the Gap* (BTG) consortium colleges as well as TAACCCT grantees from other states – Louisiana, Massachusetts, North Carolina, North Dakota, and Florida – to discuss curriculum and establish networks for best practices and sustainability strategies in three industry sectors: Advanced Manufacturing, Energy, and Information Technology.

The Retreat offered a forum for these faculty and staff to discuss:

1. Industry-recognized credentials offered and embedded in pathways;
2. Innovative program delivery;
3. Ways to partner with national industry associations;
4. Connections to occupational knowledge, skills, abilities, and competencies; and
5. Challenges faced, successes stories, and best practices associated with course development.

A summary of the Curriculum Review Retreat follows below, and includes discussion around the following sector breakout sessions and panels:

- II. Sector Breakout Sessions
  - o Advanced Manufacturing
  - o Energy
  - o Information Technology
- III. Panels
  - o Non-Credit to Credit Articulation
  - o Open Entry, Open Exit Courses
- IV. College Resources Shared

SECTOR BREAKOUT SESSIONS

Advanced Manufacturing

Overview

The colleges participating in the Advanced Manufacturing breakout session revealed a number of focus areas in the sector – welding, machining, and mechatronics – that are prevalent in the colleges' regions and exhibit projected growth. To ensure students are prepared for the workforce in this sector, certifications have been integrated into the programs. These certifications are awarded after students pass examinations at different points throughout the program, providing students with multiple opportunities to receive stackable credentials. The table below outlines the different focus areas and certifications discussed at the Retreat.

Welding	Machining	Mechatronics
AWS	NIMS	Siemens
NCCER		
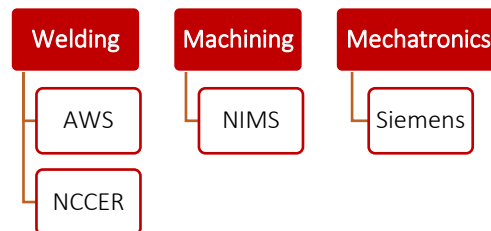
The colleges in the sessions addressed a number of topics ranging from hybridization of hands-on content and accelerated program strategies to how changes in the industry affect learning outcomes and balancing employer-specific versus generalizable skills in curriculum development.

Successes

+ Learn-and-earn, apprenticeship, and internship programs that allow students to earn a stipend while they are enrolled in the technical programs have reportedly improved student retention. According to the participating colleges, many students receive a certificate and leave the program in order to obtain paid employment so these opportunities may encourage students to remain in the programs.

+ Many colleges reported embedding developmental education courses into technical programs. Industry emphasizes a need for colleges to address English and math deficits with students, but many students leave before completing these courses. With this in mind, many colleges have begun incorporating technical-focused English and math into the programs so that (1) Students receive exposure to topics in their field of study early on and (2) Students can see how English and math apply to the fields they are entering.

Challenges

− Finding and keeping faculty has been an ongoing challenge for many colleges that attended the Retreat. Typically, colleges cannot offer potential instructors more than the industry is paying them. In addition, these candidates often do not possess the educational credentials that the college requires despite industry experience.

− Recruiting students for Advanced Manufacturing programs has been a challenge because there is a negative stigma attached to the sector. Faculty reported that many see the Advanced Manufacturing sector as factory work and fail to recognize the recent strides in technology. Because of this, potential students are typically discouraged from enrolling in the programs despite drastic technological shifts in the industry in recent years.

Best Practices

- **Embed soft skills into programs.** A number of faculty have found ways to embed soft skills into technical programs. Faculty reported a need to create a class environment that resembles a work environment to prepare students for the workforce. A number of solutions were discussed such as having class during typical business hours, taking cell phones away for class time, and utilizing time clocks.

- **Establish agreements with employers.** Many colleges reported challenges in retaining students enrolled in the technical programs as many leave for employment. Colleges that did not have this problem emphasized a need to establish agreements with employers to wait to hire students until they complete the technical program. Students completing the programs have higher degrees and can move up in the company, which is a selling point to employers and students.

Energy

Overview

The programs in the Energy sector are set up to provide students with a foundation of skills upon which the students can specialize their focus area (i.e., oil and gas, midstream, etc.) as they move forward in the program. The specialization opportunities offered at their institutions, curricula used in these programs, and industry trends were discussed during the breakout session. More specifically, Lineman and Instrumentation program curricula were outlined as well as their associated certifications (PMMI, NCCER, and ISA). The table below outlines the programs and certifications discussed at the Retreat.
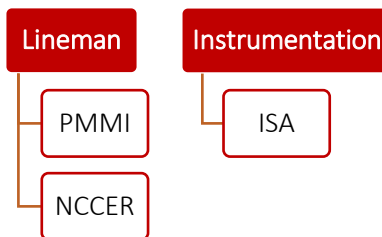
The colleges discussed a number of topics including accelerated delivery methods, block scheduling, aligning the program with industry-recognized credentials, methods of assessments, and employer engagement as well as how these topics influence curriculum development in the Energy sector at their institutions.

Successes

+ The colleges reported that there have been high placement percentages of students in the Energy sector, especially in the state of West Virginia. Due to projected growth trends, the colleges anticipate that this trend will continue and could aid with program sustainability.

+ The colleges in the Energy sector have focused their efforts on increasing student completion. With this in mind, hybrid and online offerings, accelerated formats, and bridge/gateway courses have been integrated into program development. These offerings reportedly provide students, especially incumbent workers, with more flexibility in their education increasing the likelihood of program enrollment and retention.

Challenges

- Colleges reported that there is no single credential that is nationally recognized for Energy programs other than an AAS degree. For colleges that are offering credentials, some are focusing on ways to teach students how to describe the skills associated with the certification to potential employers with the understanding the employers may not recognize the certifications.
- Many students and instructors in the Energy sector are struggling with the general education requirements at the colleges. Students are not interested in math and English, and instructors do not know how to make math and English relevant to the student's program.

Best Practices

- **Embed safety and other certifications in programs.** Many colleges reported the benefit to embedding safety certifications such as OSHA and First Aid training, and additional skills certifications such as CDL and forklift training into Energy programs to make students more marketable. Employers stress the importance of safety in the workplace and the additional certifications shows that students in these programs are prepared for the workforce immediately upon program completion.
- **Create an open environment for employers.** Some colleges described implementing open classrooms for employers that want to observe course content. Employers can feel comfortable with the content the college is teaching and were reportedly more likely to partner with the college. The open environment also provides students with the opportunity to network with local employers.

Information Technology

Overview

Faculty from a number of West Virginia colleges discussed IT curriculum at their institutions as well as challenges and success stories in program development. Colleges are reportedly embedding certifications and internships into programs and integrating hybridized course content to expedite student time to completion. Because the IT sector changes so rapidly due to frequent technological advances, getting students back in the workforce as quickly as possible is a focus with many of the programs. The table below reflects the focus areas and associated certifications discussed at the breakout session.

Cybersecurity	Networking
Security+	Cisco
Microsoft	CompTIA
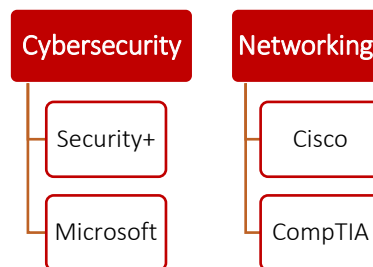
Colleges also discussed the importance of integrating project management skills into curricula as well as technical math and English to increase student marketability.

Successes

+ Many colleges are implementing accelerated program formats to expedite student time to completion. Reportedly, this structure is working well for students and instructors as it gets students into the industry as quickly as possible.

+ Colleges have reported embedding technical math and English into IT courses to address deficits in education. These courses provide students with crosscutting skill sets that make students more marketable in the competitive IT sector.

Challenges

− The IT sector is constantly changing due to technological advances. This makes it difficult for colleges to develop curricula, as they need to always take into account projected growth and industry technological changes.

− Hybridizing IT courses has been a challenge for many faculty, as students prefer more interaction and videos in their course content. Traditional online classes are not ideal for these students so faculty are attempting to find unique ways to hybridize IT courses.

Best Practices

• ***Consider having a testing center at your institution.*** Colleges reported the importance of having a testing center at their institutions, as there are many certifications in the IT sector. A testing center also allows the college to more accurately track students once they complete their certification examination, which has been a challenge for many faculty to date.

• ***Fast track qualified faculty.*** Qualified faculty in the IT sector are difficult to find because colleges have specific education requirements and IT has strict certification requirements. However, some colleges have found that fast-tracking faculty through teaching credentials, especially faculty that possess the required IT certifications, has been beneficial in expediting faculty time to teaching.

PANELS

Non-Credit to Credit Articulation

Overview

Palm Beach State College (PBSC) and BridgeValley Community and Technical College[264] implemented processes for non-credit to credit articulation at their institutions to provide students completing non-credit programs of study the opportunity to obtain college-level credit to promote career pathways and life-long learning. At PBSC, the articulation process began with faculty removing trade courses from the technical programs that did not articulate to credit. The contact hours in the trade courses were aligned to credits based off academic rigor, time in class, and certifications offered at a ratio of 38:1 contact hours for a full-time status classification. Once the process was complete, apprenticeships, curricular practical training (CPT) credits, and certifications were recognized as credits toward a degree program.

BridgeValley followed a similar process to articulate credit at their institution but has a college-wide Chief Academic Officer determine what technical courses articulate to credit. This individual is tasked with examining assessments, syllabi, curricula, and course books to determine whether courses can articulate to credit. Students in technical programs are also required to determine within two weeks of program start whether they are interested in articulating credit to a degree program. Once the student decides to articulate credit to a degree program, returning to a non-credit distinction is not an option.

Successes

+ At PBSC, the Financial Aid department is split between non-credit and credit so staff are aware of the different processes for both sides. Reportedly, this has helped move the process of articulation along faster.
+ Going through the process of articulating non-credit courses to credit provides students with the control to decide whether they want to pursue a college credential or remain on the non-credit, technical side.

Challenges

− To begin articulating programs to credit, the colleges reported cutting technical courses that could not articulate. Many faculty members argued that important content was being cut from the programs when transitioned into credit.
− Many non-credit programs do not require math and English courses, which makes articulation to credit difficult, as there are general education requirements on the academic side.

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[264] The panel discussion on non-credit to credit articulation was led by Rick Reeder from Palm Beach State College in Lake Worth, Florida and Laura McCullough from BridgeValley Community and Technical College in Charleston, West Virginia.

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Best Practices

- **Use similar colleges as resources.** Similar colleges that have successfully developed a process for non-credit to credit articulation can be great resources for starting the process. For instance, West Virginia anticipates using a structure for apprenticeship programs and credit award from Ivy Tech Community Colleges in Indiana to begin a statewide process of apprenticeship articulation.

- **Be aware of statewide policies.** In the state of Florida, every college can individually determine whether they want to award credit for certifications. However, in the state of West Virginia, there are specific policies and procedures for non-credit to credit articulation including credit conversion formulas and information to include in course descriptions. These differences will influence how colleges can implement non-credit to credit articulation at their institutions. To see West Virginia's full articulation policy, see *Appendix A.*

Open Entry, Open Exit Courses

Overview

Polk State College[265] has recently implemented an open entry, open exit model that provides an alternative to traditional classroom learning in that students have greater control over their learning schedules. Students can complete courses in several weeks, a month, or over a semester. In other words, students can enroll into a course, or multiple courses, at any point in the year and complete the course at any point during the specified timeframe. Typically, students complete the self-paced courses at home and/or in a computer lab.

The Engineering Technology program is being used as a pilot for the open entry, open exit course model at Polk State with a three credit hour course broken into three one-hour interactive modules. Each student completes the three modules within the 15-week timeframe and is required to schedule time in a computer lab for the hands-on components of the courses. There are nine labs for the three credit hour course managed by two faculty members. The modules contain quizzes with a final classroom examination at the end of the module in which the student receives a grade.

Successes

+ Students are able to schedule lab time on weeknights and weekends with a lab manager. The open scheduling is reportedly beneficial for non-traditional students as it accommodates their schedules. Lab managers are also available during regular business hours – 8 a.m. to 5 p.m. – to ensure that traditional students are accommodated as well.

+ The strain on the faculty members has reportedly decreased due to the open entry, open exit course models. Faculty act more as facilitators in the courses rather than instructors and the open scheduling provides faculty with more one-on-one opportunities with the students.

Challenges

− Resource concerns from divisions at the institution – Financial Aid and the Registrar's Office in this case – regarding needed changes to infrastructure made it difficult to move forward. Financial aid processes, for instance, must stay segregated due to different federal regulations.

− Migrating traditional classroom activities into the learning management system for transition into online content was a challenge for the college. Assigning a faculty member to this task helped the process move forward more efficiently.

Best Practices

• *Work to increase institution buy-in.* Reportedly, institution buy-in was critical in transitioning to an open entry, open exit course structure. Cooperation and dedication from faculty and the institution as a whole helped move the process forward.

• *Become familiar with the process.* Polk State participated in a number of webinars and educated staff on the process to increase familiarity with the structure. Once the institution was more familiar with open entry, open exit models, they were reportedly more comfortable with the changes.

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[265] The panel discussion on open entry, open exit courses was led by Howard Drake from Polk State College in Lakeland, Florida.

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COLLEGE RESOURCES SHARED

A number of resources emerged from the breakout sessions and panel discussions that the colleges found valuable. Documentation of these resources is listed below.

Technical Programs

Advanced Manufacturing

- **VRTEX:** a virtual reality welding trainer designed to provide a full featured, expandable platform in an easy to use and engaging welding training tool. The tool is ideal for basic to advanced welding training and as a testing, recruitment, and engagement tool for education and industry.[266]
- **Manufacturing Skill Standards Council (MSSC):** industry-led training, assessment, and certification system focused on the core skills and knowledge needed by the nation's front-line production and material handling workers.[267]
- **TimeStation:** time and attendance system that runs on mobile devices. Allows students to punch in and out, and faculty to run time and attendance reports easily.[268]

Energy

- **North American Board of Certified Energy Practitioners (NABCEP):** corporation that supports renewable energy and energy efficiency industries, professionals, and stakeholders to develop and implement quality credentialing and certification programs for practitioners.[269]
- **NAVPERS Training Manuals:** Free Navy training courses developed through the Bureau of Naval Personnel that contains technical and basic information on a number of technical areas.[270]

Information Technology

- **National Initiative for Cybersecurity Education (NICE):** national initiative to address cybersecurity in education and workforce development that builds upon existing successful programs to facilitate change and innovation.[271]
- **TestOut:** online labs for academia and IT professions so students get a broad range of hands-on experience in a safe, simulated environment.[272]

Learning Strategies

Hybridization

- **Quality Matters:** Faculty-centered, peer review process designed to certify the quality of online courses and components.[273]
- **SoftChalk:** Educators can create professional and engaging learning content quickly and easily, which enhances teaching and improves the learning experience for students.[274]

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[266] VRTEX: http://www.lincolnelectric.com/en-us/equipment/training-equipment/vrtex/Pages/vrtex-360.aspx
[267] MSSC: http://www.msscusa.org/
[268] TimeStation: https://www.mytimestation.com/Default.asp
[269] NABCEP: http://www.nabcep.org/
[270] NAVPERS: https://archive.org/details/navpers&tab=collection
[271] NICE: http://csrc.nist.gov/nice/
[272] TestOut: http://www.testout.com/home
[273] Quality Matters: https://www.qualitymatters.org/higher-education-program
[274] SoftChalk: http://softchalk.com/

Developmental Education

- **Open Campus:** free, online non-credit developmental education courses/tutorials from Bossier Parish Community College. Courses are set up in module form to allow anyone to prepare for placement testing, study/practice, or brush-up on professional skills.[275]

CONCLUSION

The Curriculum Review Retreat held at Blue Ridge Community and Technical College in West Virginia included nearly 60 faculty and staff from colleges in West Virginia, Massachusetts, North Carolina, Florida, Louisiana, and North Dakota. Because of the sessions, new opportunities emerged—most prominently a decision by West Virginia to utilize up to two of the Colleges in the TAACCCT consortium to pilot open entry-open exit as a student access and success strategy. New networks and peer-to-peer support were established, and support for successful TAACCCT-funded projects and sustainability was enhanced because of the Retreat.

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[275] Bossier Parish Open Campus: http://www.bpcc.edu/opencampus/whatis.html

APPENDIX A. WEST VIRGINIA POLICY FOR NON-CREDIT TO CREDIT ARTICULATION

TITLE 135
PROCEDURAL RULE
WEST VIRGINIA COUNCIL FOR COMMUNITY AND TECHNICAL COLLEGE EDUCATION

SERIES 3
CONVERSION OF NON-CREDIT TRAINING ACTIVITIES TO COLLEGE-LEVEL CREDIT

§135-3-1. General.

1.1. Scope. Rule establishing guidelines and procedures for community and technical colleges to convert non-credit training activities to college-level credit.

1.2. Authority. W. Va. Code §18B-1-6.

1.3. Filing Date. January 30, 2008.

1.4. Effective Date. February 28, 2008.

§133-3-2. Purpose.

2.1. The purpose of this policy is to provide consistency among community and technical colleges in converting non-credit courses to credit. This policy will provide an opportunity for participants in workforce development and other non-credit courses to convert those courses to college-level credit and meet the goal of providing additional options for individuals to pursue a college credential and engage in life-long learning.

§135-3-3. Options for Awarding Credit.

3.1. If non-credit courses are delivered utilizing the same competencies as an existing college-level course, and the competencies have been met, it may be granted that course number.

3.2. Special topic courses with institutional course numbering may be utilized to identify courses to be converted from non-credit to college-level credit.

3.3. The Certificate in Technical Studies, Board of Governors AAS Degree, AAS in Technical Studies, AAS in Individualized Studies or other existing degree programs may be utilized to grant college-level credit for non-credit activity by applying the procedures and guidelines of those programs.

3.4. Competency levels of appropriate non-credit courses may be compared to required general education course competencies to determine academic credit to be awarded through an assessment appropriate for the discipline as determine by the chief academic officer of the community and technical college or designee.

3.5. The actual awarding of college equivalent credit is made by the chief academic officer of the community and technical college or designee.

§135-3-4. Credit Conversion Formula.

4.1. For lecture courses, conversion of non-credit to college-level credit hours will be no less than 15:1 contact to credit hour.

4.2. For laboratory hours, conversion of non-credit to college-level credit hours will be no less than 30:1 contact to credit hour.

4.3. For on-the-job training activity, conversion of non-credit to college-level credit hours will be no less than 160:1 contact to credit hours.

4.4. For those courses delivered through an accelerated format and mastery of equivalent course competencies are documented, the contact to credit hour requirement may be waived.

§135-3-5. Course Description.

5.1. For each non-credit course being considered for college-level credit, the following information will be compiled:

5.1.1. Course title: Listing of the full title of the course

5.1.2. Credit hours: The number of academic credit hours to be awarded

5.1.3. Contact hours: Actual number of course hours

5.1.4. Topic description: Brief overview of the topic

5.1.5. Competencies: Listing of competencies to be taught

5.1.6. Outline: Listing of the content to be covered in the course

135CSR3

5.1.7. Learning Resources: Listing of textbooks, handouts and other instructional material

5.1.8. Suggested Method of Instruction: Instructor's methodology and mode of instruction

5.1.9. Methods of Evaluation/Grading: Listing of activities, assignments and assessments that will be utilized to determine the grade

5.1.10. An assessment will be used to document prior skill level attainment for the proposed college credit course.

APPENDIX G. ADVANCED MANUFACTURING RECRUITMENT STUDY

EXECUTIVE SUMMARY

Staff at the West Virginia Community and Technical College System (WVCTCS) overseeing the implementation of the Bridging the Gap (BTG) grant sought to better understand the enrollment patterns for advanced manufacturing programs at two colleges within the system, West Virginia Northern Community College and Pierpont Community and Technical College. The goal of the study was to understand students' reasons for attending their program of choice, and what the consortium could do to attract more students to technical programs. To explore these questions, TPMA conducted surveys and focus groups with students in the advanced manufacturing programs at these two colleges, focusing on the Mechatronics program at Northern and the Advanced Process Technology program at Pierpont.

Findings

Focus groups and survey results led to the following insights:

- **Hands-on learning** was a major draw for students in advanced manufacturing programs. This was true whether students were coming from high school and wanted to continue a hands-on course of study, or returning from the workforce and did not want to be in a traditional schooling environment.
- **Job opportunities** in a well-paying field led students to advanced manufacturing. This was especially true of students who had returned to college after spending years in the workforce. The draw of not getting laid off, being able to work closer to home, and working in a field they perceived to be growing rather than contracting were among the factors that led these students to make the investment to return to school.
- **Program distance and cost** of attendance weighed heavily on students' consideration of their program of choice, ranking second and third respectively in survey results for the most important factor related to their decision to attend their program.
- **Friends and family** were the most common source of information for students to learn about their program of study. Survey results indicated that this result was twice as common as the next response – learning of the program from the college's website – and many focus group respondents indicated that the friends, former co-workers, and relatives who had gone through the program played an important role in their decision to attend.
- **Internet research, high school guidance counselors, and CTE teachers** were also important sources of information influencing a student's decision to attend their program of choice.
- **Streamlined enrollment and financial aid processes** were a high priority for students. Students reported a number of difficulties in the enrollment process including issues with transferring credits, using financial aid – specifically WIOA funds – to obtain course materials, registering for courses, and more. Students often cited the issue of receiving conflicting information from different sources and a lack of consistency in information from the admissions office, financial aid, the business office, and instructors. Issues such as these have the possibility to harm both enrollment and retention in programs, as students who are frustrated by the process may not complete the enrollment process.

Recommendations

Based on these findings, the Evaluation Team recommends the following (with a full list of recommendations available in *the Recommendations* section):

- **Create an outcomes based marketing campaign**. Students interested in attending advanced manufacturing programs want to gain hands-on skills in order to be competitive for high demand, well-paying jobs. Campaigns that include messaging reflecting the skills they will gain, credentials they will receive, types of jobs available, companies in the area who are hiring, average salaries, placement rates and work-and-learn opportunities that add to their marketability will attract students. More information can be found in the section on outcomes based marketing campaigns.

- **Increase word of mouth connection opportunities**. Students report friends and family as the most prominent source from which they heard about programs. Thus, schools should explore opportunities to provide students with advertising collateral such as faculty business cards, admissions information, key phone numbers, or other marketing pieces they can easily share with others. Additionally, investing in search engine optimization will improve the chance that a student who hears and then begins to research it will be able to find the program easily.

- **Facilitate the process for students applying directly from high school**. Students coming straight from high school mentioned a single point of contact for learning about, applying to, and enrolling in their program of study. Staff should continue this method so that high school students have a simplified process and that the high school to college pipeline continues to grow.

- **Continuously improve the enrollment process.** Students offered a number of opportunities for increasing the ease of enrollment such as streamlining financial aid, ensuring consistent information regarding transfer credits, and providing a single point of contact for student issues. More broadly, providing cross training and customer service training for all student-facing employees can help ensure that students receive answers to their questions in an easy to use, efficient, and timely manner.

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INTRODUCTION

The West Virginia Community and Technical College System (WVCTCS) is currently administering a $25 million grant through the United States Department of Labor (USDOL) Trade Adjustment Assistance Community College and Career Training (TAACCCT) program focused on implementing the Bridging the Gap (BTG) project. The BTG project unites nine community colleges[276] in the WVCTCS to focus on creating career pathways in four in-demand industries: manufacturing, energy, information technology, and building construction. Per grant requirements, Bridgemont Community and Technical College (now BridgeValley Community and Technical College) procured an independent contractor, Thomas P. Miller & Associates, LLC (TPMA), to conduct an objective evaluation of the Bridging the Gap program.

During grant implementation, the BTG project manager sought to better understand the effectiveness of recruitment efforts for BTG programs, specifically for advanced manufacturing at two BTG institutions – Pierpont Community and Technical College and West Virginia Northern Community College. Specifically, the project manager as well as other grant staff sought to understand two questions: 1) what attracted students to advanced manufacturing at Northern and Pierpont and 2) how could other prospective students be drawn into these programs of study. TPMA saw these questions as relevant to the evaluation, particularly, "How can program processes, tools, and/or systems be modified to improve performance?" TPMA partnered with the project manager and other grant staff to address these questions.

Methodology

TPMA staff utilized surveys and focus groups as the main tools to answer their research questions.

Focus Groups

TPMA held focus groups across two days in January—one group on each campus. Students and faculty members attended focus groups, with students providing the primary feedback. Faculty were available to occasionally clarify or provide additional context for student's responses. Each focus group lasted approximately 50 minutes and centered on questions shared with faculty and staff prior to the focus groups. Fifteen students in total participated in the focus groups. Of these fifteen students, five came to the program directly from high school while ten were returning to college after being in the workforce or attending another college.

Survey

A survey, developed with the assistance of WVCTCS staff, was conducted to assess how students first learned of program opportunities and what influenced their decision to enroll. Surveys were sent to BTG staff at Northern and Pierpont and hard copies were distributed to instructors for students to take in class. A total of 36 students responded to the survey.

Survey results were analyzed and descriptive statistics were generated for multiple-choice questions. For open-ended questions, responses were grouped based on similarities and descriptive statistics were generated for these groups. A general analysis of the survey data can be found in *Appendix A*. Focus group responses were analyzed for consistency and grouped using a thematic analysis framework.

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[276] The nine colleges in the WVCTCS include Blue Ridge CTC, BridgeValley CTC, Eastern WV CTC, Mountwest CTC, New River CTC, WV Northern CC, Pierpont CTC, Southern WV CTC, and West Virginia University at Parkersburg.

Survey Demographics

A majority of survey respondents (67 percent) were between the ages of 18 and 24. Approximately 11 percent of respondents were between the ages of 25 and 34, eight percent were between 35 and 49, and three percent were over the age of 50. The majority of respondents, 59 percent, indicated that a high school degree or equivalent was the highest level of education received, with 35 percent indicating some college, and six percent indicating an associates or bachelor's degree. Regarding funding their education, 77 percent of respondents reported receiving some sort of financial aid.

FINDINGS

How Did Students Learn About Their Program of Study?

Focus Group Results

The majority of students reported learning of the program from a friend or family member. Many students mentioned talking with a friend, family, or former co-worker about the jobs available for individuals with training. Many students saw this validated as they were laid off from lower-skilled positions that were not returning to the region.

Students who came directly from high school reported hearing about the program through high school counselors and individuals tasked with coordinating CTE education at their school. Students reported that these representatives assisted with many aspects of their enrollment, from making them aware of available programs to helping them apply for admission and mitigating issues with financial aid. Participants reported that these individuals were particularly helpful in breaking down the process into manageable pieces.

Other means for hearing about the program included:

1. Seeing the building signage for the college while driving on the highway,
2. Receiving information regarding a number of programs from a local Workforce WV office,
3. Seeing program advertisements at another campus,
4. Doing their own research online, and
5. Seeing television advertisements.

Survey Results

Survey respondents reinforced the claims of focus group participants, with a majority of respondents, 57 percent, learned about their program from a friend or family member. Hearing about the program through a friend or family member was over twice as common as the next highest response, which was learning about the program through the college's website (27 percent). High school counselors (20 percent), college or job fair (20 percent), and TV advertisement (20 percent) were among the other student responses.

When asked to identify which of these factors most influenced their decision to attend the program, 39 percent indicated that the recommendations of friends or family members was the most important factor. Additionally, 12 percent of individuals indicated that personal research or information on the college's website was most influential, and nine percent indicated the influence of a high school teacher or counselor as most relevant.

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Why Did Students Choose Their Program of Study?

Hands-on Approach

Students overwhelmingly reported that the hands-on nature of the program and perceived job opportunities after graduation were their main reasons for enrolling in the program. Students were attracted to the hands-on nature of the program, as it was the type of work they had always done or the only type of program that interested them. One participant noted, "The thought of going back to a classroom and sitting in class sounded terrible. The hands-on part sounded interesting." Many in the room shared this sentiment, especially by those returning to college after years of working in industry.

Participants coming directly from high school reported having a positive experience participating in a career and technical education program in their high school. These participants reported building an interest in the field during high school because they enjoyed the hands-on nature of their technical education programs. These students reported wanting to continue the work they were doing in high school and ultimately get a job in a field they enjoyed. Some students coming straight from high school also had scholarship opportunities that paid for a significant portion of their tuition.

Job Opportunities

Individuals who had previous experience in the field saw the program as a chance to retrain in a high-demand occupation. One individual mentioned "…getting tired of being laid off" while another commented on the lack of jobs in the area, saying, "I had to keep driving further and further for the jobs…" Another participant with a similar experience had been laid off from a coalmine. This participant mentioned wanting to gain a transferable set of skills that would allow him to get a job in as many industries as possible. Some individuals who had been laid off from previous positions had been working in mining, power plant technology, and oil and gas industries.

Other focus group participants had been participating in programs at other colleges before transferring to participate in their current program. These students cited better job opportunities and higher potential wages upon graduation influencing their decision to transfer. Participants coming directly from high school saw a strong possibility of getting jobs in their field of choice as well.

When asked to identify on a scale of one to five the factors that influenced their enrollment in the program, survey respondents indicated job opportunities as the most important factor, scoring 4.7 out of five.

Cost, Location, and Other Factors

Location and price were important to students in their decision to attend their program of choice. Almost all of the student focus group participants mentioned the importance of the program being accessible and commutable. This too was reinforced in the survey, in which students identified cost and location as the second and third most important factors in their decision to enroll in the program, scoring 4.6 out of five and 4.1 out of five respectively. The importance of location was also affirmed when looking at student travel times as reported in the survey, with a majority of respondents (61 percent) traveling less than 20 minutes to get to the college and only eight percent traveling more than 40 minutes to the college.

Other factors student mentioned in focus groups and surveys as influencing their decision to attend included appeal of small class sizes, appreciating the one-on-one attention it allowed with instructors, and the community of working together with others who cared about the field.

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Post-Program Plans

A majority of the participants – and all of the individuals returning from prior work experience – plan to seek job opportunities following the completion of the program. One student expressed interest in pursuing a bachelor's degree following program completion.

Where Else Did Students Consider Attending?

Of the 36 students who responded to the survey, 22 students (61 percent) considered attending another college besides their college of choice. West Virginia University was the most popular school that students considered (seven respondents), with Belmont College (three respondents), Davis and Elkins (two respondents), and West Liberty University (two respondents) all registering as popular alternatives for students.

When looking at the particular field of study chosen by students, 11 of the 36 respondents indicated that they considered another field of study besides the one they ultimately chose. The majority of these students considered other hands on programs similar to mechatronics including power plant technology, instrumentation and controls, petroleum technology, and welding. Areas of study outside of these included x-ray, nursing, surgical tech, and culinary arts. Students reported choosing their area of study based on what they perceived to be better career prospects, quality of instructors, or for personal reasons such as grades or injury that kept them from another field. Three students also mentioned that they were participating in both mechatronics and another field of study in which they had interest.

What Was the Enrollment Process Like for Students?

Many students returning from the workforce mentioned difficulties with the process of receiving their financial aid and properly enrolling in courses. Many times, students facing difficulties getting their financial aid will drop out of their program rather than persist. Some students who face these issues will halt the process even prior to enrolling. Thus, working out these issues should be a top priority for staff.

Students reported a non-streamlined process in their experience with financial aid. Students receiving financial aid through the workforce system found the process particularly challenging as they could not purchase needed supplies such as textbooks and were concerned about the effect of having outstanding charges on their credit due to the timing of the financial award.

Many participants reported frustration at receiving different answers from different individuals in the financial aid process. These participants discussed the feeling of confusion and frustration as they were constantly referred to additional staff members. Many of these students ultimately had their questions answered, but others were still waiting to find out important information that could affect their ability to continue in the program or graduate on time. Students reported inconsistencies in answers to questions regarding the financial repercussions for dropping a class by a certain point in the semester, the ability to transfer credits from their previous college, the time and sequence in which they could take courses, and how to obtain and use their financial aid package. Participants reported receiving different answers from the financial aid office, the business office, admissions staff, and professors.

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RECOMMENDATIONS

Upon analysis of survey and focus group feedback, TPMA sees a few areas that could be modified to provide additional support to students and increase recruitment and enrollment.

Implement an Outcomes-Based Marketing Campaign

Potential students are very interested in employment opportunities available after graduation, so marketing and admission staff should focus on the outcomes of the program. Advertising the job opportunities, starting salary, internships, and hands-on skills that students can gain through advanced manufacturing programs are a way to capture potential students' attention. Staff can grow this campaign by promoting the companies that have hired students in brochures and on signage displayed in the buildings. Some focus group participants mentioned that while they were confident in the job opportunities afforded through the program, they were unsure as to the specific companies that were hiring in their field. Additionally, **expanding business partnerships to increase the number of internships and job opportunities** available to students would allow for this growth. Colleges should also **explore opportunities for apprenticeships** as workforce legislation is placing an increased emphasis on these types of programs.

Continue to Build the High School to College Pipeline

The majority of traditionally aged students indicated that a CTE coordinator, school counselor, or an instructor played a significant role in their discovering and enrolling in the program. In some cases, multiple students mentioned the same individual as playing an important role in their program choice. One strategy that was particularly popular among focus group participants was to **ensure a single point of contact** – either at the high school or from the college – to explain and simplify the admissions process. This staff member could explain how to search for schools, apply, complete FAFSA, weigh offers, and accept a program, all while answering their questions and offering support along the way. Dedicating a staff member to this or ensuring that partner high schools or CTE programs have such a person can help boost enrollment in technical areas.

Increase Ease of Enrollment

Enrollment processes always have room for improvement, and suggestions from students regarding financial aid, transfer credits, and registration all revolve around **streamlining** information and the number of people with whom students interact. By **cross-training** staff regarding financial aid, registration, and other common issues students face, staff can improve the student experience by getting them the right information sooner or directing them to the person who can more efficiently. Broadly, colleges can **explore customer service training for staff**, for student-facing staff in an effort to improve how they interact with students.

More specifically, a number of students mentioned financial aid as an area of difficulty. Students expressed frustration with the number of people they were transferred to and the inconsistency in the answers provided in the financial aid process. **Providing a single point of contact for financial aid issues** is one way to address this problem, although this solution may be impractical at larger institutions. Regular meetings between staff to discuss issues and discover common financial aid problems may help as well, especially in light of recent changes to financial aid under the Workforce Innovation and Opportunity Act (WIOA). **Creating a FAQ sheet** for all staff in student-facing positions could be helpful as well. Improving knowledge around transferring credits is another area of growth and cross training for staff. Students transferring from other institutions or returning after completing another degree expressed frustration with their

inability to receive certain credits from their prior institution. Staff can work to **ensure consistent messaging is conveyed regarding transferable credits** throughout the enrollment process to ensure students are hearing the same things from admissions staff, the registrar, the business office, and faculty.

Enable Students to Research and Market Programs

Student word-of-mouth is a key source of promotion for the programs. One way to facilitate word-of-mouth marketing is to **provide students with advertising collateral** such as faculty business cards, admissions business cards, or other materials for students to hand out to friends or family. As most students report hearing about their program of choice from friends or family, ensuring that these individuals have a contact who can provide information on the program and get them connected could help improve enrollment. Staff can also explore **search engine optimization** to ensure that students who hear about the program and search for it are more likely to encounter the program. With 26 percent of survey respondents doing internet research on their program, staff should consider ways to improve their online presence through search engine optimization. Finally, staff should look into **enhancing systems for student follow-up after graduation**. Improving current systems for following up with graduated students helps two-fold by allowing staff and faculty to know the types of opportunities students receive upon graduating and provide networking opportunities for current students such as tours, internships, and/or job opportunities.
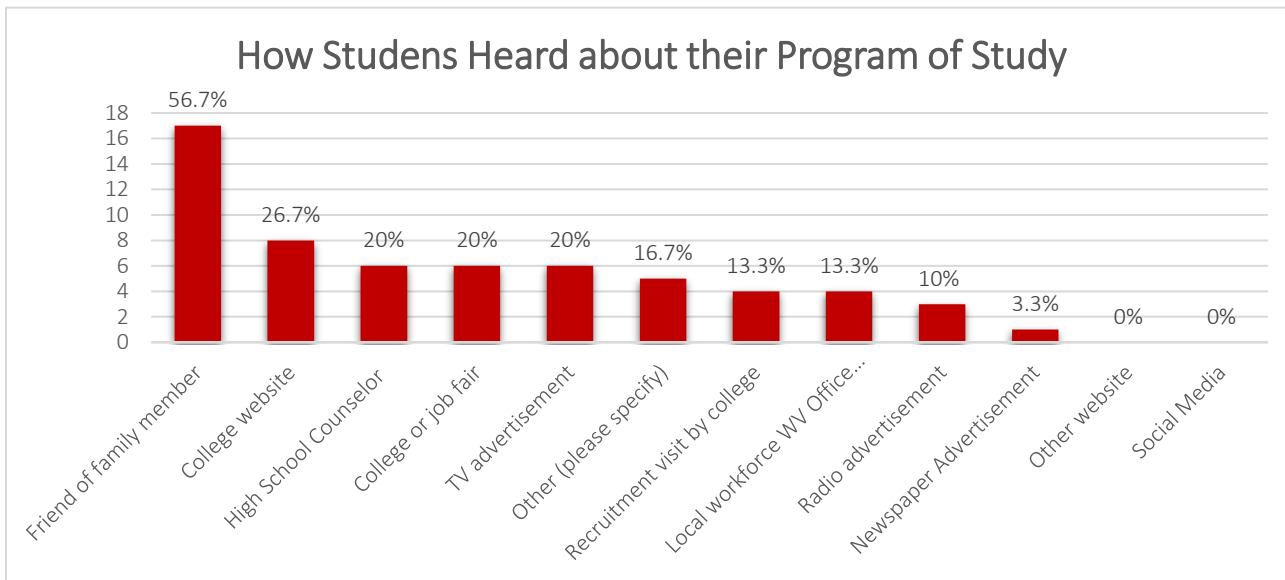
Additional Student Recommendations

A number of focus group and survey participants offered additional recommendations including that staff should continue to work to best **meet the academic needs of part-time students and advertise to them.** Focus groups participants who were attending the program part-time discussed the difficulty of attending their program and working at the same time. Exploring block scheduling options conducive to these students' needs and then creating messaging campaigns to highlight these opportunities could increase enrollment. Collaborating with area employers to develop programs their employees can attend part-time to increase their skills to gain promotion at that company could also be sources of growth. Other general recommendations included:

1. **Increasing advertising and outreach in the counties nearest to the college** as too many people in the area still have not heard about the program,
2. **Recruit in prisons or help educate parole staff who work with ex-offenders**,
3. **Consider renaming mechatronics** so that more people understand it,
4. **Offer national certifications and accreditations** as employers identify these certifications and accreditations as needs at their businesses, and
5. **Add more billboards** to local highways to increase exposure of programs to different audiences.

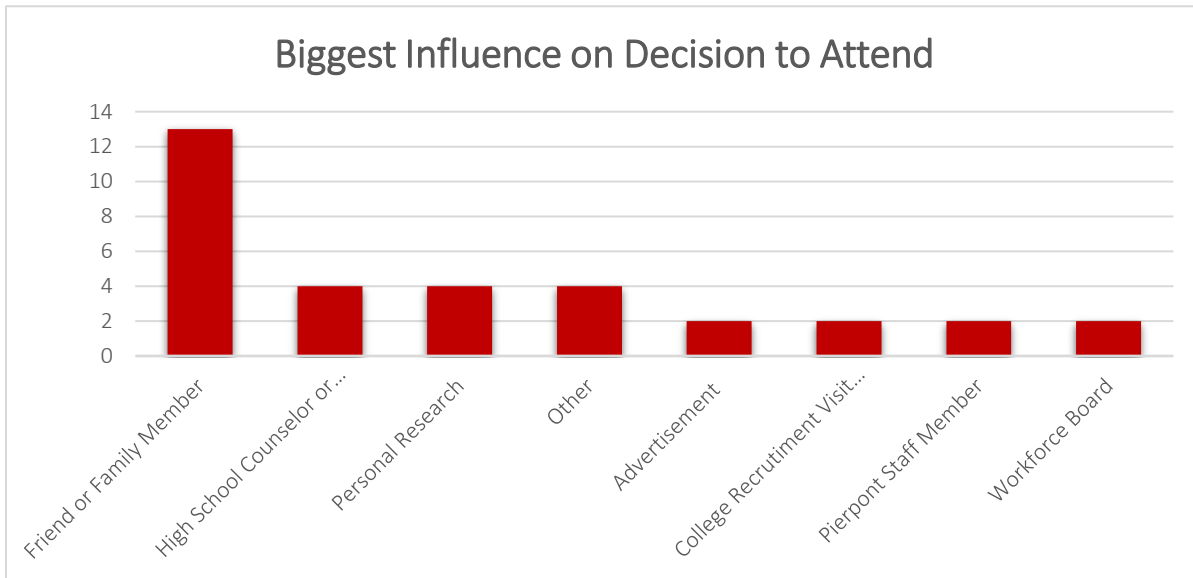THOMAS P. MILLER & ASSOCIATES WITH THE POLICY & RESEARCH GROUP

APPENDIX A – SURVEY RESULTS

Question 1: How did you hear about the program you are enrolled in?

Answer Options	Response Percent	Response Count
Friend of family member	56.7%	17
College website	26.7%	8
Other website	0.0%	0
High School Counselor	20.0%	6
Newspaper Advertisement	3.3%	1
Social Media	0.0%	0
College or job fair	20.0%	6
Radio advertisement	10.0%	3
TV advertisement	20.0%	6
Recruitment visit by college	13.3%	4
Local workforce WV Office location	13.3%	4
Other (please specify)		5
Answered question		30
Skipped question		6

How Studens Heard about their Program of Study

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Question 2: Among the options provided above, which was most influential upon your decision to attend your college?

Responses	Response Percent	Response Count
Friend or Family Member	39.4%	13
High School Counselor or Teacher	12.1%	4
Personal Research	12.1%	4
Other	12.1%	4
Advertisement	6.1%	2
College Recruitment Visit or College Fair	6.1%	2
Pierpont Staff Member	6.1%	2
Workforce Board	6.1%	2
Answered Question		33
Skipped Question		3

Biggest Influence on Decision to Attend

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Question 3: On a scale of 1 (not important) to 5 (very important), how important were the following in your decision to attend your college?

Answer Options	Rating Average	Response Count
Location	4.56	36
Cost	4.08	36
Length of Program	3.97	36
Reputation of Program	4.03	36
Reputation of College	3.72	36
Job opportunities after graduation	4.67	36
Recommendations from friends or family	3.42	36
Program advertisements	2.31	36
Direct contact from college	2.92	36
	Answered question	**36**
	Skipped question	**0**

Rating Average

Category	Value
Job opportunities after...	4.7
Location	4.6
Cost	4.1
Reputation of Program	4.0
Length of Program	4.0
Reputation of College	3.7
Recommendations from...	3.4
Direct contact from college	2.9
Program advertisements	2.3
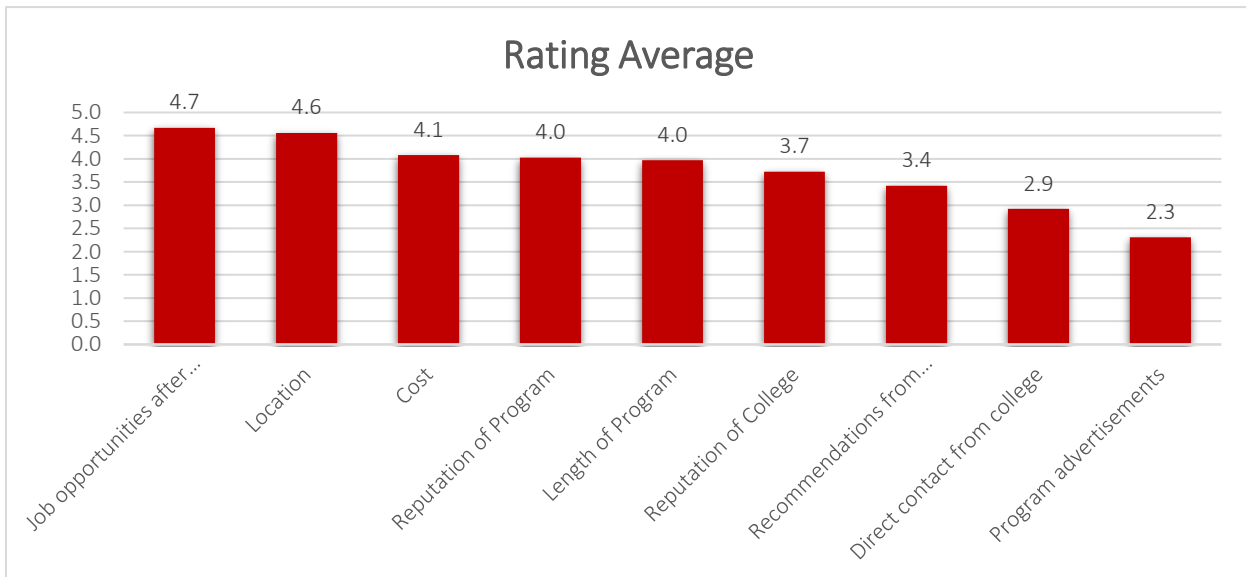
Question 4: Did you consider attending any other colleges besides your college?

Answer Options	Response Percent	Response Count
Yes	61.1%	22
No	38.9%	14
Answered question		36
Skipped question		0

Did you consider attending any other colleges besides your college?

38.9%

61.1%

Yes No
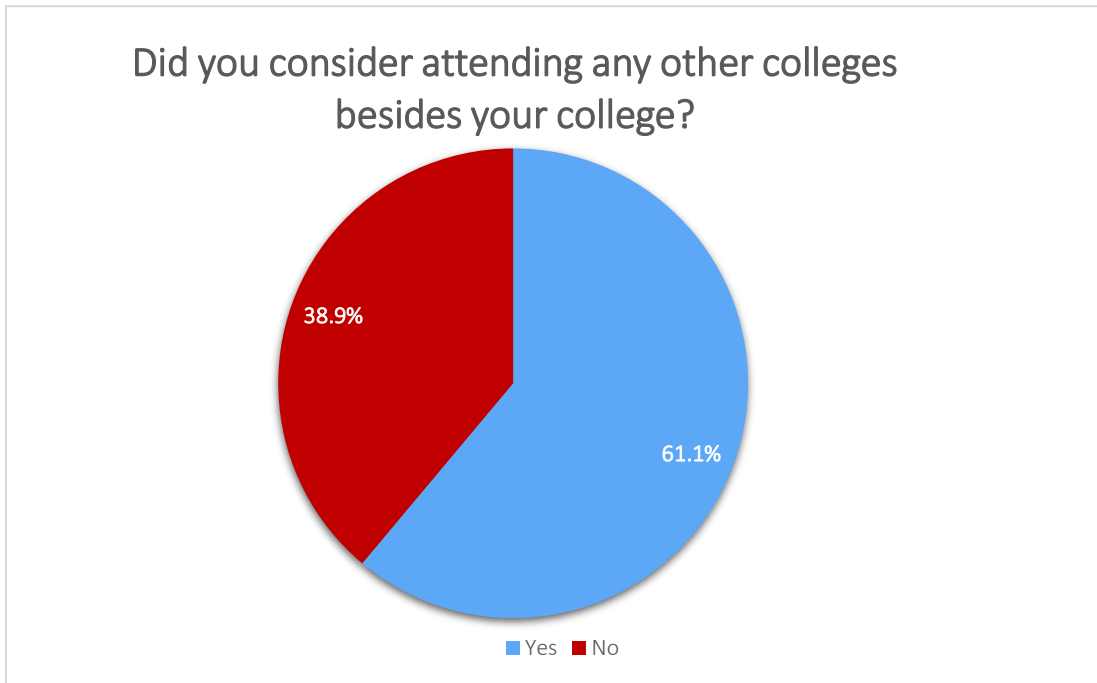
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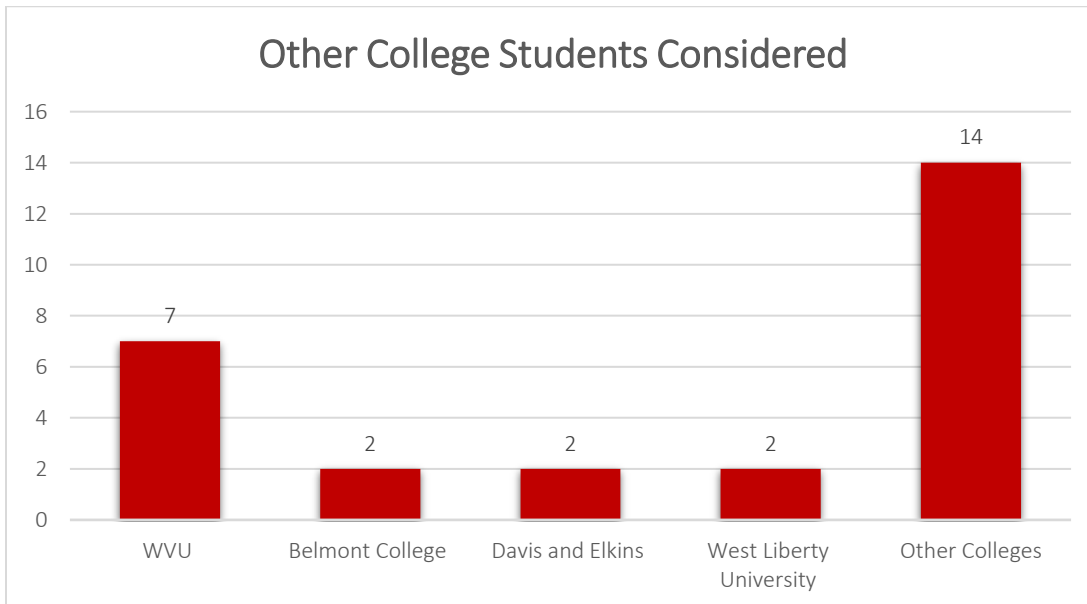
Question 5: If yes, what other colleges did you consider?

Note on responses: some students considered more than one college.

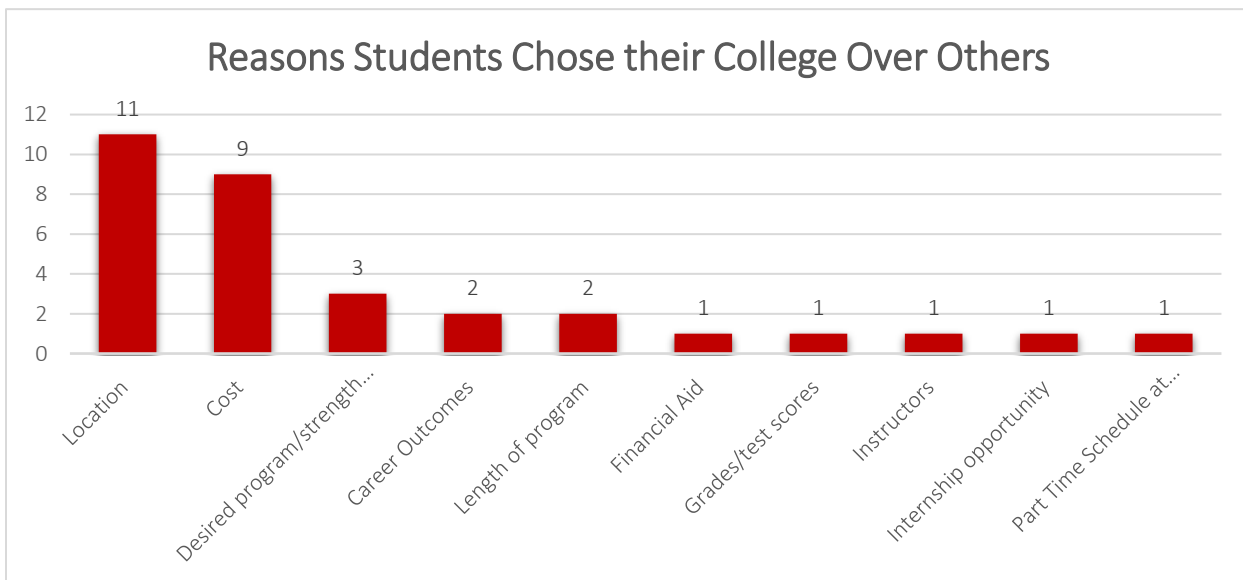| College Name	Response Percent	Response Count
WVU	25.9%	7
Belmont College	7.4%	2
Davis and Elkins	7.4%	2
West Liberty University	7.4%	2
Belmont Tech	3.7%	1
Concord University	3.7%	1
Eastern Gateway	3.7%	1
Eastern Tech	3.7%	1
Fairmont State	3.7%	1
Kent State	3.7%	1
Marshall	3.7%	1
Pierpont	3.7%	1
PTI	3.7%	1
Rosedale	3.7%	1
UTI	3.7%	1
Wesleyan	3.7%	1
WVU Parkersburg	3.7%	1
WVU Tech	3.7%	1
Answered Question		21
Skipped Question		15

Other College Students Considered

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Question 6: Why did you choose your college over these other colleges?
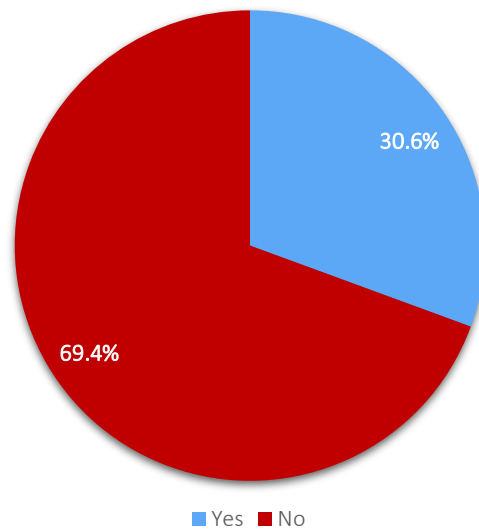*Response note – some students provided more than one response*

Responses	Response Percent	Response Count
Location	34.4%	11
Cost	26.5%	9
Desired program/strength of program	8.8%	3
Career Outcomes	5.9%	2
Length of program	5.9%	2
Financial Aid	2.9%	1
Grades/test scores	2.9%	1
Instructors	2.9%	1
Internship opportunity	2.9%	1
Part Time Schedule at same time	2.9%	1
Answered Question		21
Skipped Question		15

Reasons Students Chose their College Over Others

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Question 7: Did you consider any other programs at your colleges besides your program?

Answer Options	Response Percent	Response Count
Yes	30.6%	11
No	69.4%	25
Answered question		36
Skipped question		0

Did you consider any other programs at your college besides your program?

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Question 8: If yes, what other programs did you consider?
Note – Some students considered more than one program

Responses	Response Percent	Count
Power Plant/Energy	23.5%	4
Medical	23.5%	4
Instrumentation and Control	17.6%	3
Petroleum	11.7%	2
Welding	5.8%	1
Other	5.8%	1
Lineman	5.8%	1
Advanced Manufacturing	5.8%	1
Answered Question		11
Skipped Question		25

Other Programs Students Considered
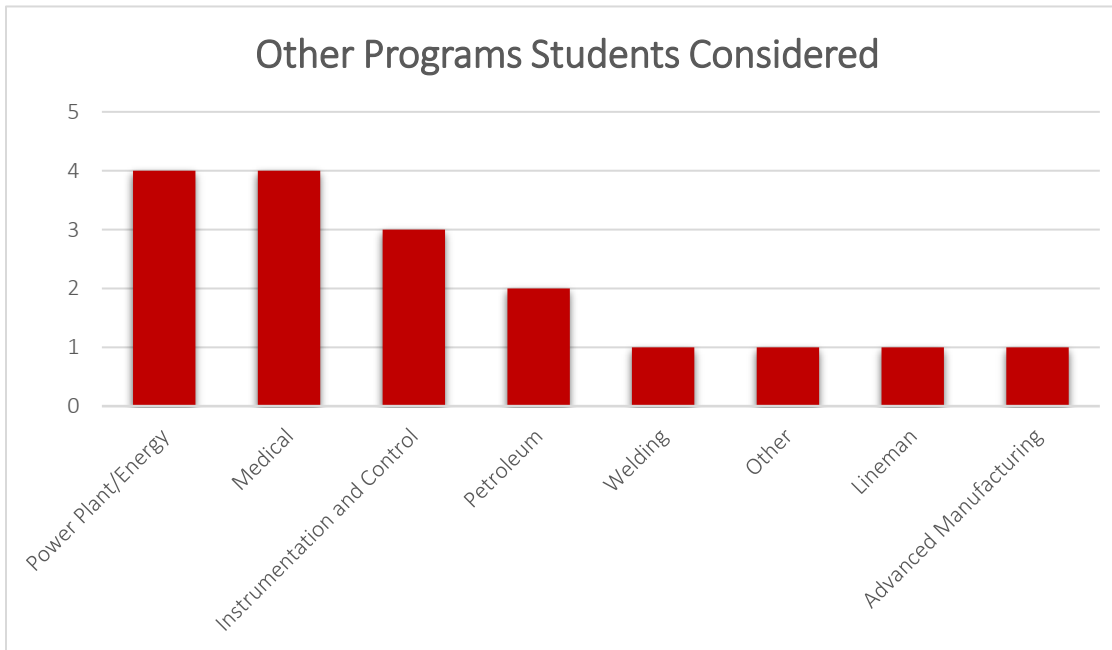
Question 9: Why did you choose your program over others at the college?

Answer Options	Response Percent	Count
Participating in other program as well	30%	3
Other	30%	3
Job/wages outlook	20%	2
Instructors	20%	2
Answered Question		**10**
Skipped Question		**26**

Reason for Program Choice
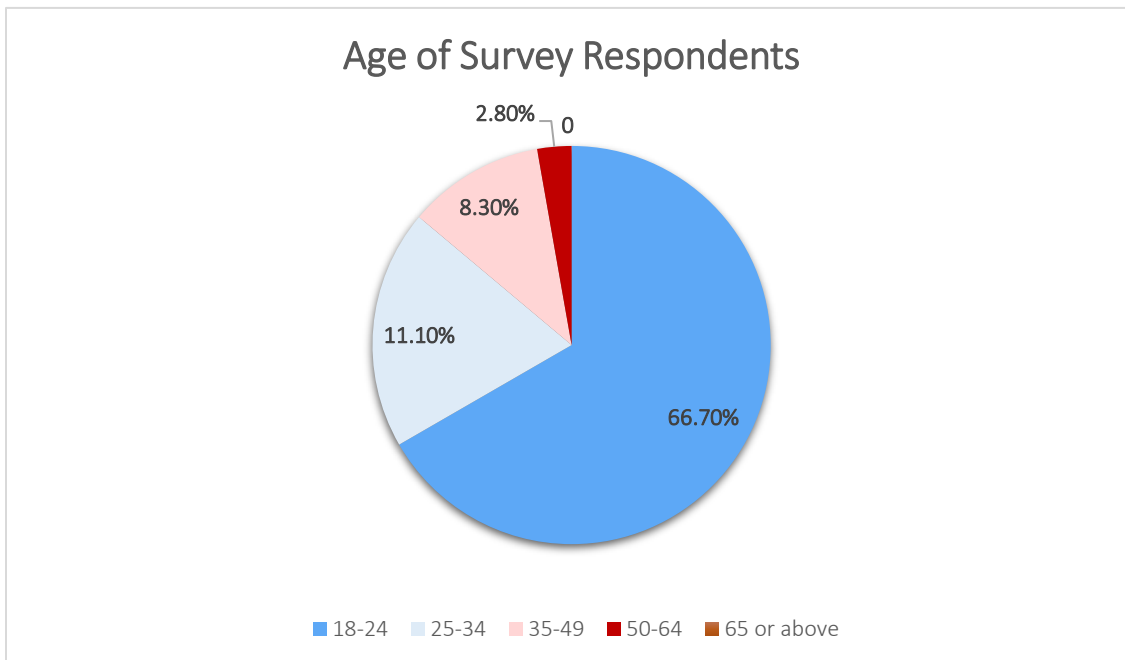
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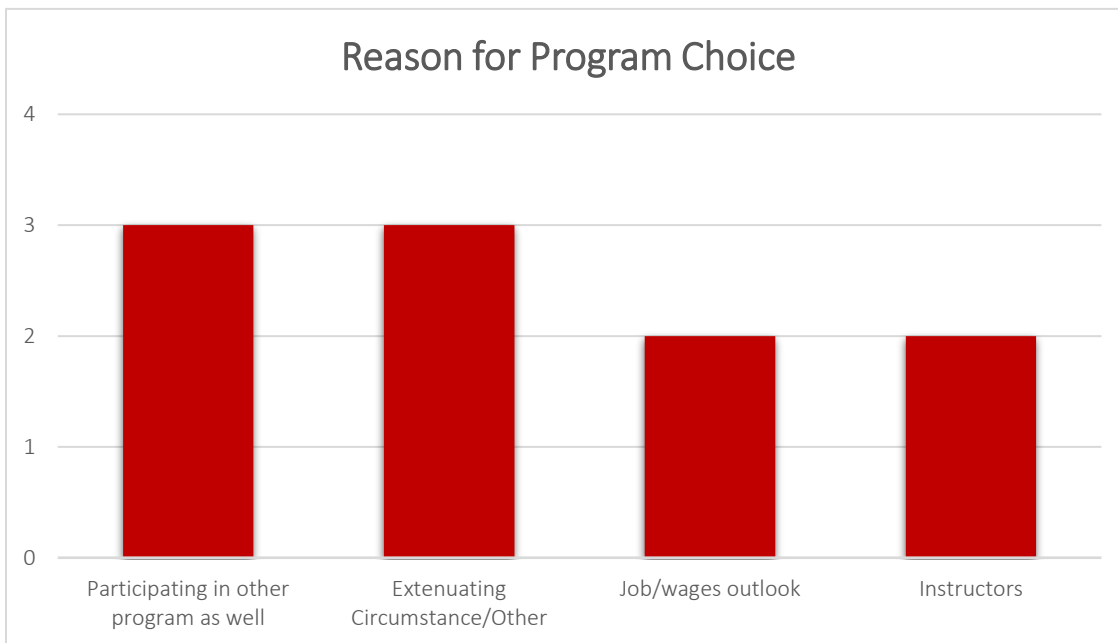
Question 10: How long does it typically take for you to travel to your college?

Answer Options	Response Percent	Response Count
0-20 minutes	61.1%	22
21-40 minutes	30.6%	11
41-60 minutes	2.8%	1
More than 60 minutes	5.6%	2
Answered question		36
Skipped question		0
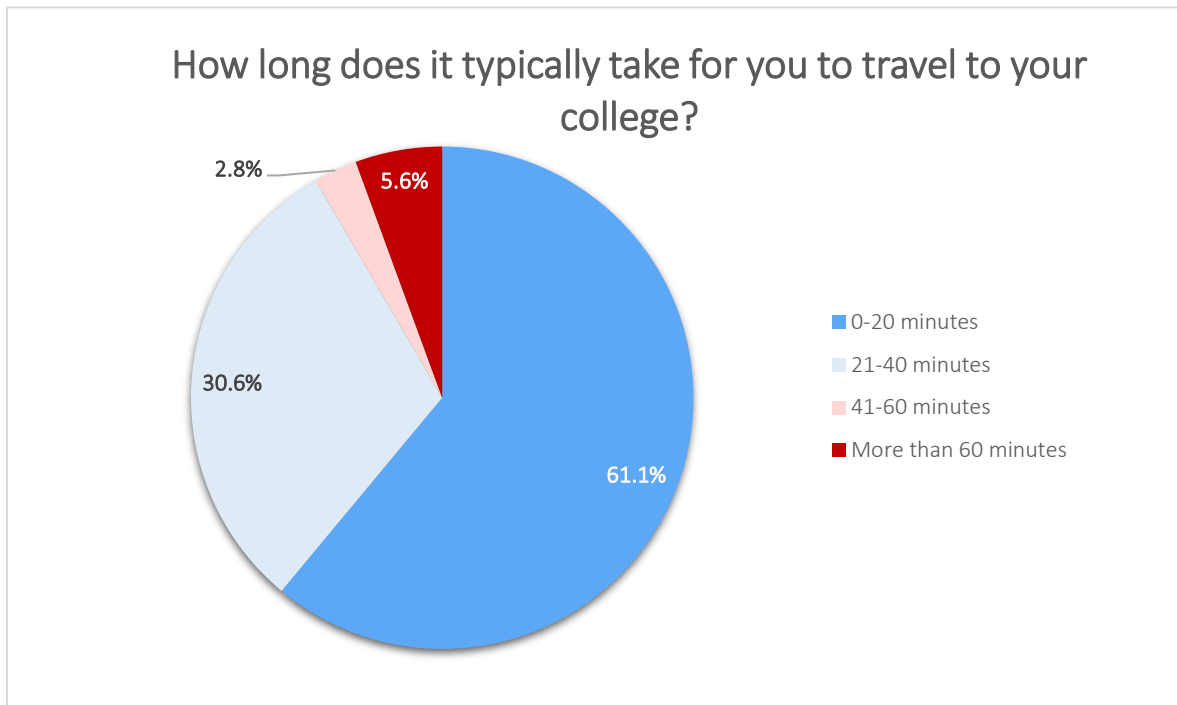
Question 11: What is your age?

Answer Options	Response Percent	Response Count
18-24	66.7%	24
25-34	11.1%	7
35-49	8.3%	4
50-64	2.8%	1
65 or above	0.0%	0
Answered question		36
Skipped question		0

Age of Survey Respondents

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Question 12: Did you receive any financial aid for your program?

Answer Options	Response Percent	Response Count
Yes	77.1%	27
No	22.9%	8
Answered question		35
Skipped question		1

Did you receive any financial aid for your program?

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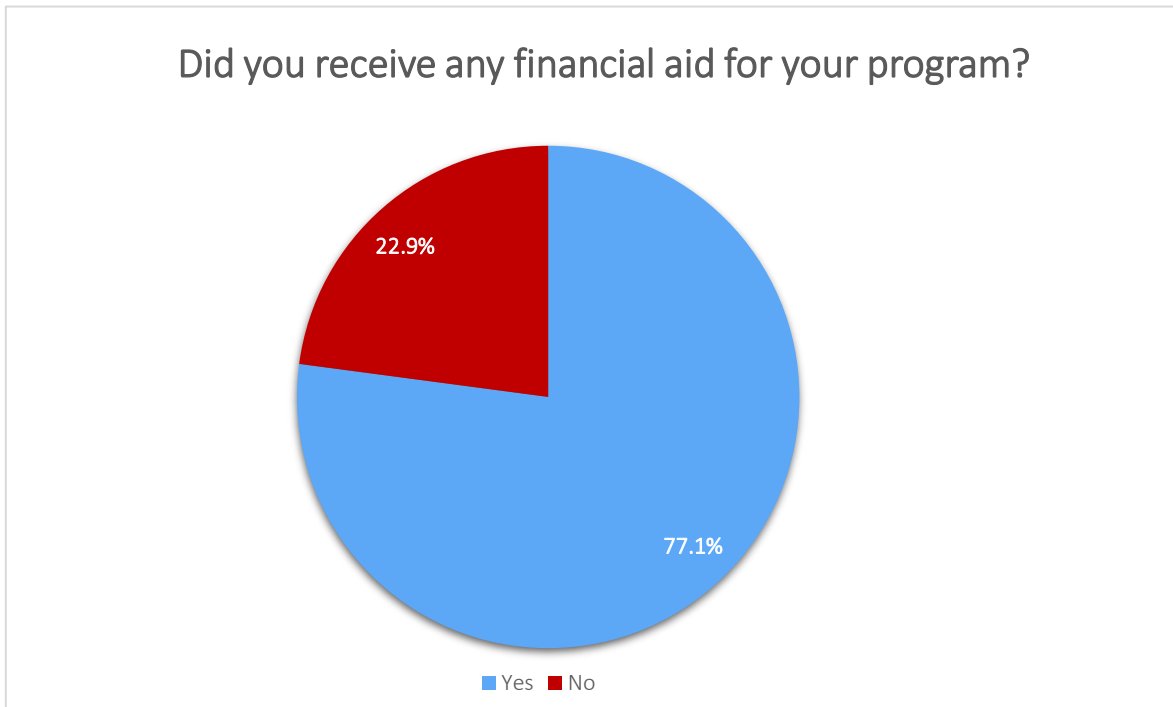
Question 13: What is the highest level of education you have received?

Answer Options	Response Percent	Response Count
Some high school	0.0%	0
High school graduation or G.E.D.	58.8%	20
Some college	35.3%	12
Associates college	2.9%	1
Bachelor's degree	2.9%	1
Master's or above	0.0%	0
Answered question		34
Skipped question		2

What is the highest level of education you have received?

- Some high school
- High school graduation or G.E.D.
- Some college
- Associates college
- Bachelor's degree
- Master's or above