Year 4 Final Report for the Evaluation of the
Guided Pathways to Success in STEM Occupations (GPSTEM)
of the Massachusetts Community College Consortium

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North Shore Community College
Northern Essex Community College
Quinsigamond Community College
Roxbury Community College
Springfield Technical Community College
Executive Summary

Overview of GPSTEM

A consortium of the 15 community colleges in Massachusetts, led by Massasoit Community College, implemented a U.S. Department of Labor (DOL) Trade Adjustment Assistance Community College and Career Training Grant (TAACCCT) Round 4 project entitled Guided Pathways to Success in STEM (GPSTEM). The community colleges advanced a comprehensive approach to addressing the training and educational needs of workers and employers statewide with a focus on articulated pathways to careers in high-growth STEM sectors: Science, Technology, Engineering, and Math; as well as advanced manufacturing and healthcare. During the grant period, 96 STEM degree options and certificate programs were created or significantly enhanced in partnership with local employers and industry groups.

The focus was primarily on helping unemployed and under-employed workers to enter STEM programs and obtain high-skill, high-wage jobs. The funding assisted the community colleges in enhancing STEM programs of study and infusing comprehensive student supports throughout the 15 campuses to benefit all student populations. This was done using Complete College America’s (CCA) Guided Pathways to Success approach, along with developing career pathways and incorporating online and technology-enabled learning. The GPSTEM initiative also focused on creating pipelines for students to seamlessly transfer to baccalaureate programs to meet demand in STEM industries. This initiative undertook successful approaches to scale and led to changes within institutions and across the state community college system.

Performance Outcomes

The GPSTEM consortium exceeded most of the performance outcomes in the initiative’s statement of work. For employment measures, the consortium was able to have access to matching student completers against quarterly wage records through an agreement between the Executive Office of Education and the Department of Unemployment Assistance.

- Through the end of Year 4, there were more than 15,200 students who participated in GPSTEM programs, which is three times the end of project goal (5,096).
- There were 2,973 students completing one or more programs, which is 109% of goal.
- The number of students earning credit hours during the grant and the number of credentials earned both exceeded goals.
- The number of students employed in the first quarter after completing a program and exiting the college is 1,811, which is 117% of the goal. The employment rate is 79% of the program completers exiting the college.
- The number of students retaining employment in the second and third post-program quarters is 1,405, which is 98% of goal. The retention rate is 90% of the cohort of completers who found employment in the first post-program quarter through December of 2017 as the last wage record quarter available was the second quarter of calendar year 2018.
- The number of incumbent workers with wage increase during the program was 907, which is 107% of goal. Over two-thirds (71%) of incumbent workers have achieved a wage increase and the increase is 30% higher than their quarterly wages at enrollment.
Implementation Analysis

Complete College America’s Guided Pathways to Success (GPS)

The CCA GPS strategies focus on reducing the time to completion of certificates and degree programs, resulting in more students entering employment and/or transferring into baccalaureate programs to add to their credentials. Through guided academic and career pathways with proactive on-time advising, the goal is for students to make more informed decisions on program selection and provide clear pathway choices that are consistent with the student’s educational goals. The guided pathways approach seeks to encourage more students to enroll with full-time course loads in order to complete an Associate’s Degree in two years. The following are highlights from some of the key CCA strategies implemented during the grant.

- By the end of the grant, for the 156 GPSTEM degree and credit certificate programs, two-thirds (103) of the programs had academic maps/pathways developed with GPSTEM support. Almost 90% of the degree and certificate programs had academic maps by the end of the grant as there were an additional 35 programs with academic maps developed with non-GPSTEM resources.
- Seven colleges developed new block schedules for 22 GPSTEM programs by the end of the grant, and the colleges were enthusiastic about their programs with block schedules and were planning to expand to more programs.
- By the end of the grant performance period, five colleges had developed meta-majors or areas of focus covering all programs of study including GPSTEM. Four other colleges had developed as a pilot meta-majors for divisions or focus areas that included GPSTEM programs of study. A total of 20 meta-majors were developed at nine colleges.
- All colleges have implemented or enhanced proactive (intrusive) advising strategies

Articulation Agreements

The GPSTEM proposal included the goal of increasing the transferability of STEM degrees from community colleges to public and private four-year institutions. By the end of the grant, individual colleges used grant funds to develop or revise over 150 articulation agreements.

Accelerated Developmental Education

The GPSTEM proposal and work plan emphasized strategies to assist students to progress more quickly through developmental education, especially math, through technology mediated instructions, self-paced courses, and co-requisite academic support. Over the course of the grant, all colleges worked to accelerate developmental math. The top 3 initiatives undertaken include aligning math with the major (12 colleges), developing accelerated/modular math content (11 colleges), and implementing co-requisite models (9 colleges). The majority of colleges have at least experimented with GPA as the placement assessment for college-level math courses with general agreement that it reduces the number of students directed to developmental courses and some continued evidence that students succeed in gateway courses.

Online and Technology-Enabled Learning

The GPSTEM proposal aimed to increase the capacity to deliver instruction through online courses and programs and to augment program delivery with simulation technologies. As the grant period ended, 56
courses in a total of 44 programs had been developed with GPSTEM funds that incorporated simulations within the curricula.

**Engagement with Employers**

Colleges across the consortium participated in employer roundtables through Academic Program Teams (APTs) in addition to further engaging their own advisory boards to validate the development of industry-relevant curriculum and to develop increased internship opportunities for students. Various STEM programs took advantage of GPSTEM funds to engage employers in the design of new programs and revamping of existing programs.

**Relationships with the Workforce System and Navigators**

The focal point of the community colleges’ partnership with the Career Centers and Workforce Boards is the grant-supported College and Career Navigator, a role created during the TAACCCT Round 1 grant. The GPSTEM Work Plan provided funding to maintain the Navigator role, including spending time on location at Career Centers. The Navigators were also asked to expand connections with workforce boards and community-based organizations to ensure collaborative activities to address participant and employer training needs. During site visits, 13 of the 15 colleges described their relationship with the Career Centers as collaborative and productive and more than half either chose to sustain their navigator positions beyond the life of the grant or incorporated these roles into other already existing positions.

**Academic Program Teams (APTs)**

Overall, the APTs proved to be useful not just as mechanisms for coordinating and completing both state-wide and local GPSTEM work plan goals, but also as vehicles for cross-campus collaboration and coordination. The Academic Program Teams (APTs) were organized by GPSTEM program of study and were charged with developing and validating curriculum and conducting inventories of campus implementations of online courses, simulations, academic maps, STEM meta-majors, articulation agreements with 4-year colleges, internships and career placement. About 120 faculty, staff, administrators, and GPSTEM Project Managers participated in the APTs. Articulation agreements, academic maps and OERs were cited as the most useful products participants developed through their APT work.

**Prior Learning Assessment**

Credit for prior learning was a priority of the Massachusetts GPSTEM grant application, which proposed the creation of PLA Think Tank that would include all 15 colleges to share expertise, build PLA capacity, and promote consistency in policies for the award of academic credit for prior learning. Over the course of the grant, colleges reported that 466 GPSTEM students received 3,238 credits for prior learning and a total of 5,216 students earned 29,005 credits across all programs.

A new website developed with grant support, My Experience Counts, went live in September 2017. It was designed to benefit individuals, especially adult learners, applying to community colleges who have accumulated learning from work, life and military experiences. My Experience Counts (MEC) is a website for applicants to any of the fifteen Massachusetts community colleges that guides the individual through a CPL Wizard to prepare a standard profile of their prior experiences and learnings.
Open Educational Resources

Significant progress was made by the Go Open Initiative, an initiative seeded by the GPSTEM grant, in developing and incorporating open educational resources (OER) into community college courses throughout GPSTEM programs and the entire college consortium. Through three rounds of grant funding for the initiative, 108 proposals were approved and funded across all 15 community colleges. A total of 103 faculty members worked on one or more projects. The estimated number of students impacted through December 2017 was over 9,400.

Across all courses, the average savings per student was $145. Forty percent of the projects involved the development of OER materials for mathematics, natural, and physical sciences, manufacturing technology, computer information science, and health science courses. The average savings for students in these classes was $180 per student. The relatively modest investment of $115,000 in GPSTEM faculty grants has resulted in $1.3 million in student savings to date.

Sustainability

Upon completion of the grant, nearly all of the programs of study are planned to be continued beyond the duration of the grant. The colleges that implemented CCA Guided Pathways to Success beyond the STEM focused programs that were part of the GPSTEM grant have a good basis from which to sustain the initiatives, particularly related to co-requisite remediation and accelerated developmental education, enhanced proactive advising, and use of academic maps. For the colleges that were only able to implement some of the CCA approaches in their GPSTEM programs of study, the successes achieved have been getting attention from other parts of the campus--indicating possible adoption by other programs. Consortium-wide initiatives such as Go Open (encouraging adoption of open education resources) and use of MyExperienceCounts.mass.edu (for increasing credit for prior learning awareness and use) show strong promise for being sustained well into the future. Additionally, while time is always a challenge, there is also good evidence that several cross-campus faculty learning communities and work groups--for instance, one related to community health worker programs--will also continue into the future.
Introduction

A consortium of the 15 community colleges in Massachusetts, led by Massasoit Community College, implemented a U.S. Department of Labor (DOL) Trade Adjustment Assistance Community College and Career Training Grant (TAACCCT) Round 4 project entitled Guided Pathways to Success in STEM (GPSTEM). The community colleges advanced a comprehensive approach to addressing the training and educational needs of workers and employers statewide with a focus on articulated pathways to careers in high-growth STEM sectors: Life Sciences/Biotechnology, CIS/IT, and Engineering, as well as advanced manufacturing and healthcare. During the grant period, 96 STEM degree options and certificate programs were created or significantly enhanced in partnership with local employers and industry groups.

The focus was primarily on helping unemployed and under-employed workers to enter STEM programs and obtain high-skill, high-wage jobs. The funding assisted the community colleges in enhancing STEM programs of study and infusing comprehensive student supports throughout the 15 campuses to benefit all student populations. The GPSTEM initiative also focused on creating pipelines for students to seamlessly transfer to baccalaureate programs to meet demand in STEM industries. This initiative took successful approaches to scale and drove policy changes that have led to reforms within institutions and across the state community college system.

The project used the national Complete College America’s (CCA) Guided Pathways to Success model to assist students in obtaining degrees and certificates in STEM fields. The model focuses on reducing the time to completion of certificates and degree programs, resulting in more students entering employment in the Commonwealth and/or transferring into baccalaureate programs to add to their credentials. Through guided academic and career pathways with proactive on-time advising, the design leads students to make more informed, deliberate decisions and provides program choices that are consistent with the student’s educational goals.

GPSTEM built upon and extended the career pathways approach of the Round 1 TAACCCT grant. The key elements included: accelerated and alternative strategies for developmental courses; credit for prior learning; stackable credentials; employer and industry engagement; and enhanced student supports. GPSTEM also continued the funding of College and Career Navigators providing career guidance, proactive advising, and coordinated job placement activities with Career Centers and the workforce system. The third strategic focus of GPSTEM was to advance online and technology enabled learning. The key elements include: online and hybrid program design; accelerated and modularized content delivery; and simulation training and assessment.
Programs of Study

The colleges in the GPSTEM consortium identified a wide variety of STEM-related programs of study to be developed or enhanced during the three and half years of the period of program operations. The programs are mostly clustered into five STEM focus areas identified in the proposal:

1. Computer Information Science and Information Technology (CIS/IT)
2. Engineering, including various concentrations
3. Health Science
4. Life Sciences/Biotechnology
5. Manufacturing

Through the end of the grant performance period (March 31, 2018), there were 189 individual programs of study across all campuses that the GPSTEM Consortium proposed to create or enhance during the grant. The list of programs for each college include programs on the initial revision to the statement of work after the grant was awarded as well as programs added by the colleges in subsequently approved plan modifications to the statement of work. Overall, 176 programs (93%) have been developed through Year 4. The programs were mostly credit programs of study, with 83 (47%) degree programs and 73 (41%) certificate programs. Only 20 (11%) noncredit workforce development programs were planned and started. (Note: The 176 programs represent a multiple count by each college of the 96 unique degree and certificate majors listed in the GPSTEM proposal and/or plan modifications.)

<table>
<thead>
<tr>
<th>Award Level</th>
<th>Programs Created</th>
<th>Programs Modified</th>
<th>Total Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pla</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>#</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Associate Degree</td>
<td>8</td>
<td>17</td>
<td>47%</td>
</tr>
<tr>
<td>Credit Certificate</td>
<td>27</td>
<td>30</td>
<td>90%</td>
</tr>
<tr>
<td>Noncredit Workforce</td>
<td>7</td>
<td>7</td>
<td>100%</td>
</tr>
<tr>
<td>Totals</td>
<td>42</td>
<td>54</td>
<td>78%</td>
</tr>
</tbody>
</table>

There were 54 new programs of study with curriculum planned to be created or significantly enhanced, requiring college and/or Department of Higher Education (DHE) academic approval. Forty-two (78%) of these programs had been developed by the end of the grant. This includes a few programs developed and available but without any enrollments as of the end of the Year 4 extension period. The programs that were not developed by the end of the grant were mostly degree programs with long cycles of development, internal academic review processes, and DHE review and approval. While there were some organizational delays related to issues cited in earlier reports (e.g., union contract negotiations in 2015-2016), those delays are not the primary reason for the programs not being developed. In many cases, engagement with employer partners and review of their changing needs identified issues that require additional curriculum design changes that could not be accomplished within the grant period.

Almost three quarters of the planned programs (135) were existing programs to be modified and enhanced during the GPSTEM grant. As of the end of the grant, all but one of these programs had been modified/enhanced. The development and approval process for these modified programs usually required a much shorter time frame than for the new degree and certificate programs.
The 176 new and modified programs were impacted by more than one of the following strategies: new or revised courses; new or revised pathways/academic maps; accelerated schedules; co-requisite developmental math; new or revised online/hybrid courses and simulations; and/or grant supported equipment and supplies. The strategies were often supported by both grant and non-grant funds. A total of $1.3 million in local GPSTEM funds was spent on program-related equipment and supplies, about 16.5% of the total $7.9 million in base grants to the colleges. All colleges also leveraged funding from other federal, state, and foundation sources to support infrastructure, equipment, and program changes.

State funding that impacted many of the GPSTEM programs included:

- Massachusetts Skills Capital Grant Program – supports the purchase and installation of equipment for vocational training programs and the related infrastructure improvements and renovations necessary for the use of the equipment (15 colleges with at least one grant);
- Massachusetts Life Sciences Center Capital Awards – support infrastructure and equipment for life sciences, biotechnology and related programs (13 colleges);
- Department of Higher Education STEM Starter Academy Initiative – supports the STEM pipeline through statewide and regional partnerships and provides funds for student supports and enhanced STEM programming (15 colleges); and
- Department of Higher Education Performance Incentive Funds (PIF) – provides funding for a wide range of local program initiatives including career pathways, accelerating developmental education, student success supports, academic and career advising, etc. (15 colleges)

Both new and modified programs also included one or more of the following additional support services: advising and placement assistance by college and career navigators, more intensive and proactive academic advising, tutoring and supplemental instruction, additional internship opportunities, and job development and placement assistance from navigators, coaches and other staff.

Table 2 displays the distribution of the 176 programs of study by GPSTEM Focus Area. For degree programs, 80% of the programs are in the areas of Computer Information Science/IT (CIS/IT), Engineering and Life Science/Biotechnology. For credit certificates, 70% of the programs are in areas of CIS/IT and Health Science. For noncredit workforce programs, 80% are in Health Science and Manufacturing. Over half of the total 176 programs of study are in Computer Information Science/Information Technology (31%) and Health Science (23%).

<table>
<thead>
<tr>
<th>Award Level</th>
<th>Associate Degree</th>
<th>Credit Certificate</th>
<th>Noncredit Workforce</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># Col. %</td>
<td># Col. %</td>
<td># Col. %</td>
<td># Col. %</td>
</tr>
<tr>
<td>Computer Info Science/IT</td>
<td>24 29%</td>
<td>28 38%</td>
<td>2 10%</td>
<td>54 31%</td>
</tr>
<tr>
<td>Engineering</td>
<td>23 28%</td>
<td>8 11%</td>
<td>0 0%</td>
<td>31 18%</td>
</tr>
<tr>
<td>Health Science</td>
<td>9 11%</td>
<td>23 32%</td>
<td>9 45%</td>
<td>41 23%</td>
</tr>
<tr>
<td>Life Science/Biotechnology</td>
<td>20 24%</td>
<td>3 4%</td>
<td>1 5%</td>
<td>24 14%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>5 6%</td>
<td>7 10%</td>
<td>7 35%</td>
<td>19 11%</td>
</tr>
<tr>
<td>Other</td>
<td>2 2%</td>
<td>4 5%</td>
<td>1 5%</td>
<td>7 4%</td>
</tr>
</tbody>
</table>

Table 2: Programs of Study Created/Modified by GPSTEM Focus Area by Award Level
For the 156 degree and credit certificate programs, two-thirds (103) of the programs had academic maps/pathways developed with GPSTEM support. Almost 90% of the degree and certificate programs had academic maps by the end of the grant as there were an additional 35 programs with academic maps developed with non-GPSTEM resources. The process of developing academic pathways usually included revising the sequence of courses and enhancing/replacing some general education as well as technical courses for the major.

One quarter (44) of all programs included course(s) enhanced with simulations developed with GPSTEM funds. About 20% (33) of all programs included one or more online/hybrid courses developed with GPSTEM funds. Additional programs (approximately 20) had new online courses or courses enhanced with simulations but funded by non-grant sources.

*Examples of Major Program Enhancements*

Holyoke Community College focused their GPSTEM grant on developing a career option for their Foundations of Health meta-major and working to develop a community health worker (CHW) and direct care worker certificate program. Despite a number of externally driven set-backs (state certification regulation delays, etc.), the programs were developed and launched successfully. Holyoke CC was a leader statewide in developing their CHW certificate program and helped other community colleges implement their own credentials by sharing their experience and convening a learning community of other college stakeholders. They worked closely with local employers such as Baystate Medical Center in Springfield, Worcester Division of Public Health, and Commonwealth Care Alliance to develop courses that would meet the employers’ needs for their current CHWs. HCC named the creation and addition of the CHW courses into the FOH as one of the transformational impacts the grant had on the college.

Quinsigamond Community College developed hybrid online courses in Computer Systems Engineering Technology (CSET) due to the high enrollment in the CSET program. The Operating Systems and Networking labs are utilized approximately 90% of their available time. As a result, hands-on projects have previously been limited to the lab class period only. Limited space was available for students in an Open Lab if students were unable to complete their projects during lab time or were unable to attend lab class. There were also some CSET technical classes that were unable to support hands-on labs due to the limited CSET Lab space available. With the addition of the NetLabs+ in the CSET program, students now have remote access to hands-on activities. This allows students to access CSET Lab resources from distant locations via the Internet and allows students to work during off hours at their own pace. The NetLab+ tool also allows faculty to assign hands-on exercises for homework and enables online courses to offer the corresponding lab online.

At Berkshire CC the Community Health Worker certificate and related Health Science degree were a transformative change as a result of the GPSTEM grant. The development of the program involved strong collaboration with community agencies/organizations in creating the curriculum and supporting the program through practicums. Partner Taconic High School aligned their Health Technologies program with the Essential Health topics for CHWs course in the CHW program. Articulation agreements
were being drawn up to give THS health technology students credit for this 3-credit course upon matriculation at Berkshire CC (starting with 2019 graduates). These students can also earn credit through Credit for Prior Learning if they have CPR or C.N.A. certifications. The campus worked closely with local 4-year universities to best align degree curriculum to a public health baccalaureate program, opening the doors to articulation agreements. The school has also begun working with state and private universities in Massachusetts and New York to develop articulation agreements to four-year degrees.
Performance Outcomes Summary

The USDOL Annual Performance Report (APR) is a consortium-level report of enrollments, completions, employment outcomes and student characteristics. The report is based on the annual files submitted by each college with cumulative participant-level details on GPSTEM enrollments and completions. The employment outcomes on the APR are primarily based on the results of wage record matching for program completers. Four colleges provided additional post-program employment outcomes based on follow-up surveys they conducted and these outcomes were used to supplement the results of wage record matches. Table 3 includes cumulative performance outcomes through the end of Year 4\(^1\), with a comparison to the end-of-grant goals submitted with the Consortium’s approved plan, i.e., Statement of Work (SOW).

<table>
<thead>
<tr>
<th>Performance Category</th>
<th>#</th>
<th>Goal</th>
<th>%</th>
<th>Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Total Student Participants</td>
<td>15,238</td>
<td>5,096</td>
<td>299%</td>
<td>Exceeded</td>
</tr>
<tr>
<td>2. Completed 1 or More Programs of Study</td>
<td>2,973</td>
<td>2,726</td>
<td>109%</td>
<td>Exceeded</td>
</tr>
<tr>
<td>3. Students Completing Credit Hours</td>
<td>11,107</td>
<td>5,096</td>
<td>218%</td>
<td>Exceeded</td>
</tr>
<tr>
<td>4. Total Earned Credentials</td>
<td>3,135</td>
<td>2,488</td>
<td>126%</td>
<td>Exceeded</td>
</tr>
<tr>
<td>5. Employed in Post-Completion Quarter 1</td>
<td>1,811</td>
<td>1,551</td>
<td>117%</td>
<td>Exceeded</td>
</tr>
<tr>
<td>6. Retained in Employment in Post Quarters 2 &amp; 3</td>
<td>1,405</td>
<td>1,439</td>
<td>98%</td>
<td>-34</td>
</tr>
<tr>
<td>7. Incumbent Workers with Wage Increase</td>
<td>907</td>
<td>846</td>
<td>107%</td>
<td>Exceeded</td>
</tr>
</tbody>
</table>

Through the end of Year 4, there were more than 15,200 students who participated in GPSTEM programs, which is three times the end of project goal (5,096). The number of enrollments was impacted by many programs being modified and enhanced by the beginning of Year 2, by the addition of programs in Consortium plan modifications and by the inclusion in the grant of two Health Science meta-major degree programs that added 4,900 enrollments to the total. There were 2,973 students completing one or more programs, which is 109% of goal. The six-month extension into Year 4 allowed for an additional 400 completions, exceeding end of grant goals. The number of students earning credit hours during the grant and the number of credentials earned both exceeded goals.

During Year 3, the Department of Higher Education was able to enter into an agreement with the Department of Unemployment Assistance (DUA) to provide wage record matching to track the employment outcomes of all students including GPSTEM participants. The Year 4 Annual Performance Report reflects the inclusion of wage record matching results for the employment measures. The wage record match for Year 4 was delayed by some technical issues until the middle of September. While this limited the possible use of wage matches for some evaluation purposes, it did have a positive impact in that matching was conducted through the second quarter of calendar year 2018. This made it possible

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\(^1\) The period of local GPSTEM program operations was for three years and six months, ending March 31, 2018. The GPSTEM grant, including statewide activities and required reporting, was funded for a period of four years ending September 30, 2018.
to do wage record matching for at least one post-program quarter even for program completions that exited during the six month extension period.

The number of students employed in the first quarter after completing a program and exiting the college is 1,811, which is 117% of the goal. As stated above, the employment measure is based on completions who exited from the grant through the end of the grant or March 31, 2018. The number of incumbent workers with a wage increase during the grant was 907, which exceeded the goal by 109%. The number of employment retentions is 1,405, just slightly below (98%) the goal of 1,439.

Table 4 charts Year 4 actual performance against end-of-grant goals for selected performance categories.

Table 4: Year 4 Actual and Goal for Selected Performance Outcomes

<table>
<thead>
<tr>
<th>Category</th>
<th>Y4 Actual</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completions</td>
<td>2,973</td>
<td>2,726</td>
</tr>
<tr>
<td>Employed in Quarter 1</td>
<td>1,811</td>
<td>1,551</td>
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<tr>
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<td>1,405</td>
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</tr>
<tr>
<td>Incumbent Wage Increase</td>
<td>907</td>
<td>846</td>
</tr>
</tbody>
</table>

Table 5 presents performance indicators or success rates for the employment measures. The indicators are calculated by taking the number of outcomes for each category and dividing by the corresponding number in the performance cohorts (number in the denominator). The employment rate in the first post-program quarter of 79% and the retention rate in second and third post-program quarters of 90% compared favorably to the results of other TAACCCT grants and other sectoral training programs within the state and nationally.\(^2\) Note that the denominator for the retention rate is not the total number of employments in first post-program quarter. The denominator of 1,557 is the number of employments through the end of calendar 2017 (for completers who exited through September 30, 2017) that could be potentially matched through the last quarter of wage record matches, the second quarter of 2018.

\(^2\) “Apples to Apples: Making Data Work for Community-Based Workforce Development Programs” published by the Corporation for a Skilled Workforce (http://benchmarking.skilledwork.org/?p=1176).
Table 5: Year 4 GPSTEM Performance Indicators

<table>
<thead>
<tr>
<th>Performance Category</th>
<th>APR #</th>
<th>Denominator</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Employment Rate in Post-Completion Quarter 1</td>
<td>1,811</td>
<td>2,289</td>
<td>79%</td>
</tr>
<tr>
<td>2. Retention Rate in Post-Completion Quarters 2 &amp; 3</td>
<td>1,405</td>
<td>1,557</td>
<td>90%</td>
</tr>
<tr>
<td>2a. Average Earnings in Quarters 2 &amp; 3; Annualized</td>
<td>$31,805</td>
<td>na</td>
<td>na</td>
</tr>
<tr>
<td>3. Wage Increase Rate for Incumbent Workers</td>
<td>907</td>
<td>1,279</td>
<td>71%</td>
</tr>
<tr>
<td>3a. Average Increase in Quarterly Wages</td>
<td>$6,405</td>
<td>$4,940</td>
<td>130%</td>
</tr>
</tbody>
</table>

Notes:
1. Denominator: Completer exits through 03/31/2018
2. Denominator: Completer exits employed in Q1 through 12/31/2017
2a. Average wage record earnings in Quarters 2 & 3 ($15,902), multiplied by 2
3. Denominator: Incumbent workers enrolled through 03/31/2018
3a. Denominator: Wage record earnings of incumbent worker in their quarter of enrollment

Over two-thirds (71%) of incumbent workers have achieved a wage increase and the increase is 30% higher than their quarterly wages at enrollment. The DOL FY16 TAACCCT Summary Report reported the national rates as: 54% Employment Rate, 64% Retention Rate and 39% of Incumbent Workers with wage increases, although these rates include the performance of some grantees that were not able to establish wage record matching agreements.\(^3\)

Table 6 displays the counts by completion status for all participants at the end of Year 4. There were 2,973 participants (20% of the total) who have completed one or more programs in the GPSTEM grant.

Table 6: Year 4 Participant Summary by Completion Status

<table>
<thead>
<tr>
<th>Program Category</th>
<th>Totals</th>
<th>Pct of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Total Participants</td>
<td>15,238</td>
<td>100%</td>
</tr>
<tr>
<td>2. Completed One or More Program(s)</td>
<td>2,973</td>
<td>20%</td>
</tr>
<tr>
<td>2a. Still Active in Grant or Non-Grant Programs</td>
<td>102</td>
<td>1%</td>
</tr>
<tr>
<td>2b. Exit the College</td>
<td>2,871</td>
<td>19%</td>
</tr>
<tr>
<td>3. Did Not Complete Grant Program(s)</td>
<td>6,896</td>
<td>45%</td>
</tr>
<tr>
<td>3a. Transferred to Non-Grant Programs</td>
<td>913</td>
<td>6%</td>
</tr>
<tr>
<td>3b. Exit the College</td>
<td>5,983</td>
<td>39%</td>
</tr>
<tr>
<td>4. No Completion, Still Active in Grant</td>
<td>5,369</td>
<td>35%</td>
</tr>
</tbody>
</table>

Over 96% of the completions have exited their colleges with the balance continuing in the GPSTEM grant in a second program. The number of participants not completing their program of study and no longer active in the grant is 6,896, or 45% of the total participants. Most of the non-completions (87%) have

exited the college but 913 (13%) have transferred to non-grant programs at the same college. A total of 5,370 participants (35%) are still active in their grant program(s).

The total number of participants (15,238) includes 595 participants with enrollments in 2 or more programs. Of these 595 participants, about half (289) enrolled in more than one program within the same award level (e.g., noncredit) and half (306) enrolled in programs in two award levels (e.g., degree and certificate programs.) The total number of participants with completions (2,973) includes 145 participants who had more than one program completion. Of these 145 completers, about two-thirds (94) completed more than one program within the same award level and one-third (51) completed programs in two award levels.

Table 7 reviews the enrollments and completions of participants single-counted by award level. Through the end of Year 4, the completion rate for non-credit workforce development programs was 88% of total participants. For credit certificates, mostly with a nominal duration of one year, 38% of participants completed their programs. For participants in degree programs, which are about 80% of total enrollments, 10% of participants completed the program, with the balance of degree participants split between non-completions and still actives.

### Table 7: Year 4 Participant Summary by Completion Status by Award Level

<table>
<thead>
<tr>
<th>Award Level</th>
<th>Associate Degree</th>
<th>Credit Certificate</th>
<th>Noncredit Workforce</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td>1. Participants</td>
<td>12,298</td>
<td>100%</td>
<td>2,191</td>
</tr>
<tr>
<td>2. Completions</td>
<td>1,266</td>
<td>10%</td>
<td>830</td>
</tr>
<tr>
<td>3. Did Not Complete</td>
<td>6,235</td>
<td>51%</td>
<td>713</td>
</tr>
<tr>
<td>4. Still Active</td>
<td>4,797</td>
<td>39%</td>
<td>648</td>
</tr>
</tbody>
</table>

Note: Participants single counted within award level; 306 students were in programs in two award levels. Completions single counted within award level; 51 students with completions in two award levels.

Table 8 charts the percentage shares of participant enrollments and completions by award level. Noncredit workforce programs, with their relatively short duration, have produced about one-third of the completions with only 7% of the grant’s total enrollments. Credit certificates, with durations ranging from one semester through up to three semesters, have a 14% share of enrollments and have produced 27% of the completions. Degree programs have produced 42% of the completions, although as noted above, only a small percentage (10%) of participants have completed their programs. Of the degree students that did complete, almost all (90%) were continuing students with some accumulated credits at the date of enrollment in the GPSTEM grant. (TAAACCCT policies require all students, new or continuing, to be reported as grant participants if they enroll in program courses created or modified and enhanced by grant activities.)

### Table 8: Year 4 Shares of Total Participants and Completions by Award Level
Table 9 presents participant enrollments by GPSTEM focus area by award level. Health Science programs had the largest share of participants in all three award levels. CIS/IT programs had the second largest share of enrollments across degree and credit certificate programs. For noncredit workforce programs, after Health Science, Manufacturing and Life Science programs had almost all of the remaining share of program enrollments.

Table 9: Year 4 Participant Enrollment Summary by Award Level by GPSTEM Focus Area

<table>
<thead>
<tr>
<th>Award Level</th>
<th>Associate Degree</th>
<th>Credit Certificate</th>
<th>Noncredit Workforce</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>Col. %</td>
<td>#</td>
</tr>
<tr>
<td>Computer Info Sci/IT</td>
<td>2,454</td>
<td>20%</td>
<td>463</td>
</tr>
<tr>
<td>Engineering</td>
<td>1,957</td>
<td>16%</td>
<td>131</td>
</tr>
<tr>
<td>Health Science</td>
<td>5,412</td>
<td>44%</td>
<td>1,239</td>
</tr>
<tr>
<td>Life Science/Biotech</td>
<td>2,087</td>
<td>17%</td>
<td>103</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>336</td>
<td>3%</td>
<td>172</td>
</tr>
<tr>
<td>Other</td>
<td>52</td>
<td>0%</td>
<td>83</td>
</tr>
<tr>
<td>Totals</td>
<td>12,298</td>
<td>100%</td>
<td>2,191</td>
</tr>
</tbody>
</table>

Note: Participants single counted within award level; 306 participants in programs in two award levels.

Table 10 presents participant completions by GPSTEM focus area by award level. As with enrollments, the largest share of completions in each award level belongs to Health Science programs. For degrees, CIS/IT and Life Science programs had the next largest shares of completions. For credit certificates,
CIS/IT programs had the second largest share of completions. For noncredit workforce programs, Manufacturing and Life Science programs had almost all of the remaining share of completions. In addition to the number of enrollments, the distribution of completions by GPSTEM focus areas is impacted by when program development was completed and programs began to have enrollments.

Table 10: Year 4 Participant Completion Summary by Award Level by GPSTEM Focus Area

<table>
<thead>
<tr>
<th>Award Level</th>
<th>Associate Degree</th>
<th>Credit Certificate</th>
<th>Noncredit Workforce</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>Col. %</td>
<td>#</td>
</tr>
<tr>
<td>Computer Info Sci/IT</td>
<td>256</td>
<td>20%</td>
<td>130</td>
</tr>
<tr>
<td>Engineering</td>
<td>158</td>
<td>13%</td>
<td>44</td>
</tr>
<tr>
<td>Health Science</td>
<td>511</td>
<td>40%</td>
<td>562</td>
</tr>
<tr>
<td>Life Science/Biotech</td>
<td>292</td>
<td>23%</td>
<td>29</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>39</td>
<td>3%</td>
<td>44</td>
</tr>
<tr>
<td>Other</td>
<td>10</td>
<td>1%</td>
<td>21</td>
</tr>
<tr>
<td>Totals</td>
<td>1,266</td>
<td>100%</td>
<td>830</td>
</tr>
</tbody>
</table>

Note: Participants single counted by award level; 51 students completed programs in two award levels.

Table 11 displays the characteristics of gender, age and race/ethnicity for total participants and by award level. The overall percentage of women in GPSTEM is 56%, with higher percentages of women in credit certificates and noncredit workforce programs. These service rates are a little lower than the percentage of women in all credit programs at community colleges (59%), and in all degree programs (59%) and certificate programs (66%).\(^4\) GPSTEM includes programs in the STEM areas of CIS/IT, Engineering, and Manufacturing which continue to be predominantly attended by men. See Table 12.

Table 11: Year 4 Participant Characteristics by Award Level

<table>
<thead>
<tr>
<th>Award Level</th>
<th>Total Participants</th>
<th>Associate Degree</th>
<th>Credit Certificate</th>
<th>Noncredit Workforce</th>
</tr>
</thead>
</table>

\(^4\) Fall 2015-2017 Enrollment Files for Community Colleges, Department of Higher Education, HEIRS.
<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>Col. %</th>
<th>#</th>
<th>Col. %</th>
<th>#</th>
<th>Col. %</th>
<th>#</th>
<th>Col. %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Participants</strong></td>
<td>15,238</td>
<td>100%</td>
<td>12,298</td>
<td>100%</td>
<td>2,191</td>
<td>100%</td>
<td>1,055</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>8,573</td>
<td>56%</td>
<td>6,679</td>
<td>54%</td>
<td>1,377</td>
<td>63%</td>
<td>724</td>
<td>69%</td>
</tr>
<tr>
<td>Male</td>
<td>6,665</td>
<td>44%</td>
<td>5,619</td>
<td>46%</td>
<td>814</td>
<td>37%</td>
<td>331</td>
<td>31%</td>
</tr>
<tr>
<td><strong>Age at GPSTEM Start</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 or Younger</td>
<td>5,233</td>
<td>34%</td>
<td>4,744</td>
<td>38%</td>
<td>381</td>
<td>17%</td>
<td>187</td>
<td>18%</td>
</tr>
<tr>
<td>21 to 24</td>
<td>3,303</td>
<td>22%</td>
<td>2,670</td>
<td>22%</td>
<td>491</td>
<td>22%</td>
<td>199</td>
<td>19%</td>
</tr>
<tr>
<td>25 to 29</td>
<td>2,683</td>
<td>17%</td>
<td>2,132</td>
<td>17%</td>
<td>407</td>
<td>19%</td>
<td>197</td>
<td>19%</td>
</tr>
<tr>
<td>30 to 39</td>
<td>2,380</td>
<td>16%</td>
<td>1,812</td>
<td>15%</td>
<td>427</td>
<td>20%</td>
<td>207</td>
<td>19%</td>
</tr>
<tr>
<td>40 or Older</td>
<td>1,639</td>
<td>11%</td>
<td>940</td>
<td>8%</td>
<td>485</td>
<td>22%</td>
<td>265</td>
<td>25%</td>
</tr>
<tr>
<td><strong>Average Age</strong></td>
<td>27</td>
<td>na</td>
<td>25</td>
<td>na</td>
<td>31</td>
<td>na</td>
<td>32</td>
<td>na</td>
</tr>
<tr>
<td><strong>Median Age</strong></td>
<td>23</td>
<td>na</td>
<td>22</td>
<td>na</td>
<td>27</td>
<td>na</td>
<td>28</td>
<td>na</td>
</tr>
<tr>
<td><strong>Race/Ethnicity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>2,637</td>
<td>17%</td>
<td>2,017</td>
<td>16%</td>
<td>540</td>
<td>25%</td>
<td>146</td>
<td>14%</td>
</tr>
<tr>
<td>Asian</td>
<td>818</td>
<td>5%</td>
<td>714</td>
<td>6%</td>
<td>89</td>
<td>4%</td>
<td>33</td>
<td>3%</td>
</tr>
<tr>
<td>Black/African American</td>
<td>1,822</td>
<td>12%</td>
<td>1,489</td>
<td>12%</td>
<td>243</td>
<td>11%</td>
<td>116</td>
<td>11%</td>
</tr>
<tr>
<td>White</td>
<td>8,591</td>
<td>56%</td>
<td>7,163</td>
<td>58%</td>
<td>1,178</td>
<td>54%</td>
<td>429</td>
<td>41%</td>
</tr>
<tr>
<td>Other Race</td>
<td>519</td>
<td>4%</td>
<td>468</td>
<td>4%</td>
<td>40</td>
<td>2%</td>
<td>15</td>
<td>1%</td>
</tr>
<tr>
<td>Not Disclosed</td>
<td>851</td>
<td>6%</td>
<td>447</td>
<td>4%</td>
<td>101</td>
<td>4%</td>
<td>316</td>
<td>30%</td>
</tr>
</tbody>
</table>

*Note: Participants single counted within award level; 306 students in programs in two award levels.*

The average age of participants at GPSTEM enrollment is 27 years old but the median age is 23 years old. Participants in credit certificate and noncredit workforce program are somewhat older with over 40% of participants older than 30 years. Participants in degree programs are younger, with a median age of 22 years. The majority of degree students (61%) are 24 years old or younger. The GPSTEM age profiles for degrees and credit certificates are the same as the average and median ages for degree and certificate students in all community college programs.\(^5\)

Participants self-reported themselves as 56% white and 38% persons of color and/or Hispanic/Latino with 6% not disclosing race/ethnicity. The adjusted ratio excluding participants that did not report on race/ethnicity is 60% white/40% non-white. This rate of service is similar to the percentage in all community college programs.\(^6\)

Table 12 charts the percentage of female and male participants in programs by GPSTEM focus area. CIS/IT, Engineering and Manufacturing programs are predominantly male whereas Health Science and Life Science have large percentages of women as participants.

---

\(^5\) Ibid.
\(^6\) Ibid.
Table 12: Year 4 Program Participants by Gender by GPSTEM Focus Areas

<table>
<thead>
<tr>
<th>Focus Area</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Info Sci/IT</td>
<td>21%</td>
<td>79%</td>
</tr>
<tr>
<td>Engineering</td>
<td>14%</td>
<td>86%</td>
</tr>
<tr>
<td>Health Science</td>
<td>86%</td>
<td>14%</td>
</tr>
<tr>
<td>Life Science/Biotech</td>
<td>62%</td>
<td>38%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>12%</td>
<td>88%</td>
</tr>
<tr>
<td>Other</td>
<td>59%</td>
<td>41%</td>
</tr>
<tr>
<td>Totals</td>
<td>56%</td>
<td>44%</td>
</tr>
</tbody>
</table>

Table 13 presents the percentage of full-time (12 credits per semester) and part-time students in GPSTEM credit programs at point of enrollment. The percentage of students that are full-time in degree programs is 49% and in credit certificate programs 36% of students are full-time. These results are similar to the share of full-time students in all degree and credit certificate programs at community colleges (for new students at point of enrollment).\(^7\)

Table 13: Year 4 GPSTEM Participant Full-Time Status by Award Level

<table>
<thead>
<tr>
<th>Award Level</th>
<th>Total Participants</th>
<th>Associate Degree</th>
<th>Credit Certificate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>Col. %</td>
<td>#</td>
</tr>
<tr>
<td>Total Credit Participants</td>
<td>14,186</td>
<td>100%</td>
<td>12,298</td>
</tr>
<tr>
<td>Full-Time Status</td>
<td>6,649</td>
<td>47%</td>
<td>6,011</td>
</tr>
<tr>
<td>Part-Time Status</td>
<td>7,537</td>
<td>53%</td>
<td>6,287</td>
</tr>
</tbody>
</table>

Note: Participants single counted within award level; 303 participants in two award levels.

\(^7\) Ibid.
Evaluation Activities for Program Implementation Analysis

Commonwealth Corporation’s contract with Massasoit Community College to be the third party evaluator of the GPSTEM TAACCCT grant began in May 2015. In June CommCorp attended the Department of Labor’s TAACCCT Round 4 Convening in Washington D.C. and submitted the required Detailed Evaluation Plan to DOL. During the first year, the evaluation team worked with the GPSTEM leadership and the DHE to establish the reporting processes needed for the consortium’s submission of the DOL Annual Performance Report. The evaluation team produced several guidance documents for colleges related to the annual performance reporting and data collection efforts. CommCorp has continued to provide technical assistance to colleges and the GPSTEM statewide management team on annual performance reporting issues.

The evaluation team has reviewed the following documents on an ongoing basis:

- GPSTEM grant proposal and work plan
- Statement of Work modifications submitted by the consortium to DOL
- Quarterly Narrative Progress Reports submitted to DOL
- College work plans and their updates and revisions
- College quarterly reports including program summaries and updates on deliverables
- Meeting notes and other materials from a variety of committees, teams and workgroups

The evaluation team attended the following meetings and events:

- Monthly meetings and conference calls of Project Managers and Navigators
- Meetings of the GPSTEM Steering Committee and Evaluation Committee
- Selected meetings of the Academic Program Teams and PLA Think Tank
- Technical assistance academies and webinars by Complete College America (CCA)
- Statewide meetings of colleges with local and state workforce system representatives
- Meetings of the Data Integration Steering Committee and workgroups

The evaluation team attended three rounds of site visits to all 15 community colleges. We used the visits to meet the college-level project management team and to learn more about the programs of study and related grant activities of each college. The team has collected surveys from participants in CCA webinars and from members and facilitators of the Academic Program Teams and the Prior Learning Assessment Think Tank. The team had follow-up discussions with Project Managers and other college staff to clarify any questions related to programs of study and performance reports.
GPSTEM Management Structure and Consortium Statewide Activities

The GPSTEM Consortium was led by Massasoit Community College. Under the overall direction of the Vice President for Academic Affairs, the college hired a GPSTEM Statewide Director and Assistant Director as well as additional fiscal staff. The grant also received ongoing staff support from the Massachusetts Community College Executive Office (MCCEO). The GPSTEM Steering Committee was established with representatives from each college, DHE, MCCEO, and the Executive Office of Labor and Workforce Development. The Steering Committee representatives were faculty and staff from a broad range of program and support departments.

The Chief Academic Officer at each college led the local implementation teams that included the GPSTEM Project Manager, the College and Career Navigator, deans and faculty from GPSTEM program departments, and staff from advising, admissions, registrar, institutional research, and other student support departments. The Project Manager and local team developed a college work plan for the grant which included a listing of programs to be developed or enhanced and local activities and goals. Colleges had the flexibility to emphasize some GPSTEM strategies without committing grant resources to all aspects or deliverables of the statewide GPSTEM grant proposal. Each college submitted a detailed quarterly report that provided a summary of enrollments and completions for each program of study, narrative report on accomplishments and challenges, and updates on progress towards the local goals for each GPSTEM deliverable.

There have been many opportunities for information sharing and peer-to-peer technical assistance across the GPSTEM consortium. The consortium established a Groupsite for the online sharing of GPSTEM updates, notes from meetings and teams, technical assistance resources, policy guidance issuances, etc. There were monthly statewide meetings with Project Managers and Navigators to discuss successes and challenges of grant implementation. They provided great opportunities for peer to peer sharing and often included formal presentations from local college staff that already had some success on a specific GPSTEM workplan issue.

Peer-to-peer training and other sharing of experiences by colleges were helpful for providing all colleges with a base level of knowledge. There was a series of technical assistance activities by Complete College America (CCA) staff including an initial statewide “academy” of teams from each college (October 2016). The CCA Academy on Guided Pathways was a day-long program that gave the college teams an opportunity to learn more from CCA and other colleges from around the country who have been implementing Guided Pathways to Success (GPS) elements. The teams were also given time to work together to make progress on a GPS implementation plan. Some colleges had been part of the CCA pilot and had made significant headway in implementing certain elements. For other colleges, the academy was an important next step to learn in more detail about the elements and philosophy of the GPS model.

CCA held a series of 6 webinars with GPSTEM colleges, along with holding 1:1 conference calls from a CCA consultant from 2015 through early 2017 during the grant. These webinars and calls were designed to provide technical assistance to the colleges as they implemented the Guided Pathways model (or some of its components) at their colleges. Topics included Technology for Degree Maps & Structured Block Schedules (12/11/2015), Academic Advising at the Center of GPS Direct (1/29/16), What we Know and are Learning Together about Meta-Majors as a Game-Changer Strategy (3/30/16), Scaling CO-
requisite Academic Support (5/16/16), Strategies for Sustaining Guided Pathways to Success at MA Community Colleges (11/17/16), and Using Your College Data to Build Local Support for GPS and Game Changer Completion Strategies (3/8/17). The evaluation team surveyed participants after each webinar. On average, the webinars were rated as moderately to extremely useful by over three-quarters (76%) of survey respondents. In addition, the CCA facilitator of the webinar series used the feedback and suggestions from the surveys along the way and to design future webinars tailored to the specific needs of the community colleges in Massachusetts. Participants responded that they particularly appreciated the chance to hear how other Massachusetts community colleges were faring in their implementation of specific strategies and how they handled challenges. For some colleges that were further along in their implementation, some of the webinars served as a refresher; for others new to the CCA GPS elements, they served as entry-points for further exploration.

On 10/20/2017, a closing statewide convening was held at Holyoke Community College. This convening focused on local community college success stories related to several of the GPS model elements. Quinsigamond CC presented on their shift to meta-majors or “Areas of Study.” Middlesex CC described how they developed academic maps and pathway maps (meta-majors), and Massasoit CC shared their academic map development process. North Shore CC discussed how they developed a two-year schedule for several of their programs, allowing for better course planning for faculty and students. Berkshire CC shared its experience purchasing and implementing a technology platform, EAB Navigate, for course planning and advising. Cape Cod CC relayed their success implementing a co-requisite model for developmental English. Finally, the state’s Department of Higher Education presented on some of the CCA outcome metrics at the state level.

GPSTEM also co-sponsored the 2016 and 2017 Teaching and Learning convenings of the community colleges, an annual professional development workshop day. The GPSTEM-sponsored convenings focused on many of the strategies and deliverables of the grant including academic pathways, transfer and articulation mechanisms, academic and career advising, prior learning assessment, accelerated developmental education, the use of open educational resources, and learning communities.

Academic Program Teams (APTs) were established for each of the STEM focus areas of the grant, including Life Sciences, Computer Science/Information Technology, Healthcare, and Engineering/Manufacturing. Facilitated by competitively procured consultants, the teams are composed of faculty from each college with related GPSTEM programs, along with Project Managers. The teams have reviewed inventories of existing practices and academic pathways, explored the use of online courses and other technology-enabled learning such as simulations, and provided opportunities for statewide and regional meetings with employers to review career maps and competencies. These various mechanisms for sharing across the consortium have been used to disseminate best practices, including completed deliverables supported by grant funds and plans for sustaining local GPSTEM initiatives.

The APTs were one of the key ways that colleges in the consortium were able to collaborate and learn from one another. Overall, a survey of faculty and staff participants found that connecting with colleagues from other community colleges around the state through the APT very useful. Similarly, working with colleagues across campuses was seen as one of the major overall successes or accomplishment of the APTs. Participants largely took what they learned from other campuses and the
projects they worked on back to their individual campuses. Several survey respondents said they were sharing with colleagues in their department, had made presentations to faculty, or had communicated via e-mail or in person about their work. While the faculty and staff who participated almost universally cited time as a challenge to full participation in the APTs, they felt the opportunities offered to convene via phone and in-person were valuable.

GPSTEM has also been able to leverage and co-sponsor other statewide workgroups. The GPSTEM workgroup (Think Tank) on Prior Learning Assessment (PLA) joined forces with an initiative of the Chief Academic Officers to improve PLA capacity in the campuses. Work on incorporating Open Educational Resources into GPSTEM programs of study led to the GPSTEM sponsorship of a statewide Go Open Initiative on the use of OER materials and the establishment of an ongoing Go Open Council. GPSTEM work on accelerated developmental math strategies was coordinated with the DHE’s Transforming Developmental Math strategies, including a statewide agreement with Complete College America for a Co-Requisite Math Initiative.

Credit for prior learning (CPL) was a priority of the GPSTEM grant application, which proposed the creation of a PLA Think Tank that would include all 15 colleges to share expertise, build PLA capacity, and promote consistency in policies for the award of academic credit for prior learning. The PLA workgroup activities were facilitated by North Shore CC which developed agendas, managed meetings, encouraged peer learning, and maintained the work products of the group. The PLA workgroup also assisted in the development of an online CPL platform as part of the Data Integration project. The consortium Think Tank met regularly for about 18 months to address PLA policies and practices. The meetings created opportunities to discuss and exchange ideas on CPL strategies and methods, policies, and administrative procedures. The Consortium members also reviewed and made suggestions on Data Integration Project’s CPL application branded as My Experience Counts. (https://myexperiencecounts.mass.edu)

During the spring 2017 semester, there were five regional trainings to demonstrate the web application, explore CPL/PLA issues, and provide an opportunity for professional development. The training sessions were hosted by Quinsigamond, Bristol, Bunker Hill, North Shore and Greenfield Community Colleges. Almost 200 faculty and staff from all 15 colleges attended the trainings with attendance approximately split between faculty and staff positions. Attendee evaluations of the sessions were overwhelmingly positive and attendees reported that they were more likely to recommend CPL to students as a result of the training.

Another initiative that emerged through the GPSTEM effort was a statewide open educational resources (OER) initiative called “Go Open”. The initiative was facilitated by Northern Essex CC and included their management of three RFP rounds that provided grant resources to faculty and OER coordinators at each community college for the development and adoption of OER materials for courses in GPSTEM programs of study. The initiative provided three rounds of training for faculty selected to develop OER and to annual summits where colleges presented on their OER projects and successes.

Faculty and OER coordinators reported impacts beyond the development of the OER materials. As with other GPSTEM work groups, faculty and staff appreciated that the process allowed more opportunities for collaboration within their college and across the consortium. Faculty and staff were supported by many chances to learn, share, and network through the training sessions and summit meetings. The
success and enthusiasm of these faculty changed attitudes at their campus and encouraged other faculty to consider OER as an alternative to textbooks.

**Guided Pathways to Success Model**

The GPSTEM project incorporated some of the strategies of the Complete College America’s (CCA) Guided Pathways to Success (GPS) model to assist students in obtaining degrees and certificates in STEM fields. The strategies focus on reducing the time to completion of certificates and degree programs, resulting in more students entering employment and/or transferring into baccalaureate programs to add to their credentials. Through guided academic and career pathways with proactive on-time advising, the goal is for students to make more informed decisions on program selection and provides clear pathway choices that are consistent with the student’s educational goals. GPS seeks to encourage more students to enroll with full-time course loads such that they can attempt to complete an Associate’s Degree in two years.

The GPSTEM proposal intent was to expand the implementation of the CCA Guided Pathways to Success model, along with other strategies, in order to address barriers to students’ success that result in low graduation rates. For instance, more than 50% of community college students are placed into developmental education and they spend too much time in developmental courses before starting credit courses. Another goal was to improve the alignment of enrollments in majors with career opportunities, as at the time of the proposal only 12% of students were enrolled in STEM majors in contrast to 35% of job openings being in STEM related fields. Students are often unclear about their career possibilities and which programs and courses to take to reach their career goals. They often lose time and momentum by taking courses that do not contribute to degree and certificate attainment. Students end up spending too much time and money on developmental and other courses that do not count towards degree completion and this results in students stopping or dropping out of programs and accumulating unnecessary student loan debt.

During the Round 1 TAACCCT grant, seven community colleges\(^8\) had started some pilot activities with CCA using the integrated strategies of Guided Pathways and the related “15 to Finish” campaign. Early evidence from other states with colleges adopting the model showed promising results, although early adopters were mostly four year colleges and universities.\(^9\) Most MA colleges in the pilot were encouraged by their preliminary work with CCA and were supportive of the inclusion of GPS in the Round 4 proposal.

**Academic Maps/Pathways**

Academic Maps or Pathways include the specific semester by semester schedule of courses for a certificate or degree that leads to on-time completion. It is a default structured pathway such that students choose programs of study and the map is then the semester by semester registration plan. The map highlights critical milestone courses that must be completed each semester so that students remain on track in the recommended sequence. The maps may also list prerequisites and/or co-requisite supports for gateway courses, the first college-level or foundational courses for a program of study.

\(^8\) Bristol, Cape Cod, Greenfield, Middlesex, Mount Wachusett, North Shore and Quinsigamond Community Colleges.

For GPSTEM programs, most Academic Maps also include or are linked to corresponding Career Pathways. Career Pathways demonstrate how a stackable pathway of programs leads to employment and transfer opportunities. Using statewide and/or regional labor market information, Career Pathways show how GPSTEM certificate and degree programs are aligned with workforce needs, job opportunities, potential earnings, advancement ladders and related industry recognized certifications.

By the end of the grant, for the 156 degree and credit certificate programs, two-thirds (103) of the programs had academic maps/pathways developed with GPSTEM support. Almost 90% of the degree and certificate programs had academic maps by the end of the grant, as there were an additional 35 programs with academic maps developed with non-GPSTEM resources. The process of developing academic pathways usually included revising the sequence of courses and enhancing/replacing some general education as well as technical courses for the major. Some colleges also developed formal part-time academic maps to support non-traditional students who often are unable to manage a full-time schedule.

College officials identified several challenges for academic maps: students requiring developmental or remedial coursework, students who are unclear about their career objective, and the large percentages of students who attend their colleges part-time. Colleges are attempting to address the first issue by accelerating developmental education or through co-requisite models pairing developmental and credit courses. The second issue is being addressed by incorporating vocational exploration in the first semester and through the design of majors in a division/focus area/meta-major that share common coursework such that students can move on to specific majors without losing credits. Most colleges addressed the third issue by creating maps that would work for students who could only take a part-time course load, in addition to full-time maps.

Massasoit CC was not in the CCA pilot but still was able to develop full-time Academic Maps with milestone courses for all GPSTEM programs and then expanded to all program majors. The development of these maps involved significant cross-department collaboration and were vetted by a focus group of students in the early planning stages. The maps were significantly revised given the student feedback. The Academic Maps were seen as a key outcome from the grant that could not have been accomplished without GPSTEM resources and were incorporated into the advising processes at the college.

Cape Cod CC was in the CCA pilot and quickly scaled up to develop academic maps for all programs of study including GPSTEM. As part of the development, all programs were organized by seven areas of focus (meta-major level). The full-time maps with career pathway information are now online in the college’s electronic catalog. The next phase is to scale up pilot efforts to address the developmental education issue by consolidating developmental courses and expanding co-requisite remedial programs. The college is also requiring and incenting students to take math courses on schedule.

Middlesex CC was also in the CCA pilot and developed academic maps early in the grant for both GPSTEM and non-GPSTEM programs. They went through a few iterations with the team and with the college’s marketing department to make them more student-friendly. The implementation of academic maps requires coordination with advising and enrollment services staff as well as faculty as the maps get incorporated into orientation and registration processes. Campus wide professional development days were devoted to the topic and advising guides were also developed. The maps and career pathways have transitioned from hard copies to online versions available on the website and in a mobile application. Middlesex has found that many students are unclear about their career and educational
goals. The college continues to experiment with mini one-credit courses built into the pathways to explore career and college options. There has been a slight increase in the number of students taking 15 credits per semester but that balance was only up to 10% in the Fall 2017 semester.

North Shore CC was also a CCA pilot and was able to develop academic pathways for GPSTEM programs and scaled up right away for all degrees and certificate programs. The format of the pathways is different than the usual semester by semester – the maps present the courses in a recommended linear order which is easier for advisors to use with students especially if they cannot attend full-time. North Shore was the first college to flag in all pathways the courses eligible for credit for prior learning. To address the issue of course availability, the college has instituted a two year schedule so students can see over an extended period when courses will be offered. Another key is continuing ongoing training for faculty and advisors on pathways. The incorporation of pathways and all career information into an interactive online catalog has been slowed somewhat by delays in the overall update of the college’s website.

Berkshire CC was not a CCA pilot; the college used the grant to develop academic maps for GPSTEM programs. The GPSTEM team developed maps with extensive career pathway information and created brochures for each program. These hard copy version are very comprehensive and have been well received by students, faculty, and staff. GPSTEM resources were crucial in the development of the maps and the challenge for the college will be how to scale up academic maps across all degree and certificate programs after the grant ends.

Many colleges, but not all, have decided to develop part-time maps (e.g., three or four year schedule for a degree) in addition to the full-time maps. Many non-traditional students are unable to attend full-time and the part-time map shows the alternative default schedule. It is helpful for part-time students to also review the full-time maps so they are made aware of all of the implications of a part-time schedule.

Some factors positively influencing the successful development of academic maps:

- Inter-departmental team made up of faculty, chairs, dean, advisors, enrollment services, etc.
- Having a plan for training and professional development for advising staff and faculty
- Conducting pilots with students and advisors to review the process and friendliness of format
- Technological support to maintain living version of map and online access by students and staff

Some challenges that delayed the development of academic maps:

- Miscommunication about curriculum changes that require major revisions to maps
- Lack of buy-in from staff or faculty that full-time maps are useful for advising part-time students and students needing remedial courses
- Lack of software to assist with the scheduling issues that go along with default maps

All colleges are prepared to sustain the academic and career pathways developed during the grant as well as the related advising changes. For the colleges (8) that already scaled up pathways across all divisions it appears that they are all well-positioned to sustain all academic maps. For colleges (7) that used the GPSTEM grant to develop and pilot academic pathways only for programs of study in the grant, it will be more challenging to scale up this innovation across the campus.
Structured/Block Schedules

Block schedules offer the program’s courses in regular back-to-back sequences on specific days of the week, e.g., M-W-F from 8:00 am to 12:00 noon. Students can take courses in a predictable time block, allowing them better balance with work and family responsibilities. CCA recommends structured or block schedules to facilitate students to enroll in more credits per semester consistent with full-time academic maps.

By the end of the grant, only seven colleges had developed new block schedules for 22 GPSTEM programs. In some cases, only technical courses are in a block, not general education or other courses. For some one-year certificate programs, all courses are in a structured schedule as the program is based on a cohort model.

Despite the low numbers, the colleges were enthusiastic about their programs with block schedules and were planning to expand to more programs. They see advantages such as student satisfaction with the predictable schedule, the development of supportive cohorts and learning communities, and providing the opportunity for supplemental instruction sessions and tutoring between courses. There are a wide variety of schedules used by colleges, including splitting semesters into two mini-semesters of 7 weeks.

The major challenges to block schedules are classroom and lab space capacity issues, difficulties with scheduling software to lock in blocks beyond one semester and, for programs that are not cohort-based, the number of students interested in the program who want to attend part-time. As more academic maps are finalized, colleges may be in a position to expand the number of programs with such schedules.

Springfield Technical CC implemented block schedules first with their Fast Track Customer Service credit certificate. This was a new program with off-semester modules and an accelerated and blocked schedule including a co-requisite developmental education model intended to help students earn 24 credits in less than a year. STCC found great success with their initial pilot (completion rate over 75%) and developed their new Fast Track IT certificate (27 credits) based on its design. Fast Track IT started in September 2017 with a schedule of 2 evenings and Saturday each week. Both Fast Track programs have involved significant local employer input and more class time devoted to vocational exploration and career services. The success of these two Fast Track certificate models, using the block schedule format, has attracted interest across the college, and other college departments are in the process of considering reconfiguring some of their programs in similar ways.

Quinsigamond CC implemented block scheduling in its Electronic Engineering Technology-Mechatronics program and Computer Systems Engineering Technology program. Mechatronics faculty shifted the program’s course work to a block schedule of Monday/Wednesday/Friday, offering a consistent schedule for the students. The shift also allowed the students to enroll in the required general education courses on Tuesday/Thursday. Faculty found that it appeared students increased the number of credits they completed by opening the Tuesday and Thursday time frame for general education courses.
Meta-Majors

In addition to academic maps/pathways the CCA Guided Pathways model recommends organizing all programs of study into a limited number of “meta-majors.” A variety of terms are used to describe this set of broad content areas: focus areas, divisions, pathways, fields of study, etc. Each area of study includes a set of courses that meet initial academic requirements that are common across a cluster of specific programs of study in the division. Students changing or refining their majors can move their credits seamlessly to the new major. For students interested in a focus area but unable to decide on a specific major, some colleges have a meta-major level program that allows students to fulfill the common courses of the division while continuing to explore the field before transferring into a specific program of study. The meta-major may also provide some additional opportunities to meet the requirement of some majors.

By the end of the grant performance period, five colleges had developed meta-majors or areas of focus covering all programs of study including GPSTEM. Four other colleges had developed pilot meta-majors for divisions or focus areas that included GPSTEM programs of study. A total of 20 meta-majors were developed at nine colleges. The five colleges that reorganized all programs into meta-majors or focus areas will sustain this approach after the grant. It is unclear to what extent meta-majors will be developed or scaled up at other colleges. Most colleges have aligned the courses in their programs of study to the MassTransfer pathways that articulate to four year degrees at state universities and the University of Massachusetts; for these colleges, meta-majors appear somewhat redundant.

Bristol CC is an example of a college that addressed both academic maps and meta-majors during the GPSTEM grant. By the end of the grant, Bristol CC had organized all programs of study around seven meta-majors/divisions. In addition to the divisional reorganization, there are now General Studies concentrations that align with each of the seven divisions. These concentrations are meta-major programs designed to offer two semesters of common critical courses and after completion students are ready to enter a specific academic pathway/major. The biggest challenge is that the majority of students are part-time, but going forward, administrators plan to develop part-time academic maps within the meta-major structure. The next step for Bristol and the other four colleges with meta-majors for all programs will be to review student satisfaction with meta-majors and the strategy’s impact on successful decision-making. With that evidence, the goal will be to reduce and eventually eliminate the “opt out” option of not declaring a meta-major.
Proactive Advising

The GPSTEM Work Plan outlined a goal to enhance advising with intrusive strategies and career information to support informed choice. In order to encourage program selection consistent with their educational and career interests, students should be provided a wide array of information on career options, programs of study, and academic maps. Students would then be supported to stay on track by proactive, just-in-time advising. This approach also suggests the need for technology-enhanced advising and early alert systems.

All colleges have implemented or enhanced proactive (intrusive) advising strategies. To support new advising strategies, colleges have introduced new or enhanced existing technologies to support early alerts, retention, scheduling, self-registration, advising, and career counseling. Often the applications were leveraged for GPSTEM from other college grants and funds. During the time period of the grant, there were eight Title III grants (Strengthening Institution’s Programs - SIP) which overlapped the GPSTEM period for at least two years of operation. The Title III grants helped support student retention strategies through the hiring of additional advisors and providing funding for technological improvements.

One of the challenges is that there are four different learning management systems in use across the fifteen community colleges: Banner (Ellucian), Jenzabar (Ellucian), Datatel, and PeopleSoft. While half the colleges use Banner, the variety of systems make consortium-wide purchases impossible, limiting peer to peer sharing of learning across the campuses.

Examples of software used by at least three colleges are: DegreeWorks (Banner), Degree Audit (Jenzabar), Starfish (Hobsons), EAB Navigate (Education Advisory Board) and College Scheduler (Civitas). There is a variety of other software used for scheduling and communicating related to advising and student support, including other Ellucian products such Grades First, WebAdvisor, and ExiAdvising. To some extent most colleges are also dependent on home-grown enhancements to their student information systems to support just-in-time advising.

The technological improvements assist in a number of ways:

- Provide more options for career exploration and educational options;
- Reduce the amount of time advisors spend on registration transactions;
- Facilitate communication and appointments among students, advisors, faculty, and others;
- Support self-registration by students, while editing student’s schedule against academic map;
- Generate more timely early alerts on milestone courses and other issues.

Many colleges discussed during site visits that, in part due to technological changes, the role of central advising is evolving from enrollment-driven services and clerical registration transactions to retention-driven services and career planning. Advisors will become more involved in career planning and orientations (and designing online versions of such orientations) before a student is able to register. This also means breaking down some of the organizational silos. Holyoke CC is moving towards a new center for advising, career services and transfer. Berkshire CC is planning on the coordination of advising, admissions, financial aid, placement testing, career services, and transfers in one center.
One way to support improved retention and completion outcomes is to implement more real-time and online academic advising systems.\textsuperscript{10} Over the course of the grant, 10 colleges made formal changes to advising policies and/or reorganized administrative structures. All colleges, however, supported some level of technological improvement, from the purchase of new software to enhancements to existing systems to support their advising efforts.

In their final quarterly reports, Massasoit, Middlesex and North Shore CCs listed the implementation of enhanced advising techniques as one of the top three transformative changes supported by the GPSTEM grant on their campuses.

Massasoit moved in the direction of encouraging students to take more credits and perceived that the academic maps help to clarify the issues students will face if they take fewer credits. The maps also support advising’s work. The college has added some technology to support advising (with GPSTEM funds, in addition to Title III and general fund dollars) similar to several other colleges: DegreeWorks, which shows courses completed and courses needed for major; College Scheduler which coordinates a student’s personal schedule with available courses; and Grades First, an early alert system which messages advisors, departments and students. They also use FOCUS2 for students needing more career exploration and career interest inventories.

As academic maps and pathways (meta-majors) were scaled up for all programs of study, Middlesex CC integrated its approach to enhancing advising to meet the objectives of using academic maps and pathways. This involved combining staff from general, transfer and career services advising under a Director of Advising and Academic Pathways. There were administrative challenges as this change required new job descriptions and negotiations with three bargaining units. Advising is proactive right from the start, with new students required to attend orientation session and assigned an advisor before registration. Students get a commitment letter identifying their advising contact and then advisors reach out to students. Students without a program major are encouraged to select a meta-major pathway.

Middlesex made significant investment in new software, including putting academic maps on the student portal. DegreeWorks is the base for tracking course completions towards program requirements for career and transfer goals. College Scheduler was added to help with coordinating course availability versus maps. Technological improvements allow students to self-register for courses as long as they are on track in their program. Advisors can now spend more time with students on career exploration and decision-making and less on the clerical tasks of registration mechanics. To further assist in early alerts and ongoing communication, the college is now integrating EAB Navigate software into the system. A Title III SIP grant has been an important source of funding for advising enhancements and technology. Capital improvement grants have supported the redesign of physical space to support a pathways center for all advisors. Another key to success has been substantial investment in training and professional development that has resulted in general buy-in to the new approach among advisors and faculty.

North Shore CC made significant progress in advising, moving from a model the college describes as an enrollment-driven model to one where pathways determine which advisor students are assigned to.

They have moved from passive (wait for students to walk in) to pro-active (schedule appointments with students) and from generalist advising (advisor could have any type of major) to pathways/divisional advising, building on the model of the GPSTEM-supported STEM advisor and navigator. They have accomplished many changes even though they have not yet invested in new software and technology. The college has a manual early alert system which includes the student, advising and faculty. Advisors have had success using text messaging and online chats for students taking online programs or courses. Between dedicated advising, academic pathways and improved communications, North Shore CC is seeing semester-to-semester registration rates remaining very high and feel that this will lead to better retention and completion.

While each college has crafted its own unique solution to enhancing proactive advising, the following are some of the most common trends:

- Organizational consolidation of general, transfer, and career advising;
- Better coordination (and often physical colocating) of advising with other student affairs departments such as admissions, registrar, financial aid, testing;
- Mandatory orientation and academic advising before course registration;
- Simplifying the registration process to facilitate student self-service, freeing up advising resources for career advising to support better choices of majors;
- Recognition that training and professional development are key to the adoption and support of technological innovations;
- Divisionally focused advisors (rather than generalists);
- Multiple channels of communication with students including text messaging, online chats, improved use of Blackboard and Moodle, proactive pushes of alerts and follow-up;
- Recognition that it takes time to get faculty to consistently use early alert systems, but that early adopters can be champions of such systems.
Career Pathways Elements

Articulation Agreements

The GPSTEM proposal included the goal of increasing the transferability of STEM degrees from community colleges to public and private four-year institutions. The consortium’s efforts for statewide articulation agreements with public universities dovetailed with a multi-year process led by the Department of Higher Education in the development of the MassTransfer system. Individual colleges also developed bilateral agreements with private institutions, as well as public four-year colleges where specific majors are not yet included in MassTransfer. By the end of the grant, individual colleges used grant funds to develop or revise over 150 articulation agreements.

The DHE working groups for developing MassTransfer pathways from community colleges to public universities operated during roughly the same timeframe as the GPSTEM grant. The Academic Program Teams were helpful in supporting participating colleges in that process, as well as surfacing issues to be addressed by the MassTransfer committees. DHE staff and college representatives reviewed foundational courses for each discipline, determined core competencies to develop course equivalencies, and then built the pathway for a sequence of the first 60 credits of the major. As they were approved, the Associate’s to Bachelor’s (A2B) pathways were posted to the DHE website (www.mass.edu/masstransfer). Students can browse the pathways from either the community college or state university view and plan their Associate’s degree choice with confidence that they will not lose credits when they transfer to an approved Bachelor’s degree program. The pathways also support the Commonwealth Commitment program that freezes tuition and fees for community college students who maintain 3.0 GPA, complete their Associate’s in two and half years and then transfer to a public four-year university to complete a Bachelor’s in two years. Average costs savings are projected to be over $5,000 per student.

MassTransfer has been a success, with Massachusetts the only New England state with a guaranteed transferable core of lower division (general education) courses and one of only two states with agreements on course equivalencies and guaranteed transfers from community colleges to four year colleges. The APTs, however, have been a forum for looking at some remaining issues. Some colleges have found that the general education core of 34 credits may be an impediment for some STEM program students, who may take additional technical courses that will be helpful in landing a job in the field, but are treated as extra credits in the transfer pathway. These APT discussions in part helped with the development of an alternative STEM core of 28 credits which allows STEM students to take foundational technical courses at the community college prior to transfer. Four-year colleges agreed to accept some of these technical courses as electives for the STEM program, thereby allowing students greater choice and flexibility to both work and continue their education without taking extra credits. The STEM core also allows some students to participate in internships for credit in their field of study that can transfer to 4-year programs. The APTs allowed schools to share experiences and information related to this work. Many members of the teams rated the work on articulation agreements as the most important contribution.

There remain some community college programs without A2B pathways. For example, there are Mass Transfer pathways for biology and chemistry but not for biotechnology. The MassBioEd Foundation was the facilitator of the Life Sciences APT. In their final report, the organization highlighted this gap for biotechnology students, even though transfer options will become increasingly important for students as employers prefer to hire 4-year grads. In the absence of the MassTransfer pathways, there continues to be a myriad of individually negotiated articulation agreements between community colleges and selected colleges. Credit equivalencies can vary from institution to institution and each college must negotiate the different transfer requirements. The report recommends that colleges continue a process modeled on MassTransfer successes to establish transfer pathways for biotechnology.
Acceleration of Developmental Education

The GPSTEM proposal and work plan emphasize strategies to assist students to progress more quickly through developmental education, especially math, through technology-mediated instruction, self-paced courses, and co-requisite academic support. GPSTEM programs built upon modular remedial math curricula and self-paced math courses developed though the Round 1 TAACCCT and through other statewide initiatives such as STEM Starter Academies.

According to the Community College Research Center at Columbia University, accelerated developmental education methods are associated with increased enrollment and completion in college level math or English and increased college-level credit accumulation supporting completion of a degree. Over the course of the grant, all colleges worked to accelerate developmental math. The top 3 initiatives undertaken include aligning math with the major (12 colleges), developing accelerated/modular math content (11 colleges), and implementing co-requisite models (9 colleges). These initiatives were most often found to be successful by the colleges that implemented them, despite the challenges. For example, Cape Cod CC struggled with getting faculty buy-in to implement co-requisite or other accelerated developmental math models. They had a far easier time implementing co-requisite developmental English (reading and composition) models.

For the most part, GPSTEM programs leveraged campus wide initiatives and other funding, with a limited amount of blended GPSTEM funding at some colleges. The following is a summary of acceleration strategies that have impacted GPSTEM programs regardless of the primary source of funding support.

Acceleration through Developmental Math

There remains a significant percentage of students who must complete prerequisite developmental math before enrolling in college level math. Colleges continue to utilize a wide range of acceleration strategies for these students.

Placement test preparation: Colleges use the Accuplacer test to place students into their initial math course. Most colleges provide workshops to refresh student math skills and test-taking skills before they take or re-take the placement test. Some colleges use the term “boot camp” to describe a short one- or two-week accelerated review offered at no cost to prepare students to re-take the Accuplacer if they are placed into a developmental math level. The STEM Starter Academy and other transition programs offered during the summer months provide free test taking and developmental math courses. A pilot at MassBay CC found that 65% of students going through the STEM Starter summer program retested into a higher level math course.

Online resources: College are providing online test prep materials such as YouTube pages and interactive worksheets that include Accuplacer math problems with hyperlinks that direct viewers to the solutions that were created and are being demonstrated by their Math Department faculty. At Bristol CC, after offering free test preparation workshops, initial pilots found that 33% of students who were retested placed into college-level math.

Condensing levels of developmental math: Some colleges have been able to eliminate the lowest level of remedial math. Other colleges such as Holyoke CC and Bunker Hill CC have been able to combine two levels of remedial math into a one-semester course with six credits. Initial results have found improved completion rates.

Competency-based computer-aided math: Some colleges continue to have success with self-paced math modules that allow students to accelerate through remedial course levels by demonstrating mastery of competencies. Often such modules are part of a computer lab using software such as Pearson’s MyMathLab. Another example of computer-based learning is the Emporium classroom piloted by Quinsigamond CC where students watch instructional videos for each module and do homework and take tests online; once they have mastered a level, they can accelerate through subsequent levels at their own pace.

Mini-semesters: Data gathered on a pilot run from Fall 2015 through Spring of 2017 at Quinsigamond CC indicated positive results for running developmental and college-level math classes on an accelerated schedule. Results indicated that 72% of students who enrolled in the accelerated, off-cycle (7.5 weeks or shorter) courses earned a final grade of “C” or better, compared to 64% in a traditional 15-week lecture course, or 54% in a 15-week online class. Rates of success were equivalent whether or not the class was developmental or college-level.

CCA Math Alignment with Pathways
This strategy includes the development or refinement of alternatives to College Algebra as the default college-level gateway course. By advising students into a clear pathway that leads directly to the right gateway math course and into a program of study, colleges can dramatically reduce remediation and promote degree completion. Students pursuing programs without a Calculus requirement should be in gateway courses such as Quantitative Reasoning, Statistics, or Technical Math in their first year. This approach does, however, have to take into account 4 year college Transfer requirements.

Math alignment with academic pathways facilitates mapping developmental math courses to the gateway math courses for the pathways. At Middlesex, students will need a different remedial math sequence for STEM pathways requiring calculus versus non-calculus STEM pathways versus non-STEM pathways. Middlesex is also adjusting its computer-based modules to align the developmental math sequence to different pathways. While the most dramatic impact can be on non-STEM majors, identifying non-calculus STEM majors in healthcare and certain technologies can also make a significant difference for the developmental math sequence. Middlesex CC is an example of how challenging it is for all colleges to modify developmental math to support student success in calculus-dependent STEM fields.

DHE/CCA Co-Requisite Support Pilot
The Massachusetts Department of Higher Education (DHE) engaged with Complete College America (CCA) on a second consortium pilot program, this time focused on implementing co-requisite remediation. In CCA’s report, Remediation: Higher Education’s Bridge to Nowhere, they offer evidence to support alternatives to traditional developmental education, particularly the idea of enrolling students in college level math or English with just-in-time support provided alongside the course.

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Berkshire, Bristol, Cape Cod, Middlesex, Mt. Wachusett, North Shore, Northern Essex and Springfield Technical were the eight community colleges that signed the DHE application in 2015 to become an official state partner in the CCA Co-Requisite at Scale Initiative. During the GPSTEM grant period, however, resources and CCA training for the initiative were provided to all fifteen colleges. Two statewide conferences in 2016 and 2017 were open to all community colleges.

Co-Requisite Support models provide additional academic support for students who enroll into credit-bearing courses but who are not optimally prepared for the appropriate gateway course. The goal is to have all students in credit-bearing courses so that they complete college-level gateway math and/or English courses within one academic year. The models include:

1. Paired college-level Gateway course and developmental course (accelerated learning);
2. Gateway courses with required Labs (structured assistance);
3. Gateway course plus additional 1 credit course (101+ model).

A number of colleges had already implemented the Baltimore Accelerated Learning Program (ALP) that pairs remedial writing with college level English Composition. Extending that model to math pathways has been the most common strategy to date.

A number of colleges, including Berkshire, Bristol and Roxbury CCs, have piloted the accelerated learning model, in which students take developmental algebra paired with college level Statistics in the same semester. Bristol has scheduled time for supplemental instruction between the college level and remedial courses and has found higher completion rates for both courses in the pilot. While initial results are promising, colleges are also recognizing that professional development and training resources are needed to better prepare the faculty teaching and coordinating the two courses.

Middlesex CC and Mount Wachusett CC are experimenting with the 101+ model where a student is placed into college level math with a one credit remedial skills development course/seminar. Lastly, a number of colleges are providing additional math lab assistance, tutoring and supplemental instruction for students needing additional assistance when placed directly into college level course. See also the GPA Pilot below.

**Massachusetts GPA Pilot for Placement in College-Level Math**

The Massachusetts Board of Higher Education (BHE) established new criteria in a pilot for placement into developmental education and college level courses. During 2014 and 2015, colleges could use two pilot standards, Pilot A based on GPA of 2.7 or higher and Pilot B based on GPA of 2.4 through 2.69. BHE reported, in January 2016, that students assessed as college-ready under the Pilot A standard had successfully completed a gateway level math course at about the same rate as Accuplacer-assessed students. BHE recommended that campuses discontinue the use of the Pilot B standard, since the research showed that students placed using this approach succeed at considerably lower rates than those placed either by Accuplacer or the Pilot A standard. BHE extended the pilot through 2018-2019 and encouraged campuses to continue to experiment with Pilot A and its subcategories.

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The majority of colleges have at least experimented with GPA as the placement assessment for college-level math courses. There appears to be general agreement that it reduces the number of students directed to developmental courses and some continued evidence that students succeed in gateway courses, although the data at some colleges is limited. A number of colleges have indicated that they want to expand the use of GPA Pilot, including but not limited to: Bunker Hill, Holyoke, Middlesex, Mount Wachusett and Quinsigamond.

Quinsigamond has also pursued a different testing approach with Accuplacer, changing the starting point so that all students start at the algebra exam and, if necessary, move down to basic mathematics test. Often students are rusty with their computational skills so if they begin with the basic math level, they are placed in a lower level developmental math course, even if they could pass an algebra test. Reversing the order of tests has had positive effect. Comparatively, in fall 2014, there were 28 sections of MAT 090 (Basic Mathematics), and in fall 2015, after the Accuplacer change, there were only 13 sections of MAT 090.
Online and Technology-Enabled Learning
The GPSTEM proposal listed two goals for the technology-enabled learning strategy: first, to increase the capacity to deliver instruction through online courses and programs, and second, to augment program delivery with simulation technologies. In the proposed Work Plan, Activity 5 focuses on increasing the use of technology-enabled learning strategies, with an emphasis on simulation trainings and efforts to increase the capacity to deliver instruction through online and hybrid courses and programs.

The use of simulation training gives students the opportunity to learn remotely and outside of typical classroom settings and hours in highly interactive applications to gain “hands-on” practice to hone their technical skills. Some simulations are used in the classroom, e.g., mannequins in allied health programs. Simulations allow the learner to model or role-play in a scenario and practice skills and behaviors in a risk-free environment. Interactive assessment in simulations provides a way for instructors to gauge student progress and mastery of complex skills. The use of online courses also provides for remote learning and non-traditional hours. Online courses also support self-paced and accelerated learning and (to some extent) competency-based education.

The process began with an inventory of online/hybrid offerings at the start of the grant and some sharing of earlier work on simulations in manufacturing and healthcare programs. The sharing of information was coordinated through the Academic Program Teams starting in Year 2. GPSTEM also provided support for individual projects via RFPs distributed through the APTs, creating another way for simulations and online courses to be developed.

In their local work plans, most colleges proposed some GPSTEM funded activities on simulations, including support of faculty and staff working on simulations, support of software and equipment, and support for faculty to participate in APTs. As with most sections of the work plan, there is a recognition of some leveraging of other funding for simulation in both new and modified GPSTEM programs.

Colleges will continue to explore options for simulations in STEM programs. Laboratory space is at a premium and incorporating effective simulations can potentially relieve some of the stress. Virtual labs can free up physical lab space and allow more access to content-area knowledge without being restricted by limited facilities.

As the grant period ended, 56 courses in a total of 44 programs used GPSTEM funds to incorporate simulations within the curricula—whether online or using simulators like mannequins (such as Manikin for nursing skills) and other equipment. Forty-two online or hybrid courses were developed and 23 programs were made entirely available online or in a hybrid format. Simulations and online courses were developed in programs in all STEM focus areas.

GPSTEM also supported some enhancements to the Massachusetts Colleges Online website where community colleges and state universities maintain an inventory of all available online and hybrid courses. All GPSTEM supported courses have been added to the site. The site provides options to search by college, programs/degrees, and specific course subject areas and credentials. (www.mco.mass.edu)

Promising practices in the use of simulations and online/hybrid programs:

At Berkshire CC, simulations, primarily virtual labs, are being used in Biological Science, Biotechnology, Physical Therapy, and Networking programs. The grant has supported equipment and software purchases. Online courses paired with on-site, in-person labs are being used in milestone and
foundational courses in Biology and Biotechnology programs to give students an opportunity to accelerate through the curriculum.

Bunker Hill CC has implemented simulations in its Biotechnology, Engineering, and Health Information Technology programs. Biotech faculty researched and selected for purchase Labster software that combines virtual lab simulation with physical lab exercises. All GPSTEM programs have significant numbers of online/hybrid courses to allow for acceleration. The existing Center for Self-Directed Studies is open 7 days a week to provide support for online students.

At Cape Cod CC, simulations in the Engineering Technology/Manufacturing program include a robotics lab which has blended grant funds (for lab equipment and supplies) with state STEM Starter funds (for the robot). With the opening of the newly renovated engineering lab space, a number of hybrid courses including Robotics and Mechanical Design are being offered.

In their Foundations of Health program, Holyoke CC developed two online courses that formerly were offered only in the classroom, making the program a hybrid program. Two courses in the CHW certificate program and one in the direct care worker certificate program were modified to be made fully online, making these programs also fully hybrid offerings. Human patient simulators were incorporated in the CHW and direct care worker certificate program courses. The Simulation lab was incorporated into the HTH 104 course for students to practice a number of skill sets to be applied during home visits. Students were put into pairs, given a “case study,” and given 20 minutes to practice a home visit. The other students were able to see and hear the interactions on a computer monitor in the next room. Some of the skills practiced included introducing themselves to the client, using effective communication techniques, building a rapport, and assessing for home safety, medication compliance, or tobacco and alcohol use. After each pair practiced, the group debriefed on what was done well, what could have been done better, barriers and possible solutions, etc. The students reported they loved going to the SIM lab and that they learned a lot from being able to practice these skill sets in such an authentic setting.

At Northern Essex CC, simulations have been implemented in Computer Aided Design and Advanced Manufacturing programs. Eight online programs have been implemented and six hybrid program are in process for various healthcare and CIS/IT programs. Some programs are part of a competency based education (CBE) pilot. The GPSTEM grant has supported the course development and instructional design work needed to offer the CBE courses. GPSTEM also funded the Learning Coach position which provides direct support to students in the CBE courses. A new position, Dean of Academic Innovation, has been added to increase capacity. The pilot will continue to roll out over the next year. The college is part of a Federal Financial Aid Pilot.

Quinsigamond CC was one of the colleges that implemented online simulations, developing a virtual lab space to expand access for Computer Science and Engineering Technology students. Due to the high enrollment in the Computer Systems Engineering Technology (CSET) program, the Operating Systems and Networking labs were utilized approximately 90% of their available time. Some CSET technical classes were unable to support hands-on labs due to the limited CSET Lab space available. Incorporating NetLabs+ allows students to access CSET Lab resources from remote locations via the Internet, and allows students to work during off-hours at their own pace and timeframe. The NetLab+ tool enable faculty to assign hands-on exercises for homework. The tool also allows online courses to offer the corresponding lab online.
Engagement with Employers

A core element of the GPSTEM focus on sector strategies is employer engagement. The proposal included the support and continued involvement of employers from statewide organizations such as the STEM Advisory Council. Local colleges committed to recruiting employers from their regions to play a larger role in the project, assisting in the design and review of the GPSTEM programs, the use of company equipment and facilities for training programs, and agreements to interview successful graduates. The work plan has a goal to increase the placement of students into internships, apprenticeships, and employment opportunities which depends on enhancing the role of some employers with local campuses. In addition, employer relationships are developed or enhanced through the GPSTEM coordination with the workforce development system.

Employer representatives on the program advisory boards for GPSTEM career-focused degree and credit certificates are very valuable contributors who provide input on curriculum design, key skills and competencies, and current trends in labor market demand. As colleges developed academic maps and career pathways, advisory board members were often asked to review these materials as well. The Academic Program Teams have convened state and regional groups of employers to review career pathways and the fit between the skills and competencies needed and the GPSTEM program curricula.

Employers have also been engaged in GPSTEM by participating in job and career fairs, giving tours of their facilities to students, providing speakers for programs and events, helping with resumes and interviewing skills, and ultimately providing information on job opportunities and interviewing program completers. A few colleges do not have Career Services Departments, which impacts these types of activities, as well as the coordination of internship opportunities. For some colleges, employer outreach activities are facilitated in part by GPSTEM Navigators and by partnering with local workforce boards and career centers.

The GPSTEM proposal also calls for increasing internship opportunities. Internships provide a setting for students to make practical application of their classroom learning, gaining experience and developing their skills. These experiences may turn into future job opportunities at the company. To date, ten colleges have reported baseline and annual counts of internships in GPSTEM. At some colleges, the lack of effective tracking systems for internships was cited as a barrier to progress and/or there was not a central coordinator, leaving the administration of internships decentralized within departments. Four colleges have created internship coordinator positions during the grant, primarily supported by non-GPSTEM funds. Colleges have also made use of Navigators to help in the recruitment of employer sites. Lastly, some colleges provided workshops that helped prepare the student for an internship experience.17

Some promising practices for employment partnerships across the consortium:

Berkshire CC has partnered with a local biotechnology start-up company to create a paid internship program as a part of the Massachusetts Life Sciences Center’s (MLSC) Internship Challenge. The state

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17 There was an Experiential Education Committee with representatives from 8 community colleges that produced and published: MCCEO. Experiential Education: Internships & Cooperative Education: A Handbook for Practitioners & Administrators. (2011). The Handbook makes a series of recommendations, including the role of an Internship Coordinator, and stresses the importance of orientation and training for successful internships.
program facilitates the placement of life science students in paid internships across the state. Three Berkshire students have worked as interns; company satisfaction with the student’s education and work ethic has resulted in a commitment for additional internships. The new Hospitality program is taught by industry experts in the region who worked with other employers to get buy-in, design curriculum, and agree to interview program completers.

Cape Cod CC decided to revamp its Engineering program at the beginning of the grant. The GPSTEM grant supported a plan to develop certificate courses that would eventually stack to an AS degree recognized by DHE. During this time period, the college tested employer response to the certificate courses. Based on feedback from its advisory board, CCCC realized there was little employer demand for non-degree certificates in traditional areas; these courses have become traditional classes counting toward a degree. Now that the degree has been approved, CCCC is working on developing certificates where there is demand. For example, the robotics certificate will probably become a certificate in robotics repair—employers are telling them this is a big growth area. “Our main concern is aligning students and employers,” the head of the Engineering Department said; “This grant has been so helpful in connecting us to employers.”

The Greenfield CC advanced manufacturing programs are a partnership with Franklin County Technical School and precision manufacturers in the region along with the workforce board. Instructors are often drawn from local employers. The curriculum includes more hands-on training based on employer feedback through monthly meetings. Employers provide a variety of supports including plant tours, speed interviews for applicants, career fairs, and a pledge to interview and hire program completers. Greenfield participates in the local Upper Pioneer Valley Precision Manufacturing Round Table, organized by the local workforce board and career center. They also participated in regional healthcare employer roundtables: these were very helpful in determining the challenges that local home care and long term care employers have in raising wages, despite additional training. The meeting helped them determine that their original plan for a direct care worker certificate was not feasible.

At Massasoit, the new Veterinary Technician program has had great support from employers in the region. Significant efforts were made revitalizing old and creating new relationships with veterinary employers to support the veterinary technician program. A coordinator for the program, newly hired at the start of the grant, led this effort. A local veterinary hospital has partnered with the college to provide lab space. Other employers have donated supplies and offered internship opportunities. Employers have helped establish an Institutional Animal Care and Use Committee for the program.

MassBay collaborated with Northeastern University’s Center for STEM Education (funded by an NSF grant) to implement the TRANSFORM model for advanced manufacturing. This program aims to retool the skill set of liberal arts college graduates to prepare them for careers in advanced manufacturing. The instructor developed a modular curriculum based on input from local manufacturers and encourages employers to continuously provide feedback on how the curriculum aligns with their business needs. See https://stem.neu.edu/programs/transform/

At Middlesex CC the efforts of a new full-time internship coordinator working with faculty have increased the number of internships, especially in Biotechnology and Information Technology. Employer advisory boards work to ensure that each program’s curriculum is aligned with industry needs. The boards reviewed the academic maps and pathways. Regional manufacturing employers assisted in the development of a new Advanced Precision Manufacturing credit certificate. There are two features in
particular that are based on employer input. While many manufacturing programs in the consortium are offered as non-credit programs in workforce divisions, this program is a for-credit offering, which includes general education courses that the employers see as a foundation for promotion. CAD courses were included because employers believed the sequence is a foundation for progression to an engineering degree, and they want their workers to have this option.

At Northern Essex CC, GPSTEM sponsors CNC/Electronics focused Job Fairs, just prior to each cohort’s graduation ceremony. The advanced manufacturing employers appreciated the smaller industry-specific job fair and have provided very positive feedback. The events are supported by a partnership of local Workforce Boards, the Northeast Advanced Manufacturing Consortium, and local technical schools.

Employers on the Quinsigamond advisory groups for GPSTEM programs have reviewed curriculum and career pathways, provided ongoing input regarding workforce needs and LMI data, and often provided supplies and equipment, e.g., high end tooling for manufacturing programs. Employers have recommended alignment of the Manufacturing Tech program with NAM, the Manufacturing Skills Standards Council and Massachusetts MEP, so students can sit for multiple certifications after completion. GPSTEM helped sponsor STEM Career and Transfer Fairs, which included both employers and four year universities.

Roxbury CC provides employers with access to a portal called Career Gateway, where they can post internships and other paid job opportunities for students. The college has a cooperative education coordinator who offers workshops prior to the internship on developing a resume, dressing for success, using social media; etc. Internship students maintain a daily blog as part of their grade (instead of a written diary) for credit internships.

Academic Program Teams (APTs) were used to support colleges across the consortium to engage with employers during the grant period. Developing partnerships with local employers is an important element of the work that colleges do to plan, develop, and support programs, but having a consistent forum for sharing ideas about how to continue doing that work successfully was helpful to the colleges. In our Year 3 summary of the APT activities (see Appendix), the evaluation team recommended continuing cross-consortium wide employer forums to support colleges in this work. The ability for colleges to participate in statewide employer networks, such as MassBio, also offers them an advantage in getting access to a variety of employers in a particular sector. Additionally, these employer relationships helped boost internships across the colleges, with at least 628 internships for students within GPSTEM programs completed by SY16-17, a 70 percent increase from SY15-16.
**College and Career Navigators and Partnership with Workforce System**

The focal point of the community colleges’ partnership with the Career Centers and Workforce Boards is the grant-supported College and Career Navigator, a role created during the TAACCCT Round 1 grant. The GPSTEM Work Plan provided funding to maintain the Navigator role, including spending time on location at Career Centers. The Navigators were also asked to expand connections with workforce boards and community-based organizations to ensure collaborative activities to address participant and employer training needs.

Navigators provide a wide variety of outreach, recruitment, advising, and referral services to applicants and students. Navigators are the key liaison between Career Center customers and community college programs. Most conducted regularly scheduled sessions at Career Centers and also provided outreach to special populations and community based organizations. During site visits, 13 of the 15 colleges described their relationship with the Career Centers as collaborative and productive.

Although there is much variation in the types and intensity of the specific duties of each College and Career Navigator, the range of activities typically includes the following:

**Outreach and recruitment:** Navigators develop relationships with the staff of Career Centers and CBOs, including adult basic education programs. They ensure that Career Centers are kept informed of college programs and resources. They have a regular schedule of visits to Career Centers and also respond to ad hoc requests for appointments to review training options. Navigators follow up by phone for other referrals and/or set up meetings at the career center or at the college.

**Internal referrals from college departments:** Prospective students that have come directly to the college and express interest in GPSTEM programs are usually referred to Navigators. The source of these referrals could be admissions, financial aid, advising, workforce division, veteran services, etc.

**Career and academic readiness:** Navigators review and assess the applicant’s educational and work history. They review the applicant’s career interests and assist in researching career pathways. Navigators discuss with applicants their academic program options and engage in problem solving to address barriers to success in the program. They begin the application process and may assist students in registering for assessment testing and pre-testing services.

**Personal readiness:** Students often have personal and family issues that are potential barriers to academic success – child care, transportation, housing, basic subsistence needs, etc. Navigators provide referrals to internal and external resources for assistance. Navigators support students to develop their self-advocacy skills to most effectively access available resources.

**Proactive advising:** Navigators work with the Advising Department to provide guidance through the registration process, including assistance with financial aid and Career Center funding. About half of the Navigators maintain a case manager role while the student is progressing through the program. They work collaboratively with academic advisors, monitor progress, get alerts for early warning systems where available, and may serve as an achievement coach making referrals to tutoring and other services.

**Job search assistance:** More than half of the Navigators provide job search assistance and career services. They may provide workshops and/or one-on-one assistance on resume writing, interviewing skills, etc. Navigators develop Career/Job Fairs with Career Centers and Career Services.
work with Career Center staff to assist their joint customers to identify job opportunities and to make job referrals.

Many Navigators provide start-to-finish wrap-around services from admissions through program enrollment to employment and/or transfer after program completion. For Navigators who hand off at some point in the student cycle, their students seamlessly continue with advising and services. These students often receive job search assistance from Navigators when they complete their program.

Across the colleges, more than half either chose to sustain their navigator positions beyond the life of the grant or incorporated the Navigator’s roles into other already existing positions. Some schools that did not retain the navigator role, but found other unrelated roles for these employees to continue working at the college, often in student services, enrollment management or admissions. The following are some key examples of this evolution of the navigator role.

At Berkshire CC the Navigator was retained from the Round 1 TAACCCT grant. She provides start-to-finish case management services and assists all Career Center referrals through registration and financial aid. If a student decides to enter a non-GPSTEM program, the Navigator hands off the student to Advising and continues to work with GPSTEM students with Advising. She uses Web Advisor to track progress, ensures that students register for courses consistent with academic maps, connects with faculty, and refers students to tutoring as needed. She also refers all students at the conclusion of the program to the Career Center for job seeker services. She also was part of the team that developed the academic maps and career pathways for GPSTEM programs. The Navigator has been transitioned to the Advising Department but will maintain (on a reduced level) the relationship with the Career Center.

Bristol CC integrated the Navigator outreach functions within Admissions during the Round 1 grant; Admissions staff are co-located at career centers serving the needs of both credit and non-credit divisions. The GPSTEM-funded Navigator specialized in outreach to local employers and CBOs to support co-operatives/internships as well as job placement services. The Navigator was one of the leaders of the Business Engagement Task Force that coordinated college-wide efforts in the community.

Quinsigamond CC maintained the same navigator from Round 1 through Round 4. The college has committed to sustaining the position beyond the current grant period, as well, and reported that the implementation of the navigator role on campus was one of the key transformational impacts of the Round 4 grant. One example success story that illustrates the kind of impact navigators can have involved a student who arrived in Massachusetts from France. The student met with QCC’s navigator at Workforce Central, the local career center. Since he and his ill father had become homeless, the student needed to quickly learn about and gain the necessary academic and workplace skills to be successful in his new environment. Through meetings with QCC’s Navigator, the student was able to obtain his driver’s license, complete the process of enrolling at QCC, and utilize his technical skills as a freelance computer repair technician. The student enrolled in nineteen (19) credits within QCC’s Computer Systems Engineering Technology Program and planned to join the College’s Honor’s Program in September.

The Navigator at Massasoit Community College had been part of the Round 1 TAACCCT grant. During the GPSTEM grant, she transitioned to a new college position that coordinates section 30, Trade, ITAs, etc. with the local Career Center (there are enough of these participants in their region to support such a position). Over the length of her tenure she solidified a strong relationship with the career centers and
was one of the most active and knowledgeable navigators across the consortium of colleges. Her position was combined with a position in Admissions, so the college believes that their connection with career centers will be sustained. A new navigator was hired and partnered with the original navigator to work on some admission-related tasks (referral and on-site work with career centers including workshops and presentations), conducting employment follow-up surveys for grant reporting, and some advising and career services. Going forward, she may transition to a part-time position in advising.

With the end of grant funding, half of the Navigators (7 colleges) are no longer at the college. At these colleges, the admissions department and/or the workforce division have incorporated some degree of partnership with the career centers. Their presence at career centers is definitely reduced. At the other 8 colleges, the Navigator have transitioned to new positions in related departments such as admissions, advising and community education. While only three have retained the main aspects of their Navigator role, the presence of the eight has provided opportunities for the former Navigators to assist the colleges to build ongoing relationships with career centers. Eleven Project Managers have continued in some role at their college; some were Deans or faculty at the start of the grant and took on project management as an additional role. Some have returned to their previous positions and others have transitioned to new staff positions. These staff members provide some additional organizational memory for work with career centers and the workforce system.

As the economy has improved in Massachusetts over the course of the grant, there has been a marked decline in Career Center customers interested in training opportunities. From FY14 to FY17, career center customers decreased statewide by 20% (from 186,000 to 149,000) and available funding for training slots decreased by 15%.

Collaboration between the state workforce system and community colleges, which was emphasized through the navigator position being introduced during the Round 1 TAACCCT grant, was further strengthened in this Round 4 grant. Though not every college took the same approach to incorporating the navigator role as originally conceived in Round 1, the institutional knowledge gained by supporting that role (even for just a few years), and the relationships formed between colleges and their local one-stop career centers, was indeed transformational. There is much better understanding of community college offerings that can support job seekers with short-term training grant funds, and better understanding of the requirements that career centers have for providing this training and how to serve the local unemployed population. Round 1 began during a period of recession in the state and Round 4 ends in one of the tightest labor markets Massachusetts has seen. Many of the people currently looking for jobs have been unemployed for extended periods or have never had strong attachment to the labor market. The challenges that these students have in being successful have forced increasing collaboration and creativity among colleges and the workforce system to meet their needs.

The Statewide Project Director took the lead in organizing several consortium-wide meetings with college’s workforce system partners from career centers and workforce boards. One meeting, held in May 2016, offered technical assistance to colleges regarding the Section 30 training program. The meeting fostered including the community colleges into the state’s regional planning process for WIOA. Navigators continued to be a key conduit to supporting the relationship between the community colleges and local one-stop career centers, though not all colleges have found ways to sustain the original navigator position.
Greenfield CC, a school that had a navigator during the grant, but did not sustain the position beyond the grant period, highlighted that communication between all partners involved in the GPSTEM initiative, including their local vocational-technical school, career center and regional employment board, area employers and other CBOs, increased significantly during the grant period, thereby creating a better service environment for area students and clients.

Massasoit CC, a school that integrated the navigator position into other campus departments (enrollment management and advising), reported that the development of a new protocol for enrolling and onboarding Section 30, TRADE, and ITA students was a transformational outcome from the GPSTEM grant.
**Academic Program Teams**

The activities and accomplishments of the Academic Program Teams (APTs) were explored in the Year 2 and Year 3 Interim Evaluation Reports. The APT section in the Year 3 Report is included as Appendix A. Overall, the APTs were useful not just as mechanisms for coordinating and completing both state-wide and local GPSTEM work plan goals, but also as vehicles for cross-campus collaboration and coordination.

Early on in the grant implementation, the GPSTEM Leadership developed a strategy to meet the goals set forth in the grant proposal and scope of work approved by the U.S. DOL. The Academic Program Teams (APTs) were organized by GPSTEM program of study: Advanced Manufacturing, Computer Information Science/Information Technology, Engineering, Health Sciences and Life Sciences/Biotechnology. GPSTEM leadership decided to use professional consultants with experience focused on the industries most closely aligned to the majority of GPSTEM programs of study to facilitate APTs. Faculty, staff, administrators, and GPSTEM Project Managers participated in the APTs, totaling about 120 unduplicated participants, with each APT having between 35-40 members. Following faculty contract guidelines, GPSTEM Leadership offered supplemental pay for faculty work on the APTs, which was considered outside of their regular duties. In the end, after the Engineering and Manufacturing groups were merged, four groups were facilitated over the course of Year 2 and into Year 3 (period of performance was planned for fall 2015 – spring 2017).

The APTs were charged with developing and validating curriculum and conducting inventories of campus implementations of online courses, simulations, academic maps, STEM meta-majors, articulation agreements with 4-year colleges, internships and career placement. In summer 2016, a process was created by which faculty could submit proposals to be paid for clearly defined work and/or research related to the APT goals.

In June 2016 the GPSTEM leadership organized an APT Learning Summit for all APT participants and GPSTEM project managers. This event included a webinar with Gerry Hanley, Ph.D., from California State University, who is also Director of SkillsCommons and Executive Director of MERLOT, the California State University OER system. His presentation on using and sharing OER was followed by several APTs presenting some of the best practices developed through their work. The CIS/IT APT showcased simulations that had been further developed and integrated into coursework by a few colleges through the grant. Breakouts reviewed academic maps, other simulations, industry/employer intelligence, articulation agreements, and labor market information. In May 2017, another APT Learning Summit was held focusing on best practices from the APTs including the development of vLabs simulations in Biotechnology at Bunker Hill CC, the development of a mobile app to support internships in the CIS/IT programs at Massasoit CC, modularized curriculum and competency based education in advanced manufacturing at MassBay CC, and OER development in Health Sciences at Bristol CC.

All APTs struggled to get team members from each college to engage in the team work consistently. A “Work to rule” action connected to union/administration contract negotiations also had a dampening effect on participation, though the stipends offered for participation should have offset the decision. Additionally, communication, broadly speaking, was a challenge between the APT facilitators, GPSTEM leadership, and college level GPSTEM project managers. Communication problems were also evident in

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18 Since several campuses had one department for both Engineering and Advanced Manufacturing programs, these two academic areas were merged into one APT.
the unevenness of deliverables uploaded to the GPSTEM Groupsite. However, by the end of Year 3, facilitators reported improved communication with GPSTEM leadership.

Despite the challenges, the APTs were one of the key ways that colleges in the consortium were able to collaborate and learn from one another. A survey of faculty and staff participants found that connecting with colleagues from other community colleges around the state through the APT was very useful. Similarly, working with colleagues across campuses was seen as one of the major overall successes or accomplishment of the APTs. Articulation agreements, academic maps, and OERs were cited as the most useful products participants developed through their APT work. Although a lot of progress on articulation agreements was made through the state’s Mass Transfer initiative and Commonwealth Commitment, the APTs functioned as places where faculty, who were often on the front lines of connecting students to 4-year programs, could learn from one another about programs of study that were commonly challenging or amenable to creating articulations. Participants largely took what they learned from other campuses and the projects they worked on back to their individual campuses. Several survey respondents said they were sharing their learning with colleagues in their department, had made presentations to faculty, or had communicated via e-mail or in person about their work. While the faculty and staff who participated almost universally cited time as a challenge to full participation in the APTs, they felt the opportunities offered to convene via phone and in-person were valuable.

The APTs were also a useful vehicle for employer engagement. Connections to labor market information and industry experts helped bring faculty in touch with the needs of local employers and helped inform curricula and career pathway development. Developing partnerships with local employers is certainly an important element of the work that colleges do to plan, develop, and support programs, but having a forum for sharing ideas about how to continue doing that work successfully was helpful. In our Year 3 summary of the APT activities (see Appendix), the evaluation team recommended continuing consortium-wide employer forums to support colleges in this work. The ability for colleges to participate in statewide employer networks, such as MassBio, offers them an advantage in getting access to a variety of employers in a particular sector. Additionally, allowing for colleges to share what they are hearing across industries is also valuable. For example, employers that engaged with both the CIS/IT and Life Sciences/Biotech APTs noted that two-year graduates did not have the requisite soft skills that they were looking for in new hires. This intelligence can help colleges come up with cross-program solutions to meeting employer needs.

A summary of each APT’s work follows:

Advanced Manufacturing/Engineering: This group focused on engaging with employers for feedback on career pathways and labor market demand for graduates. Several regional employer engagement meetings were held with college faculty across the state. A particular focus in Year 3 was work on articulation agreements with four-year institutions. One of the APT faculty participants noted the substantial and successful effort made by multiple colleges to update articulation agreements within the state college and university system. We heard that the sharing among colleges about equipment choices, curricula, challenges with articulation agreements, and employer engagement helped participants learn from one another. Several faculty spent time researching simulation programs for use in and out of the classroom. Some found ways to expand limited campus lab space by implementing virtual lab programs that could be used by students off campus and asynchronously.
CIS/IT: The CIS/IT APT was one of the more robustly attended APTs. Faculty from 9 colleges were active (and three more contributed intermittently) with faculty from around 5 campuses participating on an ongoing basis. The most active faculty could see the professional development opportunities available through participation and took advantage of the workshops and other developmental activities the APT offered. The facilitator, World Education, Inc. (WorldEd), described the faculty in the APT as very supportive of each other, functioning like a learning group. The CIS/IT faculty had a shared sense of system building. The GPSTEM RFP process for funding work through the APT was a positive influence and gave shape to the overall CIS/IT APT work. Almost all participating colleges developed at least one pathway or map, and many developed several. Several colleges’ faculty used the APT to support their efforts developing articulation agreements. Eight colleges developed and posted on Groupsite documentation of simulations currently in use in certain CIS/IT programs and with descriptions of how other colleges in the APT could make use of them. The CIS/IT APT also sponsored an employer forum at the end of the grant period at Dell EMC in Franklin: “Building a Skilled and Diverse Workforce Pipeline.” Faculty at several colleges undertook research and product development regarding internships for their students.

Health: Facilitators from WorldEd noted that the fact that multiple statewide initiatives related to Allied Health education and training led both to some support and attention, but also confusion, among participants from the colleges. They found DHE was very helpful connecting the facilitators to workforce development boards to facilitate employer engagement and helped move those conversations in ways that respected the input and expertise of the employers. Facilitators and DHE’s representative learned that connecting with employers was very new to most faculty who did not hold leadership positions. Berkshire, MassBay, Holyoke, and Mt. Wachusett all used the APT to support their work on academic maps for their programs. Faculty from several campuses worked on career pathways for certain programs. Berkshire worked on their physical therapy assistant pathway. Bristol and MassBay worked on articulation agreements in the APT. Holyoke and Massasoit spent time developing simulation activities for their programs. Faculty at Berkshire, Bristol and Roxbury worked on researching OER for their health programs.

Life Sciences/Biotechnology: The Life Sciences APT was facilitated by MassBioEd, the Massachusetts Biotechnology Foundation. Its knowledge of biotech employers’ skill needs and hiring patterns provided a strong vantage point for this APT work. The APT’s work on career pathways was shaped by both MassBioEd’s labor market data and faculty’s articulation of coursework and competencies needed for their individual college’s degrees. By the end of the initiative, 10 colleges had developed and filed on Groupsite one or more maps with clearly presented information. In recognition of the importance of articulation, the facilitator devoted significant APT time and attention to the issue. There was significant progress in use of simulations in Life Science programs as a result of the GPSTEM APT. Prior to the launch of the APT, MassBioEd’s survey found that the use of simulations was embraced only sporadically and the opinion was frequently expressed that work in real labs on actual equipment was preferable. GPSTEM’s emphasis encouraged faculty with different views to explore options. MassBioEd sponsored a meeting of APT members with five well-known biotech firms in Massachusetts mid-way through the initiative. By the end, MassBioEd developed a final report making recommendations to Biopharma employers to help support the talent pipeline that community colleges have been working to supply: Increase internship opportunities for 2-year associate degree graduates; Raise awareness of the
competency of associate degree graduates among hiring managers; and Maintain relationships with community colleges.
Prior Learning Assessment (PLA)
Credit for prior learning was a priority of the Massachusetts GPSTEM grant application, which proposed the creation of a PLA Think Tank that would include all 15 colleges to share expertise, build PLA capacity, and promote consistency in policies for the award of academic credit for prior learning. Given recent trends in declining enrollments, the hope was that increasing Credit for Prior Learning (CPL) options and access would make community colleges more responsive to the needs of adult learners with work and/or educational experience.

Implementation
The Think Tank convened in December, shortly after the commencement of the grant, followed by additional convenings in early 2016. During this time, the 15 college CAOs agreed to fund a plan presented by North Shore CC to lead a statewide CPL/PLA Consortium. NSCC would collect and collate information from the colleges and identify areas for standardization and consistency. Part of the proposal was to create a consortium-wide online portal for potential and current students to find opportunities for PLA and credit at the state’s community colleges.

During the next 18 months, the Consortium met regularly to share expertise, build PLA capacity, and promote consistency in policies for the award of academic credit for prior learning.

The Consortium undertook a variety of activities to achieve these goals. For example, NSCC developed a Glossary that proposed definitions for some 40 PLA-related terms. While some of the terms in the Glossary are familiar and have agreed-upon meanings, such as Joint Services Transcript, other terms were less familiar and discussion of them helped promote standardization of terminology and procedures across the colleges.

Another example--colleges were asked to complete a “PLA Grid” describing their practices for awarding credit for prior learning, a goldmine of cross-college information and generalizations. For example, most Massachusetts colleges use examinations – both national ones such as CLEP, AP, and DSST as well as their own departmental challenge exams. Some colleges have more standardized approaches for using credit for credentials, licenses, military, etc., whereas others loosely group them with portfolios. The “Grid” activity also promoted sharing of knowledge and experience.

During the spring 2017 semester, a series of five regional trainings was held to explore CPL/PLA issues, to introduce the new CPL portal, MyExperienceCounts.mass.edu, and to provide professional development. The training sessions were hosted by Quinsigamond, Bristol, Bunker Hill, North Shore, and Greenfield Community Colleges. Almost 200 faculty and staff attended the five regional trainings. All 15 community colleges were represented, with attendance approximately split between faculty and staff positions. Attendee evaluations of the sessions were overwhelmingly positive and attendees reported that they were more likely to recommend CPL to students as a result of the training.

The My Experience Counts website went live September, 2017. (https://myexperiencecounts.mass.edu/home) It was designed to benefit Individuals (especially adult learners) applying to community colleges who have accumulated learning from work, life and military experiences as well as documented learning through prior examinations or other evidence of competency attainment. My Experience Counts (MEC) is a website for applicants to any of the fifteen
Massachusetts community colleges that guides the individual through a CPL Wizard to prepare a standard profile of their prior experiences and learnings. The CPL Wizard assists students to identify potential areas of CPL related to their interest in Associate degree or certificate programs at the community college of their choice. Each college has created a crosswalk of programs and courses plotted against the available CPL options for each course. It is a bit too early in the deployment of the website to assess the volume of applicants or the satisfaction of such applicants with the hand-off to the local college.

**Accomplishments**

GPSTEM collected data on CPL students and credits during the grant period. There was no prior tradition of collecting such data from colleges and no guidelines for reporting. A couple of colleges lacked collection and reporting capacity and others lacked the ability to sort students/credits by program enrollment. Over the course of the grant, colleges reported that 466 GPSTEM students received 3,238 credits for prior learning and a total of 5,216 students earned 29,005 credits across all programs. The annual number of CPL students in GPSTEM programs more than doubled during the grant. The average number of CPL credits per student was somewhat greater for GPSTEM students at 7 credits compared to non-GPSTEM students at 5.5 credits.

Based on interviews and reviews of other documents, about one-third of the colleges already had robust and comprehensive CPL systems at the beginning of the grant. The other colleges had limited and incomplete approaches to CPL. When we reviewed the ten colleges with effective participation in the Think Tank (regular attendance, active participation, follow-up activities on their campus after meetings), seven of the ten colleges had improved their CPL program in documented ways to a more robust system – expanded CPL options such as challenge exams, better marketing of CPL to prospective students through their website and catalogs, more consistency across divisions and departments, better integration with admission process, etc. (The other three colleges already had comprehensive policies and procedures.) Over the course of the GPSTEM grant 466 GPSTEM participants earned 3,238 credits for prior learning, an average of 7 credits per student. The share of students in GPSTEM programs earning credit for prior learning more than doubled over the life of the grant.

**Issues**

The Evaluation Team identified several issues, based on information from Consortium meetings and individual interviews with CPL representatives. A major one is that too often CPL credits have not been accepted as students transfer to four year colleges (or even other two year colleges). Of particular concern is when students are awarded CPL credits and only find out about the issue when they later transfer to other institutions. A number of interviewees said that this factor seriously dampened support for CPL at their colleges, including among faculty.

This is important, given that faculty involvement and support are crucial to comprehensive PLA/CPL systems. Faculty are responsible for the development of course content and ensuring that students in their courses achieve the learning outcomes and competencies needed to progress in their career goals. It is of concern when some colleges cite “faculty resistance” as a barrier to CPL.

One factor that accounts for both the lack of transferability of CPL and weak faculty support is the absence of transparent statewide standards for granting credit for prior learning. Both faculty and colleges considering transfer credit want assurance that credit granted meets the standards of regularly-
granted credit for the course in question. Faculty want assurance that students can’t avoid challenging coursework through a poorly defined process. Transfer colleges want assurance that the standards for CPL meet the standards of the course for which it’s been granted.

The work accomplished by the CPL Consortium and My Experience Counts show how a voluntary standardization process can work and highlighted several colleges that have models for transparent standards across the college.

Looking ahead

The website is going to be sustained after the end of the grant. The Executive Office of Education is providing technical support and hosting into the foreseeable future. North Shore CC was awarded a DHE Performance Incentive Fund (PIF) grant that will continue the kind of activities described here, as well as fund some enhancements to the website. It would be helpful if the consortium approach provides additional opportunities for professional development and cross-college training on Credit for Prior Learning. The continued sharing of best practices should encourage working towards more consistency across the colleges in the types of CPL options and methods utilized by each college. It should also provide a forum for continued discussions on challenges such as the transferability of CPL credits and on a common approach to expanding the use of effective but resource intensive methods such as portfolios.
Open Educational Resources
In our Year 3 evaluation report, we detailed the significant progress made by the Go Open Initiative in developing and incorporating open educational resources (OER) into community college courses throughout GPSTEM programs and the entire college consortium (see Appendix C). OER are teaching, learning, and research resources in any medium – digital or otherwise - that reside in the public domain or have been released under an open intellectual property license that permits free access, use, adaptation and redistribution by others with no or limited restrictions. OER include full courses, course materials, modules, textbooks, streaming videos, tests, software, and any other tools, materials, or techniques used to support access to knowledge. During early site visits, some colleges expressed mixed feelings/hesitancy about using OER. Some of this hesitancy seemed to be rooted in a lack of familiarity with OER and uncertainty about the quality of OER materials. Others were concerned with finding the resources to support the time and effort to identify or develop resources and then integrate into courses. However, this reluctance was ultimately overcome by the work of the initiative.

Through three rounds of grant funding, 108 proposals were approved and funded. A total of 103 faculty members worked on one or more projects. Some projects had two or more faculty working on a joint project and some faculty worked on more than one project. All fifteen community colleges in the consortium received at least one grant. Faculty were asked to report on the number of students in all sections of the courses with OER materials developed through their projects. The estimated number of students impacted through December 2017 was over 9,400. Student savings were calculated by taking the price of the existing textbook (purchased new) or the costs of other materials previously used in the courses, and multiplying by the number of students in all sections of the redesigned courses where OER materials replaced these textbooks or materials. The estimated savings to the 9,400 students was over $1.3 million through December of 2017.

Across all courses, the average savings per student was $145. Forty percent of the projects involved the development of OER materials for mathematics, natural and physical sciences, manufacturing technology, computer information science and health science courses. The average savings for students in these classes was $180 per student. In any case, the relatively modest investment of $115,000 in GPSTEM faculty grants has resulted in $1.3 million in student savings to date.

Faculty and OER coordinators reported impacts beyond the development of the OER materials. As with other GPSTEM work groups, faculty and staff appreciated that the process allowed more opportunities for collaboration within their college and across the consortium. Faculty and staff were supported by many chances to learn, share, and network through the training sessions and summit meetings. The success and enthusiasm of these faculty changed attitudes at their campus and encouraged other faculty to consider OER as an alternative to textbooks. The success of the projects targeting math and science courses is helping to address some of the concerns and skepticism about the challenges of developing OER for science courses.

Many faculty commented that, in addition to the cost savings, the OER materials are more accessible and increase student engagement with course content. There is not sufficient data yet to confirm these impressions with hard data on student success and retention in the courses, but this should be an area for future research. Many colleges do feel the initial results are very positive and have either committed

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their own funds or are pursuing outside grants to continue projects at their college. The savings and other reported positive impacts have convinced even reluctant faculty to consider OER offerings.

The MCC Go Open Council and its members have already begun planning some activities to sustain the momentum of the GPSTEM-funded Go Open OER initiative after the grant. GPSTEM funding has supported the establishment of an OER Commons Hub for the MCC Go Open Project. The site is being built through the efforts of Middlesex Community College and several other members of the council. This site will serve as a central repository for all materials created through the GPSTEM Go Open Project as well as OER developed through other current and future initiatives at the individual colleges.

In order to support students in the process of transferring from community colleges to four-year public colleges, there is a Mass Transfer block of general education courses. The Go Open Project has resulted in OER courses across the consortium for the categories within the Mass Track Block, although a complete set of OER courses is not yet available at any one individual college. The Council will continue to work on coordinating the efforts of all members to create clear pathways using Mass Transfer Block and OER courses for our students. The next objective will be to create full OER degree pathways.

In order to continue the momentum of this project, additional sources of ongoing funding will be needed. The documented cost savings shown by the Go Open Project, together with growing national research on the OER impact on course completion and program retention, demonstrates that OER is a good investment and should support successful fundraising. Individual colleges have received some small grants, but funding for the consortium has not been secured. Two colleges have received DHE Performance Incentive Fund (PIF) grants to continue OER work at their campuses. PIF grants may be a potential source of funding for the MCC Go Open Council to support OER courses across the consortium.

While there has been progress across the community colleges, the future of OER in the Commonwealth would be enhanced by a collaborative system which includes four-year state colleges and universities. Working with all of public higher education would greatly increase savings for all students, increase the quality of OER available, and support collaboration among faculty at all institutions.
Appendix A: Academic Program Teams (from Year 3 Interim Report)

In the Year 2 Interim report, the GPSTEM Evaluation team reviewed the concept of the Academic Program Teams (APTs) in the GPSTEM project, findings from surveys of participants and GPSTEM campus project managers, and interviews with APT facilitators. For this Year 3 report we focus on reviewing the accomplishments and work completed through the APTs on the consortium wide goals and on college’s individual programs, as they wrap up their work. We followed up with the GPSTEM facilitators before they finished their work for final thoughts and also interviewed some representatives from the state’s Department of Higher Education (DHE) who had participated in the CIS/IT and Health Sciences APTs.

APT members were supported by funds to both participate in general APT work and meetings, as well as to work on specific proposed projects that would help multiple campuses meet consortium-wide GPSTEM goals. Participants often shared ideas, practices and learnings that were used by other faculty members and participants to accomplish their own campus deliverables and goals. The following summary primarily highlights deliverables that were directly funded as an accepted proposal project through the APTs.

As of September 2017, three of the APTs (Advanced Manufacturing/Engineering, Health Sciences and Life Sciences/Biotech) had completed their work. Continuing into the fall of 2017, only the CIS/IT APT had an active work plan. CIS/IT had an additional employer engagement meeting in December 2017. The following table details which colleges participated in each APT.

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<tr>
<th>College by APT</th>
<th>Advanced Manufacturing/Engineering</th>
<th>Computer Info Systems/Info Technology</th>
<th>Health Sciences</th>
<th>Life Sciences/Biotechnology</th>
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Advanced Manufacturing/Engineering

After a change in facilitator for the Advanced Manufacturing/Engineering APT from Thomas P. Miller Associates (TPMA) to the GPSTEM Statewide Project Manager, the group focused on engaging with employers for feedback on career pathways and labor market demand for graduates from their programs. Several regional employer engagement meetings were held with college faculty across the state. Another focus in Year 3 was work on articulation agreements with four-year institutions. One of the APT faculty participants noted the substantial and successful effort made by multiple colleges to update articulation agreements within the state college and university system. We heard that the sharing among colleges about equipment choices, curricula, challenges with articulation agreements and employer engagement helped participants learn from one another. Massasoit worked to get its engineering program off the ground while taking advantage of an outside state grant for lab renovations and equipment. Quinsigamond also worked to continue to upgrade their advanced manufacturing and engineering programs to take advantage of their new building and lab space, including hiring students as interns to work in their labs.

Academic Maps and Career Pathways

During Year 2, TPMA had done work on outlining what career pathway templates could look like for the colleges. MassBay faculty used the APT to support their work developing academic maps and career pathways for engineering and manufacturing programs. Middlesex worked on developing pathways for its Engineering/CAD certificate and sub-disciplines within their Engineering Associate’s Degree program which could be for employment, not just transfer.

Articulation Agreements with Four-Year Institutions

Several colleges’ faculty used the APT to support their efforts developing articulation agreements. Northern Essex and North Shore developed engineering transfer crosswalks, while Bunker Hill developed an inventory of calculus based physics. Mass Bay worked on documentation of their engineering transfer programs.

Simulations and Online Courses

Several faculty spent time researching simulation programs for use in and out of the classroom. Some found ways to expand limited campus lab space, by implementing virtual lab programs that could be used by students off campus and asynchronously. Cape Cod Community College purchased a robot and by the end of the grant period students could program the robot without assistance. The robot was used for classroom teaching, but also as a program recruitment vehicle at orientation and registration events. Faculty at Cape Cod also produced a report on engineering and manufacturing related simulations being used across the community colleges in the state. Bunker Hill developed an inventory of simulations being used in Physics programs. North Shore did work researching digital logic simulators and MATLAB certification options. Faculty also used the APT meeting time to explore the possibility of statewide community college consortium level purchasing for MATLAB. North Shore faculty also used the APT to support the development of introduction to engineering and physics modules for online courses.
Competency Based Education

At the May 2017 APT Summit MassBay presented on using modularized curriculum and competency based education in engineering to retrain liberal arts graduates for careers in manufacturing. This was done to appeal to the industry’s demand for workers skilled in geometric dimensioning and tolerancing. Some of the students were currently employed in manufacturing and some were unemployed and looking for a new career. The curriculum allows for more flexible start dates for the program and content tailored to a company or student’s needs. It also helps facilitate credit for prior learning approvals. This has resulted in increased enrollment for the program.

Open Educational Resources (OER)

North Shore faculty researched and documented OER materials for use in their courses. Greenfield and Roxbury conducted research into whether it would be possible to incorporate OER for their courses and programs.

Computer Information Systems/Information Technology (CIS/IT)

The CIS/IT APT was one of the more robustly attended APTs. Faculty from 9 colleges were active (and three more contributed intermittently) with faculty from around 5 campuses participating on an ongoing basis. The most active faculty could see the professional development opportunities in participation and took advantage of the workshops and other developmental activities the APT offered. The facilitator, World Education, Inc. (WorldEd), described the faculty in the APT as very supportive of each other, functioning like a learning group. The CIS/IT faculty had a shared sense of system building. The GPSTEM RFP process for funding work through the APT was a positive influence and gave shape to the overall CIS/IT APT work. The choice of projects depended on the interests of the individual faculty with the most intense work occurring in articulation agreements and career pathways/maps, and some focus on internships.

Academic Maps & Career Pathways

A DHE representative who participated in the CIS/IT APT noted that the CIS/IT field is a challenging one, where the different disciplines require different credentials and skill sets across hardware, software, cybersecurity, networking, etc. She believed that prompting IT and CS faculty to articulate pathways helped address the challenges. The APT also supported advancing the objectives of a DHE consortium grant between UMass Boston and four community college campuses to develop a cybersecurity pathway.

The APT was very productive: eleven of the twelve participating colleges developed at least one pathway or map, and many developed several. A good example comes from Mass Bay, where the grant/APT stimulated significant work by two faculty members who developed pathways in web development, web design, and computer science as well as meta-majors in cybersecurity and advanced cybersecurity.

Articulation Agreements with Four-Year Institutions
Faculty from five colleges undertook projects to establish or update agreements with one or more 4-year colleges, some on their own initiative at first and then all funded through the GPSTEM RFP process. North Shore is an excellent example, where one individual accomplished significant work to build transfer agreements with the UMass campuses. Now the faculty are working on integrating what was learned about requirements from 4-year institutions that need to be built into NSCC’s curriculum. Other examples are (1) Mt. Wachusett’s development of agreements with nearby Fitchburg State University and a private college, St. Joseph's College; (2) the Health Information Technology/Networking program at Bunker Hill which developed an articulation agreement to support their students at UMass Boston; and (3) Middlesex’s computer science transfer options.

The DHE representative appreciated the APT’s contribution to development of the MassTransfer Associate to Bachelor’s (A2B) pathway to Computer Science. The APT helped compensate faculty for time spent rearranging the sequencing of courses or developing new, more rigorous courses to meet transfer requirements. Progress would have been much slower in the absence of faculty compensation.

_Simulations and Online Courses_

Eight colleges developed and posted on Groupsite documentation of simulations currently in use in certain CIS/IT programs and with descriptions of how other colleges in the APT could make use of them. Here is one example from Massasoit: “Use to create visually captivating presentations; students can create video slideshows using their own photos and music” for Animoto. Three colleges developed and posted on the GPSTEM Groupsite documentation of online courses/programs in CIS/IT.

_Alignment with Workforce Needs_

Faculty from two colleges worked on topics regarding alignment with the labor market. The Bunker Hill HIT program conducted research to identify labor market needs, core competencies, and certifications and industry recognized credentials. Middlesex developed an “Information Technology Cybersecurity Transfer Program Eligibility List of Industry Recognized Credentials and Exams.”

The CIS/IT APT also sponsored an employer forum at the end of the grant period at Dell EMC in Franklin: “Building a Skilled and Diverse Workforce Pipeline.” The DHE staff person who had worked with the APT presented labor market information showing “outrageously low” representation of women and people of color in the field – an argument for the community college pipeline—and also demand from employers for employability and innovation skills as well as technical skills. A 3-employer panel discussion followed. The manager of the Dell EMC Associates Program—a 2-year program to prepare the leaders of tomorrow—seeks interns from the community colleges and has openings for a small number of graduates. Its recruitment material for Bunker Hill says, “IT Internships are designed to transform passionate and ambitious college graduates into future leaders in the IT profession.” The CEOs of two small firms strongly emphasized their need for candidates with critical thinking skills and a grasp of “reality,” which, in their experience, did not come with a community college degree. Both had decided against accepting community college interns because they didn’t have the non-technical experience and skills.

Faculty at several colleges undertook research and product development regarding internships for their students. At a couple of colleges, faculty scouted out and posted materials relevant to obtaining internships. At Massasoit, one faculty member carried on an extensive project for her selected field: mobile app development. She compiled as exhaustive a list as possible of firms in the region seeking to
hire people with skills in mobile app development and also a list with a frequency analysis of the skills sought taken from job advertisements. She also followed up with for-profit and non-profit firms inquiring about internship opportunities.

Health Sciences

Facilitators from WorldEd noted that the fact that there are multiple statewide initiatives related to Allied Health education and training led both to some support and attention, but also confusion, among participants from the colleges. They found DHE was very helpful connecting the facilitators to workforce development boards to facilitate employer engagement and helped move those conversations in ways that respected the input and expertise of the employers. Facilitators and DHE’s representative learned that connecting with employers was very new to most faculty who did not hold leadership positions. The facilitators observed growing knowledge and awareness of other college practices and programs among faculty participants over the course of the APTs. There was some intent on sharing and not duplicating efforts. One facilitator noted, “In these kinds of efforts the fruits of relationship development and shared understanding may not be immediately measurable, but can become visible eventually.”

One of the highlights of this work was Holyoke Community College’s Foundations of Health meta-major and development of one of the state’s first community college Community Health Worker (CHW) programs. In this case, Holyoke’s GPSTEM project manager was also the faculty member leading development of the CHW program. The work on the CHW program was considered particularly timely and useful by the APT facilitators, given the state’s efforts to professionalize the job and allowed for creation of a well-integrated network of community colleges and community organizations. The Holyoke project manager was also able to connect and share with Berkshire Community College, in particular, and others through the APT meetings and other venues to share what she was learning as she developed the program, met with employers and recruited students. This was a great example of the APT being a useful forum for cross-campus sharing of best practices and information. In fact, going forward Holyoke will continue to lead an ongoing group of community college faculty from around the state who are working on CHW programs.

The DHE representative who participated in the APT supported participants by providing labor market information, making connections with employers, and informing participants about statewide initiatives. In addition to the importance of the CHW program development at Holyoke, he observed that the APT participants’ work on building ladders—EMT programs that feed into paramedics, dental hygienist programs that feed into dental assistants—was also useful.

Academic Maps, Meta-Majors and Career Pathways

Berkshire, MassBay, Holyoke and Mt. Wachusett all used the APT to support their work on academic maps for their programs. As mentioned, Holyoke worked on their Foundations of Health Associate’s Degree, along with several certificate programs, including CHW, direct care worker and medical billing and coding. Berkshire also worked on their CHW map, in addition to maps for the physical therapy assistant program, associate’s degree in science with a physical fitness option, and physical fitness certificate. MassBay focused on the maps for medical coding, phlebotomy and central processing technology. Mt. Wachusett developed maps for their pre-pharmacy liberal arts & sciences track, health information management and CHW certificate.
The facilitators saw the work on meta-majors early-on as broadening people’s thinking in terms of how best to offer students broad options in health care. Bunker Hill created a good option for helping students not only get into the exclusive pathways, but also how to match themselves with other careers that may be a better fit without having to start from scratch. In addition, Bristol, Holyoke, Middlesex and Mt. Wachusett faculty all did work on meta-majors for health sciences.

Faculty from several campuses worked on career pathways for certain programs. Berkshire worked on their physical therapy assistant pathway. Bunker Hill worked on pathways between central processing technology and surgical technology, starting with either program, and MassBay also worked on a central processing to surgical technology pathway. Greenfield worked on pathways for programs leading to allied and administrative health occupations. Holyoke worked on pathways starting with CNA, then LPN, terminating with RN. They also worked on pathways for certified medical assistants to move from certificate through to an associate’s in Foundations of Health. MassBay developed a broad health care career pathway using APT resources.

**Articulation Agreements with Four-Year Institutions**

Bristol and MassBay worked on articulation agreements in the APT. Bristol focused much of their work on an articulation between their health care information degree and UMass Dartmouth’s four-year program. MassBay worked on their MassTransfer health science related agreements.

**Simulations**

Holyoke and Massasoit spent time developing simulation activities for their programs. Holyoke created a vital signs and simulation lab experience for their Connection to Careers in Health course and a home visit simulation for their CHW program. Massasoit created a Welcome to Clinical for Respiratory Therapy simulation activity.

**Open Educational Resources (OER)**

Faculty at Berkshire, Bristol and Roxbury worked on researching OER for their health programs. Berkshire developed a report vetting several OER and Bristol found a series of videos and other resources they could use in their phlebotomy program instead of textbooks.

At the May 2017 APT Summit, Bristol offered a presentation on their development of 13+ training videos and use of OER instead of a textbook in the Phlebotomy program. Faculty were driven to work on this when they found students were dropping out of the program because they couldn’t afford the three required text books. It took several years to get this up and running. They involved students in the development of the materials and study guides. Students also participated in creating the videos for future students.

**Prior Learning Assessment**

Bristol used the APT to support their work in developing a prior learning assessment catalog for the college. STCC worked on trying to convert some of the curriculum from their CHW certificate focused on children’s behavioral health into a prior learning assessment that would award up to 9 credits.
Life Sciences/Biotechnology

The Life Sciences APT was facilitated by MassBioEd, the Massachusetts Biotechnology Foundation. Founded in 2001 “to build a sustainable life sciences workforce in the region through educational programs,” MassBioEd commissioned (along with its affiliate, MassBio)\textsuperscript{20} an industry endorsement procedure for biotechnology programs at community colleges in 2012. As a result, MassBioEd had developed an understanding of life sciences programs in Massachusetts’ community colleges that positioned it well for facilitation of the GPSTEM APT. Its knowledge of biotech employers’ skill needs and hiring patterns provided a vantage point, unique among the APT facilitators, from which to bridge the GPSTEM’s focus on students’ college completion and the industry oriented perspective of employers.

Academic Maps & Career Pathways

Prior to the start-up of the APT, MassBioEd undertook a baseline survey of the 9 colleges it identified as having biotech courses/programs with regard to their status achieving GPSTEM’s deliverables. For academic maps, it found “a wide spectrum,” ranging from no maps to presentations of required courses in the proper sequence. Faculty who responded recommended that maps be developed to correspond with students’ plans—either employment after completion or transfer to a 4-year institution.

The APT’s work on career pathways was shaped by both MassBioEd’s labor market data and faculty’s articulation of coursework and competencies needed for their individual college’s degrees. At the March 2016 APT meeting, MassBioEd presented detailed labor market information for 3 industry sub sectors (biomanufacturing, research labs, and medical devices) across 4 Massachusetts regions. Two-year graduates represented a declining percentage of hires (16% in 2010, 13.8% in 2015). By the end of the initiative, 10 colleges had developed and filed on Groupsite one or more maps with clearly presented information regarding graduates’ future options. For example, Mt. Wachusett developed maps for 3 tracks: Biotechnology/Biomanufacturing; Liberal Arts/Biology; and Liberal Arts/Chemistry.

Articulation Agreements with Four-Year Institutions

Employers’ increasing preference for 4-year degrees placed a premium on community colleges’ ability to establish articulation agreements with 4-year colleges, especially those in their region (the preference of most students). MassBioEd’s baseline survey found that all but 2 programs had some articulation agreements, but there was much confusion among faculty regarding the MassTransfer program and what programs could transfer and which ones could not.

In recognition of the importance of articulation, the facilitator devoted significant APT time and attention to the issue, beginning with requests to faculty to submit comprehensive lists of agreements from their colleges. Subsequent meetings with participating faculty revealed that there was no centralized repository of articulation agreements at most colleges but instead a patchwork of lists from various sources (biotech faculty, GPSTEM quarterly reports and a state website).\textsuperscript{21} MassBioEd produced a crosswalk based on information it had collected plotting 2-year courses against 4-year institutions—both agreements and the absence of agreements.

\textsuperscript{20} The Massachusetts Biotechnology Council represents 1000+ companies and other organizations involved with the biotechnology industry.

\textsuperscript{21} \url{http://www.mass.edu/forstufam/admissions/TransferAdmin/PublicList.asp}
One complication is that MassTransfer has not developed a biotech transfer pathway. There are pathways for biology and chemistry, where course requirements crowd out biotech-specific courses offered at community colleges, including for-credit internships—important for students seeking employment. By the end of the initiative, several colleges had posted extensive transfer agreement lists. The challenges and complexity are revealed in the lists—Berkshire, for example, lists agreements with 6 colleges for its AA in biotechnology, one for its AA in biology with a private college, and 10 in biology through MassTransfer. There was not much progress on the internship issue.

In its end-of-program report, Community College Biotechnology Graduates: A Path Forward, MassBioEd emphasized that, while progress has been made, much confusion remains. Each program must navigate the differing requirements of state and local private universities for each new agreement. One example of many is “cell biology” offered by 4 community colleges; various state colleges either grant full credit, partial credit or none. Given the growing importance of the 4 year degree, MassBioEd has studied the MassTransfer methodology and recommends steps for the future.

Simulations and Online Courses

There seems to have been significant progress in use of simulations in Life Science programs as a result of the GPSTEM APT. Prior to the launch of the APT, MassBioEd’s survey found that the use of simulations was embraced only sporadically and the opinion was frequently expressed that work in real labs on actual equipment was preferable.

GPSTEM’s emphasis encouraged faculty with different views to explore options. A faculty member from Bunker Hill, for example, embraced the GPSTEM focus almost as soon as the initiative launched. By the time of the June 2016 general convening of APTs, he had researched the use of virtual labs (v-labs) internationally and had arranged with the Danish firm Labster to demonstrate its capabilities and answer questions via the internet. He was awarded several APT grants for further research and later said he believed that the simulations really benefit his students, giving them a chance to get comfortable and learn without being afraid of making mistakes. A number of faculty from other colleges seemed equally impressed. By the end of the initiative 5 additional colleges had posted lengthy lists of simulations now incorporated into their programs—including a vet tech program that established simulation protocols to reduce usage of live animals.

Several colleges documented opportunities for students to take online courses. In all cases, the opportunities lay outside the offerings of biotech courses proper—general education or science courses that would fulfill graduation requirements. Roxbury may have been the most ambitious developing a hybrid general chemistry course with face-to-face lectures and take-home lab kits.

Alignment with Workforce Needs

MassBioEd sponsored a meeting of APT members and five well-known biotech firms in Massachusetts mid-way through the initiative. The extent of the connectedness between industry and colleges is striking in comparison with most industries and 2-year college programs. One faculty member presented a history of Massachusetts community colleges’ biotech programs’ relationship with the industry that goes back ten years resulting in a set of competencies that have been reviewed and vetted by industry. MassBioEd presented data demonstrating an oversupply of 2-year graduates and evidence that employers, if given a choice, will prefer candidates with a 4-year degree. Attending faculty expressed
frustration: we’ve been talking about these issues for several years and nothing seems to change. What can we do?

MassBioEd took these concerns seriously and its final report makes the following recommendations to Biopharma employers:

- Increase internship opportunities for 2-year associate degree graduates;
- Raise awareness of the competency of associate degree graduates among hiring managers; and
- Maintain relationships with community colleges.

The report also makes the following recommendations to Higher Education:

- Clarify pathways to 4-year programs for biotechnology students.
- Greater integration of soft skills. While the college programs have been assiduous in updating technical skill offerings, research indicates a “shortfall” in soft skills. At the top of employers’ wish-lists are collaboration, communication, and writing.
- Better alignment with industry, including both relationships with individual firms and monitoring of the latest labor market data.

Summary and Recommendations

Overall the APTs were a vehicle that supported team building across colleges and the development of useful research and products that informed and led to the completion of college-level and consortium-wide GPSTEM goals. Several APT facilitators noted that some challenges in process, coordination and communication that were identified in Year 2 were resolved for Year 3. Below are several recommendations that emerged from our analysis of these APTs.

1. While consortium-level work groups can be successful for sharing best practices and addressing statewide issues such as MassTransfer, resources to facilitate meetings and faculty time constraints are key obstacles to overcome. One reason the APTs were so successful was that the grant provided financial resources to compensate faculty for their participation and their work on completing projects or research that was part of both individual college-level work plans and larger consortium-wide goals.

2. Materials delivered by APT members were supported by grant funds and will be posted to SkillsCommons. It is hoped that colleges can build upon this experience with SkillsCommons and will continue in the future to explore the site for the discovery of curriculum and program support innovations and for the expanded use of OER materials.

3. APTs were one vehicle for exploring how programs can become better aligned with employer needs and identified that there is more work to be done. Partnerships with local employers are certainly an important element of the work that colleges do to plan, develop and support programs but having a forum for sharing ideas about how to continue doing that work successfully going forward would be great. The ability for colleges to participate in statewide employer networks, such as MassBio, offers them an advantage in terms of getting access to a variety of employers in a particular sector. Additionally, allowing for colleges to share what they are hearing across industries may also hold value. Employers that engaged with both the CIS/IT
and Life Sciences/Biotech APTs noted that two-year graduates did not have the requisite soft skills that they were looking for in new hires. This intelligence could help colleges come up with cross-program solutions to meeting employer needs.
Appendix B: Prior Learning Assessment (from Year 3 Interim Report)

In the Year 2 Interim report, the GPSTEM Evaluation team reviewed the start-up and first year activities and progress of the GPSTEM consortium’s Prior Learning Assessment (PLA)/Credit for Prior Learning (CPL)\textsuperscript{22} Think Tank. The Think Tank was a work group with representatives from all consortium colleges with the goals of exploring and expanding CPL strategies, enhancing or establishing formal policies at each college, and increasing the overall number of awarded CPL credits.

The Think Tank was able to leverage an effort of the Chief Academic Officers (CAOs), led by North Shore Community College (NSCC), to explore a consortium approach to CPL. These efforts were blended to a great extent and NSCC was funded to lead the activities of the PLA/CPL Think Tank.\textsuperscript{23} Another important development during Year 2 was the decision to include the design and build-out of a web-based CPL application through the GPSTEM Data Integration initiative. The Think Tank provided recommendations on the design and worked closely with \textit{fivestar*}, the Data Integration contractor.

For this Year 3 report we focus on reviewing the accomplishments and work completed through the Think Tank on the consortium wide goals and on individual college’s CPL systems. In addition to attending Think Tank meetings and convenings throughout the year, we reviewed quarterly reports from the colleges and other local CPL documents. As the Think Tank completed its activities, we interviewed the Think Tank facilitator from NSCC and the CPL contacts from 13 of the 15 colleges to review progress made across the system and at each college.

Summary of Year 3 PLA/CPL Think Tank Activities

\textit{Think Tank Meetings}

There continued to be meetings of the Think Tank through the first half of Year 3. The group continued to review the development of the CPL website and online application developed by \textit{fivestar*}. The meetings were an opportunity to provide feedback on the prototypes, to suggest strategies to inform prospective students about the website, and to discuss any concerns about the process and sustainability issues. The meetings were also an opportunity for colleges to discuss their different approaches to the administration of PLA/CPL. The approaches range from decentralized models where components of PLA are split across Testing, Advising, Registrar and academic divisions and departments to more centralized models where the process is led by an appointed CPL coordinator. Attendees continued to discuss some challenges for PLA/CPL at their campuses including transferability of credits to four year institutions, concerns from faculty on the academic integrity of some PLA methods, and the resources needed to expand the use of portfolio evaluations as part of the PLA process.

\textit{Regional Trainings}

During the spring 2017 semester, there was a series of five regional trainings to explore CPL/PLA issues and to provide an opportunity for professional development. The training sessions were hosted by

\textsuperscript{22} The process of assessing whether college Credit for Prior Learning (CPL) can be granted is referred to as Prior Learning Assessment (PLA). Both terms will be used to describe the activities of the workgroup.

\textsuperscript{23} The facilitator was Dr. Cristy Sugarman, Director, Center for Alternative Studies & Educational Testing at NSCC.
Quinsigamond, Bristol, Bunker Hill, North Shore and Greenfield Community Colleges. Each session followed the same basic outline of topics:

- An introduction to Credit for Prior Learning/Prior Learning Assessment and then a presentation on the new website. The website presentation included both a demonstration of the “CPL Wizard,” which walks prospective students through questions about prior education, examination and experiences, as well as the backend process for distributing CPL applications to local CPL liaisons at the student’s choice of college.
- Presentations and testimonials on the benefits of CPL from students who received credit for prior learning at the college.
- Questions from attendees about the website and other CPL issues.
- Breakout sessions for attendees organized by specialty/position at their respective colleges, e.g., student advisors, staff in testing offices, faculty, etc.

Over 200 faculty and staff attended the five regional trainings. All 15 community colleges were represented, with attendance approximately split between faculty and staff positions. About 100 faculty were provided an introductory training on portfolio review and approximately 100 staff were trained in CPL advising. Attendee evaluations of the sessions were overwhelmingly positive and attendees reported that they were more likely to recommend CPL to students as a result of the training.  

24 My Experience Counts Website

After about 18 months of development and testing, the My Experience Counts website went live in September of 2017. [https://myexperiencecounts.mass.edu/home](https://myexperiencecounts.mass.edu/home) Individuals (especially adult learners) applying to community colleges often have accumulated learnings from work, life and military experiences as well as documented learning through prior examinations or other evidence of competency attainment. My Experience Counts (MEC) is a website for applicants to any of the fifteen Massachusetts community colleges that guides the individual through a CPL Wizard to prepare a standard profile of their prior experiences and learnings. The CPL Wizard assists students to identify potential areas of CPL related to their interest in associate degree or certificate programs at the community college of their choice.

The elements of the online CPL profile include:

- selected college and up to three degree/certificate programs;
- military experience and/or work experiences, with occupation and length of time at job;
- national examinations – AP, CLEP, DSST, Excelsior;  
  25  
- certificates, licenses, continuing credit courses;
- training courses provided by an employer;
- prior credit or noncredit college experience;
- proficiency in languages other than English; and
- professional skills/subject matter knowledge from informal study, volunteering, hobbies, etc.

24 North Shore Community College and the GPSTEM-supported PLA/CPL Initiative was selected as one of the Community College Futures Assembly’s 2018 Bellwether Award Finalists.

25 AP-Advanced Placement; CLEP-The College Board’s College Level Examination Program; DSST-DANTES Subject Standardized Tests; Excelsior-tests offered by Excelsior College, NY, through an arrangement with Pearson.
The Wizard allows the applicant to create a user account and develops a CPL petition (profile) that is transferred to the college of choice. A college advisor/liaison who is a CPL specialist then contacts the applicant and follows through with a review of the profile. The specialist works with the applicant to identify courses in their program(s) of interest that provide the best opportunities for academic credit based on their prior learning and experiences. This may include, for example, suggestions for the applicant to take departmental or challenge exams for specific courses that have been developed by college faculty. The specialist then confirms the applicant’s CPL options and recommends how to proceed. Where appropriate, the applicant will be guided through the process of creating a formal online portfolio to submit for review by college faculty.

There is no cost to student applicants to use the MEC website or to submit applications/portfolios. Once determined eligible for CPL, the student is usually responsible for a fee per CPL credit which is less than the tuition cost for such credits. There are a few types of CPL that are often provided at no charge – e.g., for those with military experience or advanced placement credits. The CPL fee schedule is specific to each community college and disclosed to the applicant as part of the MEC submission process.

While there will not be a statewide outreach/recruitment campaign for the website, a GPSTEM-supported marketing tool kit has been provided to colleges to assist their local efforts to make applicants aware of the website. Individual colleges continue to work on integrating the MEC website with their local CPL processes and their college websites. Another GPSTEM Data Integration product has recently been released – a student pathways website at https://CareerGPS.mass.edu/home. CareerGPS assists prospective students to explore occupations and careers and link their interests to programs of study at a community college of their choice. CareerGPS includes links to the MEC website and is another avenue for increasing traffic to the website.

**Review of Local PLA/CPL Procedures**

In addition to observing the activities of the PLA/CPL Think Tank, the evaluation team conducted interviews in the fall of 2017 with CPL contacts at 13 of the 15 consortium colleges to review the progress of the CPL initiative at the local level. The review protocol asked college representatives to describe PLA/CPL practices at their college before the start of the Think Tank as well as after the completion of work group activities. The contacts were also asked to characterize the college’s participation in the Think Tank and local developments during the statewide CPL Initiative.

The topics covered by the protocol/questionnaire were based on both PLA goals from the GPSTEM Proposal/Work Plan as well as recommended benchmarks for a robust and comprehensive CPL program drawn from Think Tank discussions and materials:

- Written formal policies that identify the CPL options available at the college and that describe the procedures and practices for them.
- Centralized lead for coordinating all CPL functions.
- Wide variety of CPL options and methods.
- Systematic collection of data regarding CPL students and awarded credits.
- Marketing and dissemination of information on CPL to inform all students of their options.
- Integration of *My Experience Counts* and designated CPL Coordinator with local systems.
The interviewees’ experiences varied widely—some had been involved with PLA/CPL for many years at their college while others had been newly recruited by their colleges to participate in the GPSTEM Think Tank. Nevertheless, the evaluation team was able to obtain useful information from the 13 interviews and reviewed written documents for the other two colleges sufficient to assess progress on CPL practices during the course of the GPSTEM initiative.

**Progress towards Work Plan Objectives: Written Policies**

One goal of the Work Plan was for each campus to have a written policy for awarding credit for prior learning. All colleges have written policies to some extent and the majority of colleges have made at least some changes and enhancements to their policies during the grant. Ten colleges have comprehensive CPL policies; that is, they cover all the CPL options available at the college and they are posted on the college website and/or printed in the college catalog. (Some of these colleges have a wider variety of available options than other colleges.) At the five other colleges, there are specific policies or procedures for certain CPL options available at the college, but, generally speaking, they are not as comprehensive and information on the options is not as easy to find for prospective and current students.

**Progress towards Work Plan Objectives: Explore New CPL Strategies**

Another goal of the Work Plan was to encourage colleges to explore and pilot new CPL strategies and methods. The establishment of the Think Tank, especially under the facilitation of North Shore Community College, provided a good forum for the sharing of best practices and supported colleges in their review of adding CPL options to their local systems. The standard categories within the MEC website were drawn from a comprehensive glossary of CPL practices based on contributions from many members of the Think Tank. Both the Think Tank discussions and the website itself have expanded knowledge about existing options throughout the consortium and prompted some colleges to review and enhance their systems.

It is difficult to measure with any precision the effect that participation in the Think Tank and its activities had on local CPL systems. Not all representatives could always attend the in-person meetings for the usual logistical reasons and often participating by phone was not as effective. Some colleges were better than others at adopting processes that connected Think Tank participants with key administrators, staff and faculty at their colleges to keep them informed of new ideas and up to date on the development of the MEC website. Anecdotally, however, it is clear that participation in the Think Tank had positive impacts on the colleges. Some quotes from interviews support this view.

“The GPSTEM CPL initiative enabled us to learn about other colleges with more robust programs and to learn good practices from them. It was interesting to learn that North Shore Community College has a whole department focused on CPL.”

“The statewide initiative galvanized the college and me in my role of the CPL Coordinator. I was able to look at a number of colleges while developing the Handbook for the college and I started pulling CPL information into a central point. I feel that the college is on a trajectory. While the college’s interest in CPL started prior to the GPSTEM grant, the statewide initiative breathed new life into the college’s activities.”
“While I was a newly-appointed CPL lead, I became very aware that CPL was quite solid at our college but that it was not centralized. I also gained a good understanding of possibilities as well as a good perspective on where the college could go.”

Based on interviews and reviews of other documents, about one-third of the colleges already had robust and comprehensive CPL systems at the beginning of the grant. The other colleges had limited and incomplete approaches to CPL. The following are some quotes from the interviews.

“We have had CPL options available for some time but did a poor job of marketing. It was disjointed, with responsibility scattered among many offices and departments, and there was no attempt to alert students through the admissions process.”

“Although we started strengthening our CPL program a number of years ago, as a rule there was not a lot going on. Few departments offered CPL options and it was not a part of the admissions process.”

When we reviewed the ten colleges with effective participation in the Think Tank (regular attendance, active participation, follow-up activities on their campus after meetings), seven of the ten colleges had improved their CPL program in documented ways to a more robust system – expanded CPL options such as challenge exams, better marketing of CPL to prospective students through their website and catalogs, more consistency across divisions and departments, better integration with admission process, etc. (The other three colleges already had comprehensive policies and procedures.)

Progress towards Work Plan Objectives: Reporting on Increases in CPL Students and Credits

One of the challenges for this initiative is that there was no tradition of standardized reporting on CPL credits for performance purposes. There is no standard reporting of CPL credits in any of the required submissions to the Department of Higher Education and thus there is no historical information on CPL trends. A small GPSTEM reporting committee recommended a simple format that was added to the GPSTEM Quarterly Report to collect data on the number of students with CPL credits and the number of credits for both total students and GPSTEM students. This report requested colleges to report on these items for two baseline years before the Think Tank and for two academic years within the grant period.

This turned out to be quite challenging for some colleges. While CPL credits are obviously tracked on transcripts and individual student records, each college has its own approach to categorizing and coding CPL. Some colleges found it difficult to link this data to generate performance reports from the student information system. This situation improved over time but there were still two colleges that did not report on CPL data at all and a few other colleges with some limitations to their reported data. There was adequate information from 13 colleges to do a high-level review.

Overall, the number of students with CPL credits increased by 12% over the reported baseline counts. The increase may reflect both actual increases in the number of students awarded CPL credits and some improvements in reporting. For seven colleges with less than 200 students per year with CPL credits in the baseline year, the average number of students was 90 CPL students per college in the baseline year and 101 CPL students in the GPSTEM years, an increase of 12%. For six colleges with more than 200 CPL students in the baseline period, the average number of CPL students per college in the baseline years was 334 and the average number in GPSTEM years was 376, an increase of 13%. 
Progress on Local College Coordination with the My Experience Counts Website

All consortium colleges have taken the steps necessary to support the My Experience Counts website. They have each appointed a CPL Coordinator who will be the contact to receive notification from interested students who have selected the college as their choice. They have identified a process for reaching out to the applicants and the methods for informing an applicant about the available options. Each college has created a crosswalk of programs and courses plotted against the available CPL options for each course. It is a bit too early in the deployment of the website to assess the volume of applicants or the satisfaction of such applicants with the hand-off to the local college.

The colleges are working to fully integrate My Experience Counts with their local processes, most of which are based on manual processes and paper forms. With limited marketing so far, most prospective students apply through existing admission procedures and are referred to local CPL processes. As discussed earlier, the link in the CareerGPS website will drive more applicants to My Experience Counts. There are other efforts to increase the percentage of potential CPL students going through the website CPL Wizard. As an example, Greenfield Community College has added the link to My Experience Counts to their college website page on CPL so that more CPL applicants start with the electronic profile. Other colleges have similar plans to add links to their website or are referring applicants to the website in other ways. North Shore Community College is moving towards having walk-in students meet with CPL staff and have them use the CPL Wizard to complete an electronic profile instead of paper forms. Most colleges have plans to better integrate the website with their local processes.

Continuing Challenges for Credit for Prior Learning

In our interviews with local college CPL contacts, we found overall support for CPL and its benefits for students but the level of enthusiasm was often impacted by some challenges and issues. With the demographic trends in Massachusetts resulting in a declining pool of traditional community college students, i.e., recent high school graduates, the colleges recognize the need for recruiting adult and nontraditional learners and that CPL can be an important element of this strategy. There are, however, some challenges that are impacting the scaling up of CPL.

Transferability of CPL Credits to Other Institutions

Most colleges raised the concern that too often CPL credits have not been accepted as students transfer to four year colleges (or even other two year colleges). Of particular concern is when students are awarded CPL credits and only find out about the issue when they later transfer to other institutions. Mass Transfer Bachelor degree pathways to state universities, as well as articulation agreements with private institutions, rely upon reviewing course descriptions, syllabi, learning outcomes, etc., to determine an alignment between the specific courses at the two institutions. Often CPL credits have been awarded by a method and/or without sufficient documentation such that the equivalency of courses is not recognized by the receiving institution.

These concerns have been a major barrier to the development of PLA at some colleges, especially for transfer-oriented students. As one interviewee stated:
“In general, there hasn’t been much focus on CPL at our college in the past. There is a lot of skepticism about the ability to transfer credits to other schools and when students are informed about this issue, many students conclude that it’s not worth their while.”

Some states have addressed such issues, at least within the public higher education system, by having statewide policies or regulations on both CPL and transferability but there is no current policy on this issue in the Commonwealth. There may also not be easy solutions for this issue when CPL credits are initially awarded by a college to satisfy their own requirements for career-oriented certificate and degree programs and only later become a problem when graduates decide to pursue degrees to progress in their careers.

**Lack of Support from Faculty**

The involvement and support of faculty is crucial to comprehensive PLA/CPL systems. Faculty are responsible for the development of course content and ensuring that students in their courses achieve the learning outcomes and competencies needed to progress in their career goals. It is of concern when some colleges cite “faculty resistance” as a barrier to CPL.

Interviewees most frequently cited that the basis for this lack of support is faculty concern about academic integrity. This is often the result of differences in the awarding of CPL credits across divisions and departments at a college which raise questions about the rigor of the process. There are other instances where the basis for concern is somewhat vague, e.g., anecdotes of how students have been simply awarded credits for prior work, military or other experiences without much review of the actual learnings from those experiences and how they relate to the awarded credits.

This is an important issue. Programs of study and their coursework must address important learning outcomes, the requirements of accreditation standards as well as industry and professional certifications and the expectations of employers that their employees have needed job competencies. CPL processes must ensure that they are not in any way viewed as opposing those goals. The work of the Think Tank and the follow-up discussion at some campuses have resulted in some progress on this issue but there is clearly more work that needs to be done.

**Lack of Statewide Agreement on the Breadth and Depth of CPL Methods**

While not an issue raised during many interviews, this is an issue that came up in Think Tank discussions and it is something the evaluation team has heard in other site visits to colleges. While the Think Tank members jointly developed a comprehensive list of methods for the CPL Wizard of *My Experience Counts*, not all colleges use all methods and there are many differences among colleges on how similar methods are used, e.g., creditable score for AP courses, number and types of challenge exams, etc.

Another example of this variation is the level of interest in portfolio assessments, an approach that requires more effort on the part of students to describe prior work, military, and life experiences and to provide direct and indirect documentation of their learnings. While there is some evidence that this is an effective method that leads to higher retention and graduation rates, it is also a resource intensive

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26 “State Policy Approaches to Support Prior Learning Assessment.” 2012 (updated 2015.) Council for Adult and Experiential Learning (CAEL.)

method that has been used frequently only by a handful of colleges.28 While the Think Tank generated more discussion of this option, including the potential of a centralized consortium process, it is clear that many colleges do not promote this option as much as other methods, perhaps due to the two other challenges listed above.

**Recommendations for Future Activities**

There would be great benefit to many colleges if there were continued discussions within the consortium on CPL topics including the challenges listed above. There may be other actions that colleges can take to build upon the momentum created by the Think Tank. There are clearly some colleges that have already addressed many of these issues.

The *My Experience Counts* and *CareerGPS* websites are intended to assist more prospective students, including adult learners, to become aware of the opportunities at community college to achieve their career goals. It is expected that these websites and work at local colleges will also result in more applicants pursuing CPL options. This may lead to expectations that CPL works in a similar way at all community colleges.

**Better engagement with faculty:** Some CPL Coordinators reported Think Tank and website activities generated internal discussions with faculty and staff about a wide range of CPL issues. These discussions demonstrated that CPL methods would be implemented in ways that respected faculty values and also resulted in recommendations from faculty that improved the CPL process. Continuing this engagement may be a way to address other issues such how to work with the consortium on transferability issues.

**Standardized and transparent CPL processes:** Colleges with well-defined CPL systems have standardized procedures and forms, while still allowing the departments and faculty to decide the content. The form29 clearly defines the responsibilities of the faculty evaluator, the student and the CPL coordinator. It makes clear the assessment guidelines to the student such as the type of documentation required, payment of fees, whether an interview or exam is needed, and how to prepare for the interview or exam. There is also a clear statement of learning outcomes or competencies that the faculty person must rate a student on in order to provide an overall recommendation for CPL credit. While this may require more upfront work, once completed and saved to a library of templates, it makes subsequent reviews more efficient and consistent.

**Better engagement with students:** Think Tank and local CPL discussions have often resulted in a recognition that existing methods were not as effective as they could be because engagement with students did not begin upon their initial contact with the college. Often students found out about CPL opportunities through the random discovery of a web page or suggestions from faculty once they enrolled in a program. As mentioned previously, many colleges are marketing CPL more prominently on their websites and catalogs. Some colleges have added CPL to their checklists of required topics for admissions staff and advising staff. There is probably more that can be done along these lines. To address the transferability issue, some college have discussions with students about their transfer goals and encourage students to contact colleges that they are interested in and discuss their CPL questions.

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28 A few colleges work on this issue through national organizations, the Council for Adult and Experiential Learning (CAEL) and the American Council on Education (ACE).

29 This description is based on the “CPL Guidelines and Evaluation Form” used by Middlesex Community College.
Continued and Improved Performance Counting: In the long run, it would be helpful if the consortium continues some level of CPL counting to have the data to demonstrate the impact of CPL. This might require some work to ensure consistency across the consortium. Having performance data on the impact of CPL on retention and graduation may assist in finding resources to support CPL.

CPL Champions in Senior Management: When asked questions about “looking ahead” to the future of CPL at their college, many colleges responded that their answer depended on the commitment of the senior leadership. Not surprisingly, CPL Coordinators were very positive about sustaining and improving their CPL systems when they felt that their President and/or Chief Academic Officer had consistently expressed that CPL was a strategic priority and demonstrated support for the effort. For colleges going through transitions in these positions, there was more uncertainty about the future of CPL.

Sustaining My Experience Counts and Scaling Up Credit for Prior Learning

The development and maintenance of the My Experience Counts website has been supported by the GPSTEM Data Integration grant, which ends September 30, 2018. In addition, the efforts of the consortium colleges to work together on the Think Tank, and the facilitation of the Think Tank by North Shore Community College, were supported by the GPSTEM grant. While the Executive Office of Education and the Department of Higher Education will continue to host the website and provide basic IT support, there is a need for some level of resources to manage the system and to continue to support an expanded role for PLA/CPL.

The presidents of the community colleges have committed to sustaining the website after the grant through a consortium approach, with North Shore Community College as the lead college. The application needs at least a part-time system administrator to ensure that the information in the website (on programs of study, CPL fee schedules, local CPL Coordinator contact information, and the college crosswalks of courses by type of CPL) are kept up-to-date. This administrator would support ongoing training for the website and propose enhancements as needed to the system. The consortium will need to explore a range of potential sources of funding, from other grant sources to a consortium MOU with membership fees.

It would be helpful if the consortium approach provides additional opportunities for professional development and cross-college training on Credit for Prior Learning. The continued sharing of best practices should encourage working towards more consistency across the colleges in the types of CPL options and methods utilized by each college. It should also provide a forum for continued discussions on challenges such as the transferability of CPL credits and on a common approach to expanding the use of effective but resource intensive methods such as portfolio assessments throughout the consortium.
Appendix C: Open Educational Resources (OER) (from Year 3 Interim Report)

Open Educational Resources (OER) are teaching, learning, and research resources in any medium – digital or otherwise - that reside in the public domain or have been released under an open intellectual property license that permits free access, use, adaptation and redistribution by others with no or limited restrictions. OER include full courses, course materials, modules, textbooks, streaming videos, tests, software, and any other tools, materials, or techniques used to support access to knowledge.30

Prior to the start of the GPSTEM grant, many community colleges already had begun small, grassroots efforts promoting the use of OER on their campuses. This effort arose in response to students at all colleges citing that the costs of textbooks were an important concern; often, some students simply did not purchase the textbook or did not even enroll in courses with high costs. At Northern Essex Community College (NECC), a Textbook Task Force of faculty and staff reviewed these issues and it soon became clear that OER was a very cost effective alternative. This NECC initiative was eventually named the Adopt Open: Access and Excellence project. In addition to cost savings for students, faculty at NECC and other community colleges were also finding that students were more engaged in reading OER materials for their classes. Students reported finding it easier to access the materials and often enjoyed this style of learning more than traditional textbooks.

The local OER initiatives were clearly aligned with the GPSTEM Work Plan goal of increasing the use of OER materials in STEM programs of study. With the assistance of the Massachusetts Community College Executive Office, NECC on behalf of all consortium colleges submitted a proposal to use GPSTEM funding to advance a consortium approach to increase training and professional development on OER. Another goal was to engage all colleges to support new efforts in adopting, adapting or developing OER. The project plan was approved and was named the Massachusetts Community Colleges (MCC) Go Open Initiative. The two faculty leads31 of the NECC Adopt Open project became the facilitators of the statewide initiative.

In order to help expedite the process of increasing faculty awareness and adoption of OER across the consortium, a new Massachusetts Community Colleges (MCC) Go Open Council was formed and first met in May of 2016. The council comprises members who have been appointed by the Chief Academic Officers (CAOs) from each of the 15 community college campuses, as well as a representative from the Massachusetts Community Colleges Executive Office. With the support of the Council and the GPSTEM grant leadership, the two facilitators from NECC have taken the lead in expanding the use of OER throughout the consortium. The goals of the Go Open Initiative include adopting and creating a statewide repository (website) of OER materials for easy access and sharing by all community college faculty; providing training and technical assistance on OER for faculty, staff and administrators; and using a competitive request-for-proposals (RFP) process to provide small grants to support faculty adoption, adaptation and/or development of OER materials for use in courses. Mini-grants to implement OER were available only for courses that were required within one of the GPSTEM programs.

30 William and Flora Hewlett Foundation. https://www.hewlett.org/strategy/open-educational-resources/
31 The facilitators were Sue Tashjian, Coordinator of Instructional Technology, Center for Instructional Technology and Distance Learning and Jody Carson, Associate Professor, Early Childhood Education & Instructional Coach, CIT.
Activities of the Go Open Initiative

GPSTEM funding provided up to $125,000 for grant awards to faculty from local community colleges and up to an additional $75,000 to support the two NECC facilitators and local OER coordinators in project coordination and administration, and to provide support for statewide training sessions. The Go Open initiative started with a regional OER summit in June 2016, with sessions by local and national OER experts, attended by representatives from community colleges and from other institutions of higher education (GPSTEM funding covered only the participation from the community colleges).

Before each RFP round, a Go Open Training session was offered for faculty and staff interested in developing a proposal. At the first Go Open Training at Middlesex Community College on August 26, 2016, 40 people from across the consortium attended. Topics covered over the course of the day-long training included:

- Strategies to implement OER (getting started, motivating faculty, spreading the word);
- Finding free and open resources;
- Creative Commons/Open Licensing; and
- FAQs on OER.

Additional training for faculty took place in October 2016 and February 2017. Faculty awarded grants were also offered one-on-one training by facilitators and local OER coordinators.

There have been three rounds of RFPs issued (in August 2016, November 2016 and April 2017) to offer grants to faculty for the following activities:

1. Adopt: Redesign a course to incorporate an existing open textbook or course content as is.
2. Adapt: Remix existing open educational resources and create new open content to bridge gaps in available resources to enable a fully open course. New content may add missing chapters to existing OER or create quiz question banks, lecture slides, lab manuals, etc.
3. Build: Create a substantially new open textbook or fully open course where it can be documented that quality resources are not currently available to meet learning objectives.
4. Propose: Propose a different kind of project not covered by the categories above.

Proposals were to target courses that contribute to the certificate and degree pathways within the GPSTEM TAACCCT grant. The proposals had to relate to a specific course that resulted in the course having no additional costs for required textbooks for students. Faculty had to commit to running their courses solely using OER for at least one full academic year.

Proposals were evaluated by a committee made up of members from the MCC Go Open Council according to the following criteria:

- Projected student savings;
- Quality considerations such as accessibility of proposed content, support for user experience, potential for future adoption in other settings, etc.;
- College and departmental commitment, e.g., redesign of all sections of a course; and
- Overall feasibility of the project as proposed.
Faculty and staff who received grants agreed to the following requirements:

- Complete face-to-face training or take the online “Getting Started with OER” class;
- Share their work with a CC-BY Creative Commons license so others can easily adopt/reuse;
- Provide electronic copies of all work developed as part of the grant by the deadline stated in the application—all materials to be uploaded to SkillsCommons.
- Work with the GPSTEM Go Open statewide facilitators and local OER coordinators to develop timelines for deliverables and assessment data.

Through the three rounds of grant funding, 108 proposals were approved and funded. A total of 103 faculty members worked on one or more projects. Some projects had two or more faculty working on a joint project and some faculty worked on more than one project. All fifteen community colleges in the consortium received at least one grant. All work was completed by September 1, 2017.

There was a second regional summit in June of 2017. The summit was an opportunity for faculty and staff to share newly developed materials and courses and to continue discussions to sustain and expand OER efforts across the consortium.

Accomplishments of the Go Open Initiative

There were 108 projects supported by GPSTEM funding across the consortium, at an average cost per project of $1,040. Over 70% of the funded projects were proposed as either level 1 (adopt) or level 2 (adapt), with an average cost per project was $605. For funded projects that were proposed as level 3 (build) or level 4 (other new activity), the average cost per project was close to $2,000. The difference in the level of support was based on documentation that new OER materials needed to be developed for the course in the level 3 and 4 proposals.

Faculty were asked to report on the number of students in all sections of the courses with OER materials developed through their projects. The estimated number of students impacted through December 2017 is over 9,400. Student savings were calculated by taking the price of the existing textbook (purchased new) or the costs of other materials previously used in the courses, and multiplying by the number of students in all sections of the redesigned courses where OER materials replaced these textbooks or materials. The estimated savings to the 9,400 students was over $1.3 million through December of 2017.

Across all courses, the average savings per student was $145. In the aggregate, the average savings per student was the about the same for courses developed by level 1 or level 2 projects and for courses developed by projects funded as level 3 or level 4 projects. Forty percent of the projects (of any level) involved the development of OER materials for mathematics, natural and physical sciences, manufacturing technology, computer information science and health science courses. The average savings for students in these classes was $180 per student. In any case, the relatively modest investment of $115,000 in faculty grants has resulted in $1.3 million in student savings to date.

All colleges in the consortium participated in the project, and faculty and OER coordinators reported impacts beyond the development of the OER materials. As with other GPSTEM work groups, faculty and staff appreciated that the process allowed more opportunities for collaboration within their college and across the consortium. Faculty and staff were supported by many chances to learn, share, and network.
through the training sessions and summit meetings. The success and enthusiasm of these faculty has often changed attitudes at their campus and encouraged other faculty to consider OER as an alternative to textbooks. The success of the projects targeting math and science courses is helping to address some of the concerns and skepticism about the challenges of developing OER for science courses.

Many faculty have commented that, in addition to the cost savings, the OER materials are more accessible and increase student engagement with course content. There is not sufficient data yet to confirm these impressions with hard data on student success and retention in the courses, but this should be an area for future research. Many colleges do feel the initial results are very positive and have either committed their own funds or are pursuing outside grants to continue projects at their college.

**Sustainability and Scaling Up the Go Open Initiative**

The MCC Go Open Council and its members have already begun planning some activities to sustain the momentum of the GPSTEM-funded Go Open OER initiative after the grant. GPSTEM funding has supported the establishment of an OER SkillsCommons Hub for the MCC Go Open Project. The site is being built through the efforts of Middlesex Community College and several other members of the council. This site will serve as a central repository for all materials created through the GPSTEM Go Open Project as well as OER developed through other current and future initiatives at the individual colleges.

An important focus going forward is to collect data on student savings and success as OER courses are implemented and continued. In order to collect accurate data, a common system will need to be developed and shared among the OER Coordinators across the state. While there is a standard definition for savings, not all colleges are currently coding or designating courses as OER, which impedes their ability to track data.

In order to support students in the process of transferring from community colleges to four-year public colleges, there is a Mass Transfer block of general education courses. The Go Open Project has resulted in OER courses across the consortium for the categories within the Mass Track Block, although a complete set of OER courses is not yet available at any one individual college. The Council will continue to work on coordinating the efforts of all members to create clear pathways using Mass Transfer Block and OER courses for our students. The next objective will be to create full OER degree pathways.

In order to continue the momentum of this project, additional sources of ongoing funding will be needed. The documented cost savings shown by the Go Open Project, together with growing national research on the OER impact on course completion and program retention, demonstrates that OER is a good investment and should support successful fundraising. Individual colleges have received some small grants, but funding for the consortium has not been secured. Two colleges have received DHE Performance Incentive Fund (PIF) grants to continued OER work at their campuses. PIF grants may be a potential source of funding for the MCC Go Open Council to support OER courses across the consortium.

While there has been progress across the community colleges, the future of OER in the Commonwealth would be enhanced by a collaborative system which includes four-year state colleges and universities.

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32 Northern Essex Community College and the GPSTEM-supported MCC Go Open Initiative was selected as one of the Community College Futures Assembly’s 2018 Bellwether Award Finalists. These recommendations are drawn for their award application.
Working with all of public higher education would greatly increase savings for all students, increase the quality of OER available, and support collaboration among faculty at all institutions.
Appendix D: Examples of Academic Maps
### 1. FIRST SEMESTER

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Grade</th>
<th>Semester Taken</th>
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<tbody>
<tr>
<td>ENL101</td>
<td>English Composition I</td>
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<tr>
<td>CHM151</td>
<td>General Chemistry I</td>
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<tr>
<td>ENR101</td>
<td>Intro to Engineering &amp; Advanced Manufacturing</td>
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<tr>
<td>MAT240</td>
<td>Calculus I</td>
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### 2. SECOND SEMESTER

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<td>Human Communication</td>
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<td>ENR102</td>
<td>3D Mechanical Design I</td>
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<tr>
<td>MAT250</td>
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### 3. THIRD SEMESTER

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<td>Behavioral &amp; Social Sciences</td>
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<tr>
<td>PHY211</td>
<td>University Physics I</td>
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<tr>
<td>MAT260</td>
<td>Calculus III</td>
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<td></td>
</tr>
<tr>
<td>ENR201</td>
<td>Statics</td>
<td>3</td>
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<tr>
<td></td>
<td>Engineering Technology &amp; Manufacturing Elective</td>
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### 4. FOURTH SEMESTER

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<td>PHY212</td>
<td>University Physics II</td>
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<tr>
<td>MAT270</td>
<td>Differential Equations</td>
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<td>Engineering Technology &amp; Manufacturing Elective</td>
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<td></td>
<td>Engineering Technology &amp; Manufacturing Elective</td>
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**Total Credits:** 60-62
Biotechnology Technician (Fall Start)
Associate in Science

START here

**Semester 1 - Fall**

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<th>Course</th>
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<tbody>
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<tr>
<td>CHE 121 - Introduction to Chemistry</td>
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<tr>
<td>ENG 101 - English Composition I</td>
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<tr>
<td>TMA 100 - Math for Technology</td>
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**Total Credits:** 15

**Semester 2 - Spring**

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<tbody>
<tr>
<td>BIT 150 - Methods of Biotechnology</td>
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<tr>
<td>BIT 155 - Quality Control and Good Manufacturing Practices</td>
<td>3</td>
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<tr>
<td>BIO 240 - Microbiology for Industrial Applications</td>
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<tr>
<td>ENG 102 - English Composition II: Introduction to Literature</td>
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<tr>
<td>CAP 103 - Computers for Technology - or - CSC 101 - Introduction to Computer Science - or - CSC 151 - Programming I</td>
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**Total Credits:** 17-18

**Semester 3 - Summer**

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<td>BIT 250 - Advanced Techniques in Biotechnology</td>
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<td>Behavioral Science Elective - Recommended: PSY 101 - Introduction to Psychology - or - SOC 101 - Introduction to Sociology</td>
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**Total Credits:** 7

**Semester 4 - Fall**

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<td>BIO 250 - Immunology</td>
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<tr>
<td>BIT 200 - Internship</td>
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**Total Credits:** 10

**Semester 5 - Spring**

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<td>BIO 255 - Molecular Biology</td>
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<tr>
<td>CHE 180 - Principles of Biochemistry</td>
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<td>MAT 177 - Statistics</td>
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<tr>
<td>ETH 105 - Introduction to Bioethics - or - ETH 101 - Ethics and Society</td>
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<tr>
<td>ECO 120 - Economics and Management in the High-Tech Industry</td>
<td>3</td>
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</tbody>
</table>

**Total Credits:** 17

You’ve FINISHED!

**Helpful Hints**

- The first year of the associate degree (29 credits excluding PSY 101/SOC 101 elective) satisfies requirements for Biotechnology Technician Certificate. All credits earned for the certificate transfer towards the associate degree.
- Students needing to satisfy prerequisites for MAT 177 (semester four) should consider taking math courses early in the program.
- Students looking to transfer to a four-year program should consider CHE 131 - College Chemistry I in place of CHE 121.
- BIO 131, CHE 121 (or 131) and ENG 101 are prerequisite for BIT 150, BIT 155 and BIO 240.
- Students can register for BIT 200 - Internship following semester 2.
- If BIT 200 is taken during semester 3, BIT 250 should be taken during the summer following semester 2.

**Career and Transfer Outlook**

Graduates of this program work in various departments and roles within the biotechnology industry. Some of the positions that MCC graduates have held include lab technician, cell culture technician, research technician, microbiology technician, chemistry associate, process operator, quality assurance manager and supervisors.

To learn more, call us at 1-800-818-3434 or visit www.middlesex.mass.edu

MIDDLESEX COMMUNITY COLLEGE • LOWELL CAMPUS, 33 KEARNEY SQUARE • BEDFORD CAMPUS, 591 SPRINGS ROAD
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