BELLEVUE COLLEGE

Evaluation of the Bellevue College Consortium's Health eWorkforce (HeW) TAACCCT Grant

Final Report

September 2016

Prepared by:

Deborah Kogan
Marian Negoita
Melissa Mack
Renatta DeFever

1333 Broadway, Suite 310
Oakland, CA 94612
Tel: (510) 763-1499
Fax: (510) 763-1599
www.spra.com

Prepared for:

Bellevue College
Life Science Informatics Center
3000 Landerholm Circle SE
Bellevue, WA 98007

SPR SOCIAL POLICY RESEARCH ASSOCIATES

Project No.3432

Acknowledgements

This report has been funded by a U.S. Department of Labor (DOL) Trade Adjustment Assistance Community College and Career Training (TAACCCT) grant awarded in Round 2 to the Health eWorkforce (HeW) Consortium led by Bellevue College in Bellevue, Washington.

The authors of this report would like to thank the following individuals for the assistance they have provided to the SPR evaluation team: Patricia Dombrowski, Executive Director of the Bellevue College Life Science Informatics Center and project director of the HeW Consortium TAACCCT grant, Heather Neikirk, Interim Associate Director of the Center, Margaret Murphy, Senior Project Manager, and all the other members of the Bellevue College grant management team who were generous in sharing time and information with SPR researchers over the grant period. Special thanks is due to Rebecca Gonzales at Bellevue College, for her assistance cleaning and preparing the Bellevue College client-level "hub" database and sharing a de-identified file with the SPR evaluation team for analysis for the Final Evaluation Report.

We would also like to thank the grant managers, student support staff, and other community college administrators at the participating colleges who welcomed evaluation research team members on our multiple on-site visits to each college, as well as the students at each college who participated in focus groups and shared their perspectives on the TAACCCT grant-funded programs in which they were enrolled. Without contributions from these individuals, this report would not have been possible.

Contents

Executive Summary 1

Findings from the Implementation Study 1

Findings from the Outcome Study 3

Plans to Sustain Grant-Funded Programs and Priorities 4

Lessons Learned 5

I. Introduction 1

The Bellevue College Consortium's Health eWorkforce Project 1

The Evaluation of the Health eWorkforce Project 3

This Report 6

II. Project Leadership and Activities at the Consortium Level 8

Providing Project and Grant Leadership 8

Supporting Grant-Aligned Objectives 19

Conclusion 25

III. The College Level: Developing New Programs, Enhancing Existing Programs, and Supporting Students 26

Overview of Grant-funded Program Development and Enhancement 26

New Health IT Certificate Programs 27

Existing IT Certificate Programs Infused with Health IT Content 32

Existing Nursing and Allied Health Programs Infused with Health IT Content 33

Current Students' Satisfaction with New Programs and Infused Courses 38

Recruitment and Student Support Services 40

IV. Outcome Study Findings 49

Introduction and Background 49

Enrollment Outputs 50

Academic Outcomes 50

Labor Market Outcomes 56

Conclusion 62

V. Conclusion 63
Findings from the Implementation Study 63
Findings from the Outcome Study 64
Plans to Sustain Grant-Funded Programs and Priorities 66
Lessons Learned 71
Appendix A: Estimating and Compensating for Nonresponse Bias in Participant Surveys 74
Appendix B: Methodological Note 76

Executive Summary

Building on its prior experience over the past decade developing and providing training to prepare healthcare industry workers to work with digital technology, Bellevue College invited eight other community colleges (seven in Washington State and one in the Commonwealth of Virginia) to form a Health eWorkforce (HeW) Consortium to apply for a grant from the U.S. Department of Labor (DOL) under Round 2 of the Trade Adjustment Assistance Community College and Career Training (TAACCCT) program. In the fall of 2012, the HeW Consortium, with Bellevue College as the designated lead college, was awarded a $11.8 million grant to build the capacity of community colleges to provide health information technology (Health IT) training.

The HeW TAACCCT grant proposal emphasized two distinct but complementary training goals:

- train students in clinical nursing and allied health programs to work in settings that use electronic health records (EHRs), and
- train health information technology (Health IT) specialists capable of developing and maintaining healthcare information systems, developing new technology tools and software applications to support healthcare delivery, and analyzing "big data" to support primary and applied clinical research and healthcare business management practices.

In addition, the scope of work funded under the grant included a number of consortium-level activities designed to

- promote the entry of veterans into the Health IT field, and
- develop instructional resources that would enhance the capacity of community colleges nationally to provide Health IT instruction.

In this Final Evaluation Report, we summarize the implementation experience of the HeW initiative at the consortium level as well as at the level of the nine participating colleges and describe the outputs and outcomes achieved by the 1,615 students who earned program credentials during the evaluation period.

Findings from the Implementation Study

At the consortium level, the grant funding supported several bold initiatives that were designed to benefit the Health IT field as a whole (even beyond the programs at the participating colleges in the HeW consortium). These initiatives included the development of a Health IT apprenticeship program for veterans, the implementation of a cloud-based platform to provide educational institutions access to a wide variety of EHR systems for instructional use, a national initiative to welcome veterans to the Health IT field, and the development of additional Health IT instructional tools and resources. Although the veterans' Health IT apprenticeship was not realized, and a sponsor to sustain a cloud-based platform to provide educational institutions with

access to EHRs for instructional purposes was not found, the Health IT educational resources developed by the Bellevue College leadership team have the potential for widespread dissemination and use by colleges throughout the nation in the coming months and years. The most promising resources include an interactive version of a "Health Information Technology Foundations" curriculum now available to interested educational institutions and individual students on Stanford University's Open Learning Initiative website at http://oli.stanford.edu/health-technology/ and eight different multi-media instructional modules on how to use EHRs that provide instruction using PowerPoint simulations of two open-access EHRs that will be disseminated via the DOL-sponsored website for products developed under TAACCCT grants. More detail on the system-level activities funded under the grant is provided in Chapter II of the Final Report.

The participating colleges, with the assistance of consortium-wide leadership, reached many of their intended project goals, described in Chapter III of the Final Report. Accomplishments of the HeW initiative at the college level included the initiation and piloting of 11 new Health IT certificate programs, infusion of the curriculum of 19 existing nursing and allied health programs with Health IT knowledge and skills, infusing the curriculum of two existing IT programs with Health IT content, the enrollment of 3,211 students in grant-funded programs, and the provision of enhanced academic and career navigation services to enrolled students to promote successful completion of their chosen programs.

As the project unfolded, the focus and scope of the grant-supported programs evolved in some interesting ways. Ultimately, the infusion of nursing and allied health programs with Health IT content—initially treated with caution and some resistance at a number of the participating colleges—was embraced enthusiastically by many of the participating colleges as both students and employers showed strong interest in what it could achieve. The infused nursing and allied health programs ended up enrolling substantially more students during the grant period than the new Health IT programs.[1] In addition, two of the participating colleges expanded the number of clinical programs included in the infusion initiative during the grant period, and several colleges are considering adapting the Health IT curriculum modules for infusion into the curricula of additional healthcare programs in the future.

In contrast, the success to date of the new Health IT programs has been more mixed. The initial plan to create a new associate degree-level Health IT program at NOVA was not realized because the sponsoring department was concerned that the new Health IT degree would not be substantially different from an existing IT associate degree. Although a majority of the new

1 This is not surprising since the nursing and allied health programs were pre-existing programs with large numbers of enrolled students prior to the HeW initiative, whereas the new Health IT programs had to start from scratch to recruit and enroll students.

Health IT programs were piloted successfully during the grant period and are being continued as valuable additions to college program offerings, several of the newly created programs are inactive or are being discontinued by their college sponsors, because they had very limited success attracting students or were not felt to impart the exact skills and experience that program graduates would need to find employment in the Health IT field. Taken together, these implementation experiences demonstrate the difficulty of gaining widespread employer buy-in for a new occupational training program, particularly in a rapidly changing field. Although colleges elicited input and approval of the new Health IT programs from employer advisory boards, the fact that a significant proportion of Health IT program completers failed to obtain employment in training-related fields during the evaluation period suggests that program designers had difficulty matching their program designs to the local employer demand for skilled workers in this emerging occupational field.

Findings from the Outcome Study

The outcomes summarized in Exhibit ES-1 show that the initiative exceeded its target goals in terms of the number of students enrolled and the number of students who completed credentials during the evaluation period. However, it fell somewhat short of the goal of having 76 percent of program completers find employment after exiting. Although the evaluation will not be able to update outcomes for the 1,000-odd students still active in their programs at the end of the grant period, as these students complete their programs, the total number of completers who earn credentials and enter employment will increase over time.

Exhibit ES-1: Summary of Project Outcomes Versus Targets

Outcome	Grant Target	Achieved	Percent of Target
Students Enrolled	2,093	3,211	151.0%
Students Completed Credential	1,423 (68% of enrolled)	1,615 (51% of enrolled)	113.5%
Students Employed After Exit	1,082 (76% of completers)	903 (59% of completers)	83.5%

Source: Bellevue Community College TAACCCT Grant Proposal and Outcomes from Bellevue College Grant Database, August 2016.

The detailed outcome findings raise some concerns about the effectiveness of the new Health IT training programs. Although 61 percent of program completers in nursing and allied health were employed sometime during the first quarter after program exit, only 46 percent of program completers in Health IT and infused IT programs were employed during the same period and nearly one-third of those who were employed were working in jobs in the retail trade or

hospitality and food service sectors, which were unlikely to be related to their Health IT training[2,3]

One important finding from the multivariate analysis of student outcomes is that the delivery of more intensive student support services—including both academic supports and career counseling and job search support—was associated with an improved likelihood that students would complete their selected programs as well as a probability that quarterly earnings would be higher than for student who did not receive as many instances of enhanced staff support. This finding is important evidence supporting the efficacy of enhanced support services for students enrolled in TAACCCT grant-supported programs.

The multivariate analyses also show that older students (41 years of age or older), members of some minority groups, low-income students (those eligible for Pell grants), and individuals who received more support for personal issues were less likely to complete their programs than other students. In addition, students 25 years of age or less, low-income students, and individuals who received more support for personal issues were likely to receive significantly lower quarterly wages than other students within the first quarter after program completion. These findings serve as a reminder that community colleges enroll many persons with significant educational and labor market barriers who need significant help to achieve positive outcomes and suggest that there is a continued need to support members of these groups in order to increase the overall success of community colleges in accomplishing their employment and training mission.

Plans to Sustain Grant-Funded Programs and Priorities

Numerous aspects of both the new Health IT programs and the infused Health IT and nursing and allied health programs were successful enough that the participating colleges plan to sustain them beyond the grant period.

Grant-funded Health IT Programs

As the end of the grant approached, the participating colleges began to assess the success of the new grant-funded programs and plan for their continuation after the end of the grant period. Information available at the end of the evaluation period suggests that seven of the eleven new Health IT certificate programs will be continued after the end of the grant period. Commitment to continuing the grant-funded new Health IT programs was influenced by the level of student

2 Administrative data showed that only a few students who completed the targeted credentials subsequently enrolled in follow-on educational programs. Bellevue College updated the information on the number of students subsequently enrolled in education using National Student Clearinghouse data after it had provided SPR with the final data extract for the evaluation.

3 Measured outcomes for completers of both types of training increased about 15 percentage points between the first and fourth quarters after program completion.

interest in the program, the extent of faculty commitment to it, and whether the program was perceived as beneficial to the respective departments and the college at large.

Infused Nursing and Allied Health Programs

Overall, the strategy of infusing Health IT content into existing allied health and nursing programs was considered by the participating colleges to be a success, although, in many cases, students had suggestions about how curriculum infusion could be improved. In almost every case, participating colleges plan to maintain the infusion of Health IT content into existing nursing and allied health programs after the grant is over. Bellevue noted that the grant-funded staff members at each college had successfully "passed the baton" of infusing Health IT content to the individual programs that will be sustaining it after the end of the grant.

Student Support Services

Many of the participating colleges are looking for ways to maintain the enhanced student support services provided under the HeW grant. Six colleges described plans to continue enhanced student support services, by expanding the general advising services available to students in all programs, funding instructional support specialists for specific programs, or making a greater effort to link college students to public workforce system services.

Use of Prior Learning Assessments

For several colleges, the expanded use of prior learning assessments was another aspect of the grant that will be sustained after the grant is over. Although PLAs were not used extensively by the grant-supported students, three colleges indicated that the work to develop PLAs during the grant was valuable to the college at large and helped create a framework for increased use of PLAs by future students.

Emphasis on Recruiting and Serving Veterans

Several of the colleges already had robust services for veterans. In a few cases, the focus of the grant on recruiting veterans resulted in an expansion of college attention to recruiting and supporting veterans in additional academic programs. For example, one college is developing a new plan for providing comprehensive support for veterans enrolled in nursing and other allied health programs. Academic programs at another college developed close working relationships with a newly established college-wide veterans' resource center.

Lessons Learned

The nine colleges that participated in the HeW initiative faced a number of different challenges in preparing students for Health IT occupations. Although each college attempted to realize project goals in different contexts and encountered unique challenges, there are some common

themes in the challenges encountered, and a number of lessons learned apply to the HeW project as a whole.

New Health IT Programs

Some of the new Health IT programs faced major challenges to helping students obtain successful employment in the Health IT field.

- Program graduates were not as well-positioned to find jobs in the regional labor market as expected.
  - Representatives from several colleges reported that there were fewer openings for Health IT positions within their region than they had realized.
  - Several programs reported that employers were looking primarily for job seekers that already held 4-year degrees or even graduate degrees in the Health IT field.
  - Programs that lacked intensive IT coursework or prerequisites were particularly concerned that their program completers would not be attractive to employers in the Health IT field unless they already had substantial training or work experience in the IT field.
  - Unlike the nursing and allied health programs, the new Health IT programs did not already have established internship or practicum programs. Although several colleges began recruiting employers to create internships for Health IT students, progress in developing these work-based training opportunities was modest.

Several specific lessons can be drawn from the experience of designing and implementing new Health IT programs and infusing Health IT content into existing IT programs:

- Taken together, these implementation experiences suggest the difficulty of gaining widespread employer acceptance of a new occupational training program particularly in an merging sector like Health IT.
- Several programs found it helpful to explicitly link new Health IT curricula to existing IT degree programs as a new area of specialization for students in existing IT programs.
- A largely untested market for Health IT programs among the participating colleges comprised professionals already working in the Health IT or IT fields. One college found that there was substantial student interest in a noncredit healthcare data analytics program targeted to working professionals in related fields.

Infused Nursing and Allied Health Programs

It can be challenging to infuse Health IT content into nursing and allied health programs because of the following factors:

- Major EHR software venders are likely to be resistant to making their products accessible for use in an online instructional platform for use by students enrolled in public occupational training programs.
- Developing an EHR software platform and populating the database with fictional case data that can be used in specific instructional activities is a complex undertaking.
- Nursing and allied health program curricula have limited "space" for the insertion of new curricular content about EHR systems.

A few specific lessons can be drawn from the HeW implementation experience in infusing Health IT content into nursing and allied health programs:

- Hands-on exposure to EHRs or simulated EHRs was perceived as a valuable enhancement of the program curriculum by nursing and allied health students.
- Even more valuable to students were courses that imbedded information about the use of EHRs into multiple courses and applied it to multiple clinical topics (rather than offering a separate free-standing module on EHRs without linking it to the rest of the curriculum).
- Students particularly valued practicums and internships that allowed them to apply their knowledge about EHRs in a real work setting.

In conclusion, the HeW initiative offers a powerful example of how a group of colleges can work together over a three-year period to develop programs that better prepare their students for rapidly expanding job opportunities in the Health IT sector. The HeW TAACCCT grant experience also shows that a grant-funded collaborative can be a powerful force for helping colleges infuse Health IT content into existing training for nursing and allied healthcare occupations.

I. Introduction

The emergence of health information technology (Health IT) has been rapidly changing the landscape of health care in the U.S. Electronic health records are increasingly being used to document patient care and monitor the costs and quality of healthcare services; technology tools are being applied to patient diagnosis and care; and large health information databases ("big data") are being deployed in both healthcare management and research contexts. These developments have created a demand for workers with Health IT skills and opened up a new occupational field with considerable growth potential. However, because the need for workers with Health IT skills is growing so rapidly, and because Health IT jobs are performed within a wide variety of work settings and for a broad range of employers, Health IT jobs are not yet well defined and the emerging Health IT occupations and career pathways are still in flux.

The Bellevue College Consortium's Health eWorkforce Project

Since 2003, Bellevue College, in Washington State, has been at the forefront of identifying the knowledge and competencies needed by the Health IT workforce and designing curricula to prepare workers to move into Health IT jobs. Under a Round 2 Trade Adjustment Assistance Community College and Career Training (TAACCCT) grant from the U.S. Department of Labor awarded in the fall of 2012, Bellevue College was the lead college in a consortium of eight community colleges in Washington State and a ninth community college in Virginia that worked to build the capacity of community colleges to prepare students for a wide variety of Health IT and allied health occupations.

This collaborative, TAACCCT-grant-funded effort—the Health eWorkforce Project (HeW)—emphasized two distinct but complementary training goals: (1) preparing clinical nursing and allied health workers to work in environments in which they are increasingly expected to be competent in the use of electronic information systems for managing patient care and exchanging healthcare information with other users; and (2) preparing individuals to work in a matrix of emerging occupations in the Health IT sector. These new occupations include *IT specialists* trained to develop the rapidly changing technology tools, data systems and software design for health care delivery systems as well as *data analysts and researchers* trained to use "big data" to provide basic research and inform business management practices in the health care sector. In addition, the scope of work supported by the grant included a number of activities designed to (3) promote the entry of veterans into the Health IT field, and (4) develop instructional resources that would enhance the capacity of community colleges nationally to provide Health IT instruction.

The grant supported a wide range of distinct activities intended to achieve these objectives. At the consortium level, Bellevue College assembled a grant staff that included health information technology and curriculum development specialists who supported the development of new curriculum materials by the participating colleges. The consortium also contracted with a variety of entities to carry out ambitious activities that included the creation of a nationally focused initiative to welcome veterans to the Health IT field, an effort to develop a national Health IT apprenticeship program targeted to veterans, and the development of a digital platform to enable colleges to access electronic health record systems for use by students in an instructional setting. The consortium-level activities and accomplishments are described in more detail in Chapter II of this report.

Six of the nine individual colleges participating in the project and grant, with support and oversight from the consortium-level staff members at Bellevue College, initiated a total of eleven new Health IT certificate programs designed to enable students to find immediate employment in the field or enter further study and work towards associate-level or baccalaureate-level degrees in the Health IT field. In addition, all nine participating colleges developed curriculum modules to infuse Health IT content into existing nursing and allied health associate degree programs. Ultimately, the colleges infused a total of nineteen degree programs that prepare nursing and allied health providers to work in clinical settings where they would be expected to use electronic health records, and infused two preexisting IT programs with content related to the design and use of electronic healthcare information systems. Participating colleges also used grant funds to increase recruitment of veterans in the targeted programs and to increase student retention and advancement by providing student support services and encouraging the use of prior learning assessment (PLA) systems to award credit for prior study or work experience. Overall, the colleges sought to realize two key outcomes: expand the colleges' capacity to provide Health IT training, and increase the likelihood that students would complete the targeted educational programs, enter and retain employment in training-related fields, and enjoy increased earnings and opportunities for career advancement.

A Note About Timing

Three of the participating colleges completed services to students at the end of the third grant year (September 30, 2015); six colleges continued serving students through March 2016. Between the end of March 2016 and the end of the TAACCCT grant at the end of September 2016, a reduced number of grant-funded staff members at the individual colleges and at the consortium level prepared grant products for dissemination, attended conferences to share grant findings, completed documentation of student outcomes, provided data to support the evaluation, and carried out administrative activities associated with grant close-out.

The Evaluation of the Health eWorkforce Project

In early 2013, Bellevue College engaged Social Policy Research Associates as the external evaluator of the Health eWorkforce project and specified the objectives of the evaluation: to identify early program strengths and weaknesses, to provide regular feedback to support the success of the Health eWorkforce project, and to analyze outcomes at the institutional and student levels to identify what program designs and student characteristics were associated with the desired outcomes.

The evaluation comprised three components: an implementation study, a study of students' experiences and perspectives, and an outcomes study. Exhibit I-1 summarizes the research questions addressed by each component of the evaluation.

Exhibit I-1: Research Questions by Evaluation Component

Evaluation Questions	Implementation Study	Student Surveys	Outcome Study
How did contextual factors shape the design of the consortium and individual college activities?			
How was the project shaped by the demand for workers in Health IT and nursing/allied health?	✓		
What existing strengths did the partners leverage in building the initiative?	✓		
How was the project shaped by an understanding of the skills required for employment in Health IT jobs?	✓		
How did the project's organizational features shape project design and implementation?			
How did Bellevue College, as the lead college, guide the realization of grant goals? What were effective practices? What were organizational challenges?	✓		
What challenges did individual colleges encounter in carrying out their grant roles?	✓		
How did outside contractors participate in project design and implementation? What challenges, if any, were encountered?	✓		
How might grant communication and coordination between different partners been improved?	✓		
How well did the grant accomplish its planned activities and outcomes? What challenges were encountered and how were they addressed?			
Goals for developing and implementing new Health IT certificate programs	✓	✓	✓

Evaluation Questions	Implementation Study	Student Surveys	Outcome Study
Goals for infusing Health IT content into nursing and allied health curricula			
Goals for implementing prior learning assessment procedures to meet the needs of participants			
Recruiting and enrolling students in new certificate and degree programs			
Designing and delivering professional development resources for faculty involved in teaching Health IT or infused courses			
Providing supports to retain students and increase their success in program			
Developing cloud-based resources for students to access electronic health records programs in the classroom setting			
Developing a federally registered Veterans Health IT Apprenticeship program in two employer sites			
Recruiting and supporting veterans enrolled in Health IT and infused programs			
Developing strategies to disseminate grant-developed resources			
Developing strategies to sustain capacity of participating colleges after the grant			
How has the grant influenced student experiences and outcomes for students in new HIT and infused nursing and allied health programs?			
Effect on outreach and recruitment for students in all grant-funded programs			
Level of student satisfaction with course content, instructional modes and quality of instruction			
Student receipt of career information, career planning, or job search/interviewing skills training			
Student receipt of instructional support services			
Influence of grant participation on student career and employment objectives			
Suggestions for program improvement			
Differences in outcomes for different types of students			
Level of program completion for enrollees			

Evaluation Questions	Implementation Study	Student Surveys	Outcome Study
Level of employment for completers			↖
Whether employment is in training-related occupations		↖	↖
Whether program graduates use Health IT knowledge and skills in their jobs		↖	

Implementation Study

To address many of the research questions listed in Exhibit I-1, the implementation study collected information about the design and implementation of the grant-funded activities conducted at the consortium level and carried out by participating community colleges and outside contractors. To collect data relevant to implementation, the evaluators reviewed various written materials, interviewed key actors face-to-face and via telephone interviews, and participated in monthly group online/phone conferences scheduled by different cross-college work groups, including project managers, student support service staff, and members of a continuous improvement team. The evaluation team assigned a study liaison to each of the nine colleges and, over the grant period, conducted three site visits to Bellevue College and to each individual college participating in the project to document and assess grant-funded activities. During the site visits we interviewed grant-funded staff members and faculty members and administrators within the departments that sponsored the grant-funded programs. The researchers also convened focus groups of participating students during two of the three site visits to collect information about student satisfaction and suggestions for program improvement. To assess the accomplishments of the third-party contractors, evaluation team members talked with several contractors by phone and received periodic descriptions of contractor activities and accomplishments from members of the Bellevue College consortium staff.

Interim findings from the Implementation Study have been included in each of the evaluation's interim reports.

Study of the Experiences and Perspectives of Students and Program Completers

To address research questions about students' experiences with the grant-funded programs, SPR's subcontractor, the Social and Economic Science Research Center (SESRC) at Washington State University, conducted two different surveys: an online survey of current students

conducted in the spring quarters of 2014 and 2015, and a telephone survey of all program graduates conducted six to nine months after each respondent's completion of the program.

The online survey of current students provided information about the experiences of students in the IT-infused nursing and allied health and the new grant-funded Health IT certificate and degree programs. Survey topics included reasons for enrolling in the program, educational and work background, career interests and goals at the time of enrollment and at program completion, satisfaction with the course of study and the supports available from the program, and suggestions for improving program content, instructional methods, and support services.

The telephone survey of program graduates began in the spring of 2014 and continued through the winter of 2016. This survey collected information on student plans for employment or further study after completion of the grant-funded program; for students employed in occupations related to the training completed under the grant, the survey asked whether respondents were using Health IT knowledge and/or skills in their jobs.

Findings from the study of student experiences and perspectives were included in Interim Reports 2 and 3.

Description and Analysis of Student Outcomes

To answer the research questions related to participant outcomes, participant-level data were obtained from the following sources: the intake form completed at program registration; college records; earnings records maintained by the state agency that administers unemployment benefits; and student support logs maintained by Student Navigators. Bellevue College secured and merged the data from the multiple sources described above for individual students enrolled in the program and stripped out all personally identifiable information before providing the student-level data to SPR.

To assess how student outcomes are related to student characteristics and the services provided under the grant, the evaluators developed a series of multiple regression models where the dependent variable is an outcome of interest, measured at the individual level. We focused on three Health eWorkforce participation outcomes: program completion, post-program employment, and post-program earnings. Findings from the student outcomes study have yet to be reported in any evaluation deliverable.

This Report

This Final Report on the Evaluation of the Bellevue College Consortium's Health eWorkforce Project summarizes the key findings from the implementation and student perspectives studies that were presented in interim evaluation reports, discusses findings from the implementation study that have been developed since the submission of the interim reports—notably those related to project accomplishments at the consortium level and system-building outcomes for

participating colleges—and presents for the first time findings on the academic and employment outcomes of the 3,211 students enrolled in the TAACCCT grant across the nine participating colleges between October 1, 2013 and March 31, 2016. [4]

In Chapter II, we review the implementation and accomplishments of the Health eWorkforce project at the consortium level, focusing on Bellevue College's role as the lead college in guiding overall activities by the consortium colleges and its role contracting with outside entities to address consortium-level goals. In Chapter III, we assess the implementation experiences and accomplishments of the individual colleges in creating new Health IT certificate programs and infusing Health IT-related content into existing nursing and allied health programs. Chapter IV presents findings from the analysis of student outcomes. Chapter V summarizes study findings, reviews implementation challenges, and describes lessons learned.

[4] Bellevue College received additional data from several of the participating colleges after the final data extracts were provided to SPR for inclusion in the evaluation. As a result, the numbers included in Bellevue College's final reports to DOL may not conform exactly to the numbers in this Evaluation Report.

II. Project Leadership and Activities at the Consortium Level

As the lead college in the Health eWorkforce (HeW) consortium, Bellevue College had two kinds of consortium-wide responsibilities for ensuring the success of the project. First, it served leadership roles in the areas of management, coordination, technical assistance, and oversight that could not be decentralized in the individual colleges. Second, it encouraged several practices that were viewed as being aligned with the objectives of the project and the grant: encouraging participating colleges to recruit and enroll veterans, use prior learning assessments, and articulate their college programs to Bellevue College's professional baccalaureate programs; and creating health information industry-education councils in other states to encourage industry participation in designing training for Health IT professionals.

Providing Project and Grant Leadership

In its role as lead grantee, Bellevue College served as the grant administrator and fiscal agent for grant funds; helped the participating colleges develop curriculum, recruit students, and enhance student support services; and took the lead role in disseminating curriculum. To support these different functions, Bellevue developed a grant leadership team that included the project's executive director and associate director, administrative and fiscal staff members, and a team of specialists in curriculum development, prior learning assessment, faculty development, student support and employment services, and other areas of expertise.

As illustrated in Exhibit II-1, of particular note at the consortium level were grant leadership activities carried out by Bellevue College to

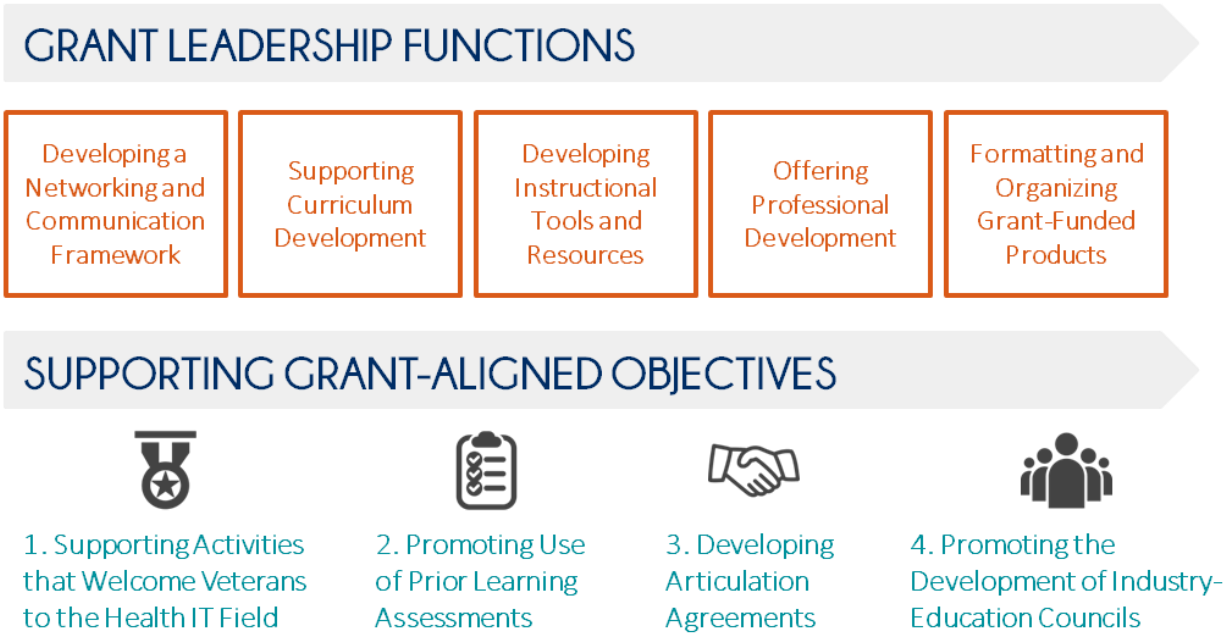
- provide an organizational structure for the grant activities at the consortium level and facilitate communication among consortium partners;
- support the development of course curricula and review developed curricula;
- develop instructional tools for use by participating colleges as well as the field at large;[5]
- offer professional development resources to prepare college-level instructors to impart Health IT knowledge and skills training to their students; and

5 Health IT instructional resources developed with support from the HeW grant included (1) the creation of a software platform called EMR-STAR that could be used to provide hands-on student access to a variety of electronic health records systems; (2) the creation of simulation modules for instructional use for two open-source electronic health record systems (VistA and Open EMR); and (3) the preparation of an interactive version of the CAHIMS curriculum called Health Information Technology Foundations developed in cooperation with and released on the Stanford Open Learning Institute (OLI) platform.

- format and organize products developed under the grant for dissemination to the field, as required by DOL.

Below, we discuss how the Bellevue College management team addressed each of these leadership functions.

Exhibit II-1: Grant Leadership Functions



Developing an Organizational Framework and Facilitating Communication Among Consortium Members

Because the project involved a large number of complex and interrelated activities, one of the primary responsibilities of Bellevue College as the grant lead was ensuring that all participating colleges were familiar with the details of the project and with their roles and responsibilities.[6]

During the initial months of the project, Bellevue College's grant management team devoted much of its energy to developing and supporting cross-college functional teams made up of project managers, curriculum developers, and student support services staff members from the participating colleges. To support grant administration and information sharing, Bellevue College scheduled regular monthly telephone meetings between the consortium management team and the grant managers at each participating college, as well as having designated members of the consortium management team conduct an annual on-site monitoring visit to assess progress and provide technical assistance to each participating college. Project managers and student support

6 In several instances, changes in key college administrators occurred between the time the proposal was submitted and the grant start-up began.

staff members from each college also participated in monthly teleconferences to share information with members of their functional teams located at other colleges. During the initial year of the project, monthly virtual team meetings were also held for the curriculum development team, the student support team, and a Continuous Improvement Council that included both consortium-level and college-level managers.[7]

Throughout most of the first three years of the project, project managers and student support staff members continued to meet monthly in teleconference sessions. Overall, grant representatives from the participating colleges said they found the members of the Bellevue grant leadership team to be responsible and pleasant administrators, with staff members who were accessible, attentive, and eager to engage with the colleges to address problems as they arose.[8] Respondents at the participating colleges said they generally liked the monthly meetings between Bellevue and each participating college because it provided them an opportunity to ask questions and get responses from the leadership team. They also appreciated Bellevue's efforts to give all project stakeholders the opportunity to talk with each other.

However, some respondents found it hard to converse informally and share useful information in a teleconference environment. For example, one respondent said that while the project manager teleconference meetings had been somewhat helpful, they could be better organized to promote "dynamic discussions" among project managers. Nearly universally, program staff members at the college level expressed a preference for face-to-face meetings over teleconferences. They also expressed a desire for an opportunity to have more informal meetings with other project managers to share specifics about how they have responded to particular challenges.

In response to this feedback, Bellevue College encouraged project staff members at individual colleges to talk informally with each other and also helped arrange three face-to-face meetings during the grant period, at which multiple representatives from each of the participating colleges could share information, discuss effective practices, identify implementation challenges, and discuss possible solutions. Representatives from the participating colleges expressed appreciation for these opportunities for face-to-face communication. A respondent from one college particularly appreciated discussing with individuals from other colleges how they had worked to align communication about the project among staff members in college admissions,

7 After the initial grant year, the participating colleges voted to discontinue the separate meetings of the Continuous Improvement Council and to integrate the topics covered by this group into the monthly project manager meetings.

8 Grant staff members at the Consortium colleges reported that the data collection and reporting requirements associated with the grant were time consuming. In particular, they complained about need to revise project curriculum templates and reporting forms multiple times, as requested by the Bellevue College management team. In large part, however, college grant managers recognized that Bellevue College faced the same pressures as the other co-grantees in having to leap into action on the grant without an advance planning period.

financial aid, and student services. Another college respondent said she found it helpful to exchange ideas with other colleges about curriculum design, data collection, and marketing activities.

The role of Bellevue College as grant and project manager evolved as the project matured. During the initial years of the project, members of the consortium team monitored activities to make sure that participating colleges were on schedule to contribute to the overall grant deliverables. For the participating colleges, key milestones included approving and initiating new and infused programs, developing and documenting high-quality curricula, recruiting and enrolling students, and refining curriculum designs in response to feedback from students and faculty who participated in piloting the new courses. Although not all participating colleges were able to follow through on the initiation of planned programs, the consortium team tracked progress closely and took needed actions to ensure that the co-grantees continued to be accountable for their grant commitments.[9]

During the second year of the project, an important management issue for Bellevue College was ensuring that all participating colleges and contractors had in place sound fiscal and program management policies and procedures that would pass the on-site project reviews conducted by federal DOL grant monitors in the spring of 2014. Participating colleges reported that they valued Bellevue College's leadership in keeping the project "on track" and enabling individual colleges to pass the on-site reviews with high marks.

Project management and oversight during the third year of the grant period focused on the challenges that colleges faced as students completed their programs and prepared to enter the labor market. The consortium staff supported college staffs' efforts to make sure that college grant managers and student support staff members used all available resources to support students in finding employment related to their training. These resources included input from program employer advisory boards and the placement services available at their colleges, as well as job search support from grant-funded student support staff members. Respondents from participating colleges expressed appreciation for the newsletters, LinkedIn page, and monthly student support staff conference calls arranged by the Bellevue College consortium's student support staff lead.

[9] For example, the computer information systems (CIS) faculty at Whatcom Community College failed to approve the initiation of a proposed new Health IT data security certificate program, and a planned Health IT AA degree program at NOVA failed to materialize. In each of these instances, the Bellevue College consortium team worked with the college to identify corrective actions. As a result, Whatcom agreed to develop a new non-credit certificate on Health IT data security, and NOVA reorganized its grant team to ensure that grant deliverables would be met.

Supporting Curriculum Development and Reviewing Curricula

The curriculum development model used by the Bellevue College Consortium was to have each college work independently, with its own curriculum development specialists, to develop new courses and infuse existing courses with Health IT content. During the first eighteen months of the HeW project, each of the participating colleges worked to complete curriculum materials for their new Health IT programs and for the existing nursing and allied health programs that were to be infused with Health IT content.

Bellevue College's role included the provision of professional development around consortium curriculum development standards. These standards formed the core of course design and the bar against each co-grantees submissions were approved for implementation. To support this effort, Bellevue invested substantial staff effort in creating and providing webinars and interactive workshops and resource materials on curriculum development for faculty who may not have had experience teaching Health IT content or developing curricula. The purpose of these webinars was to promote evidence-based, high-quality instructional design. The Bellevue College curriculum specialists on the consortium staff also reviewed and provided feedback on the draft curricula submitted by the participating colleges to ensure that the curricula met curriculum development standards such as including activities and exercises to ensure active student engagement and assessment tests and activities for demonstrating new Health IT knowledge, competency, and skills. Bellevue College also ensured that all curriculum materials were formatted using a standardized template and were designed for fully online instruction.

By the end of the second grant year, participating colleges had made substantial progress in piloting each of the new courses with one or more cohorts of students. Bellevue College asked each college to develop a curriculum improvement plan for each piloted course, based on the lessons learned during the piloting process. To make these curricular changes, the HeW program managers and program faculty communicated with the Bellevue consortium team about the curriculum additions.

Second, the project was expanded to include a new category of infused programs: IT programs infused with Health IT content. Both Renton and Bellingham infused the curricula for all students enrolled in their respective computer networking technology certificate programs with Health IT content, to better prepare these students to work in IT jobs in the healthcare sector.

Although developing and disseminating fully online course materials was a strong feature of Bellevue College's vision for Health IT instruction, some of the participating colleges decided to develop courses for their own use that blended face-to-face instruction and online materials. Using "flipped" course designs, blended courses provided several colleges with an opportunity to have students study material online between class sessions, and use face-to-face class sessions

to discuss and practice what they had learned. All colleges provided wholly online course designs for dissemination as part of the grant.

By the beginning of the third year of the project, all curriculum materials developed with grant funding had been submitted to Bellevue College and were undergoing final quality review and revisions by the Bellevue College consortium team. Although subsequent changes were not reflected in the curriculum materials prepared for dissemination, several colleges told the evaluators that they planned to continue revising infused curricula during the third grant year to expand the Health IT topics covered, make student activities more interactive, or include increased use of the online instructional resources developed by Bellevue College (described in the next section.)

In general, colleges appreciated Bellevue College's suggestions about curriculum improvement, and accepted Bellevue College's template of formatting requirements with good grace, though not with enthusiasm. However, there were some challenges. The curriculum development model used by the Bellevue College Consortium was to have each college work independently, with its own curriculum development specialists, to develop new courses and infuse existing courses with Health IT content. Although the Bellevue College consortium team worked closely with each of the participating colleges to review their new and infused courses and to provide suggestions for improvement, respondents at some colleges indicated that they were not familiar with the materials developed at other colleges. Several colleges suggested that it might have been helpful if Bellevue College had played a more active role in encouraging participating colleges to share curriculum materials with each other when they were infusing Health IT content into similar programs

In addition, several colleges indicated that they were unable to respond to Bellevue College's suggestions for curriculum improvement, because the comments were received after their curriculum had already gone through an internal college approval process and been approved in their present form.

Developing Instructional Tools and Materials to Support Health IT-Related Instruction

Under the HeW grant, Bellevue College consortium team members invested significant grant funds and staff effort to develop several instructional tools to support Health IT-related instruction. The initial beneficiaries of these tools are the nine colleges participating in the HeW project. Over time, several of these tools will also become valuable to a broader audience of Health IT educators.

Developing and Launching the EMR-STAR Software Platform

One goal of the HeW project was to develop a cloud-based access point to academic instances of a variety of EHR systems for use in an education and training setting. This has been a somewhat challenging goal because the vendors of proprietary EHR systems have generally not been willing to license their products for use in a general educational setting. To initiate the project, Bellevue College first contracted with a vendor to develop and launch a software platform that would allow academic institutions to access two of the major open-access software programs—OpenEMR (a clinic-based system) and VistA (a hospital-based system developed for Veterans Administration hospitals).

The first version of the EMR-STAR platform was launched on schedule during the first year of the grant period. The platform was initially welcomed by colleges that wanted to be able to expose students to EHR systems. However, this initial launch was of limited utility to the participating colleges for several reasons. First, without a pre-populated set of fictional patient records, instructors had a difficult time creating student activities using the software in their course curricula. Second, because some faculty members were not familiar with EHRs and lacked IT experience, they did not feel comfortable introducing students to the software or developing exercises that would enable students to become familiar with how EHRs are used in clinical practice. Third, the initial launch required participating colleges to be able to download EMR-STAR to local servers or computers, which was not always an option due to limitations in technical infrastructure. As a result of these difficulties and others, the early versions of the EHR software platform were not embraced by most of the nursing and allied health program instructors for use in their Health IT-infused curricula.

With the agreement of the initial contractor, Bellevue College terminated the initial EMR-STAR contract and found a second contractor that was better equipped to host the software platform and to work with participating colleges to support their use of the software. In its "second release," EMR-STAR was a cloud-based resource accessible from within a college's learning management system by any student who was provided with an EMR-STAR account.

To further support the use of EMR-STAR by the participating colleges, the Bellevue consortium staff created seven OpenEMR lessons within the online learning platform to give students exercises and providing auto-scoring of assessments. These lessons were developed for use in instructional settings within both Health IT programs and Health IT-infused nursing and allied health programs. They taught students how to schedule a patient visit, enter patient vital statistics into the system, assign access rights to different parts of patient records, and check audit logs to see what additions or changes had been made to a patient's record and to audit changes in patient information.

At least four of the colleges participating in the HeW grant reported that EMR-STAR in its second release was a valuable addition to their instructional tools.

- At Renton, the most enthusiastic user, instructors in the medical assistant program had students use OpenEMR during clinical labs in connection with scheduling patient appointments, drawing blood, entering vital signs, inputting clinical notes, and entering prescription orders. In the pharmacology technician program, students were shown how to build drug inventories for patients using OpenEMR.
- At Pierce, the electronic health records course (required for both the medical office assistant certificate and the new healthcare data management and design certificate program) covers how EHRs are used in the field and offers hands-on access to EHRs for student practice. Online activities available to students include access to EMR-STAR software, which provides experience with both OpenEMR and VistA. According to the course instructor, the more EHR systems that students are exposed to, the better. The course instructor is available to answer questions and go through examples using the software platform in the class sessions.
- A recent quarterly report from NOVA to the Health eWorkforce consortium notes that students in NOVA's certified clinical medical assistant program receive hands-on instruction on the OpenEMR system, including practice entering patient data into the software.
- OpenEMR has also been infused into the curriculum for NOVA's respiratory therapy students and can be used during class sessions held in the campus simulation lab. During these sessions, students read about mock patients in the OpenEMR, perform breathing treatments on SIM Lab mannequins, and then chart these clinical experiences in the EHR system.

These colleges, and others that adopted EMR-STAR, felt that the experience of exposing students to EHR software provided students with a valuable learning experience and demonstrated the value to of Health IT infusion. Two of the participating colleges (Renton and Whatcom) made arrangements to host EMR-STAR on their own college's server after the EMR-STAR contractor ceased hosting the platform in September 2015.

Partly because OpenEMR would only be available as a free resource during the grant period, other colleges participating in the grant (including Clark, Clover Park, Bellevue, Spokane, and Bellingham) were less interested in adopting EMR-STAR as a tool in nursing and allied health programs at Clark and other colleges. Furthermore, several of the colleges had already selected another electronic health record system as an instructional tool. The Clover Park dean of health, human services, and workforce development informed the research team that other nursing and allied health programs at the college would be unlikely to be interested in using EMR-STAR because they already used EPIC as an instructional tool. At Spokane, the health information

management program director already used another version of EHR software (VLab, developed by AHIMA) as an educational tool to bring EHRs into the classroom.

Developing the Open Learning Initiative (OLI) Version of the CAHIMS Curriculum

After the Bellevue consortium was awarded the TAACCCT grant for the HeW project, the grantee was invited to participate in a related project, funded by the Bill and Melinda Gates Foundation, to elaborate the Certified Associate in Health Information Management Systems (CAHIMS) curriculum for dissemination as part of the Open Learning Initiative (OLI) hosted by Stanford University. Since this was an activity that would add value to the products developed under the HeW grant and increase the ability of the consortium to disseminate products for public use, the consortium leadership team accepted the invitation, not appreciating that this involvement would mean a substantial commitment of staff time. Nevertheless, an online version of the CAHIMS curriculum, rebranded as the "Health Information Technology Foundations Course," was completed and is now available to individual users as well as to educational institutions at http://oli.stanford.edu/health-technology. This online version of the course has been extremely well received both by individual students and by educational institutions.

The OLI version of the CAHIMS curriculum made the content modules that provide the foundation of much of the infused Health IT content available to a much broader audience, in a readily useable Internet-based format. Access to the curriculum was free for all users during the TAACCCT grant period, and will continue to be free for individual student users after the grant ends. After the end of the grant, educational institutions that would like to integrate the curriculum into their learning management systems and access the assessment results embedded into the curriculum instruments will be required to pay an OLI licensing fee of twenty-five dollars per student.

Developing Instructional Materials using Simulations of Electronic Health Records

During the second year of the HeW project, consortium staff members realized that some nursing and allied health instructors were not comfortable supporting students in the use of actual EHR software, but might be interested in using simulations of EHR software as an instructional tool. To realize the vision of a simplified set of lessons that would be "plug and play" Bellevue College designed seven lessons that would teach students how to use VistA and Open-EMR electronic health records to carry out such functions as schedule a patient for an appointment, complete a clinical intake, document a clinical assessment, and create an audit log of changes to a patient's record. A software developer was contracted to produce the simulations designed by Bellevue College. Consortium staff reported that by February 2015, the simulation software lessons were completed and ready for dissemination to interested audiences.

Each simulation is about forty-five minutes long and is designed to serve as a student's first exposure to an aspect of EHR systems. The simulations offer a detailed, step-by-step view of using an EHR system, followed by practice in completing each step. Students can replay and review any part of an activity, and can complete a review of the entire activity at the end of the lesson. In addition, each lesson has been developed in two versions, one for use with OpenEMR and one for use with VistA. Using the completed simulations, faculty members can assign students exercises by sending them to an online site where they can interact with the software. As a result, faculty members do not have to interact with or be able to use the EHR software programs themselves.

The long-term potential for broad use of these simulations is enormous. However, it was unfortunate that these products were completed relatively late in the grant period, after most of the colleges had finalized the modules for infusing Health IT content into their nursing and allied health programs. To encourage use of these instructional tools by the participating colleges, the consortium team has offered demonstrations of the simulations to each of the HeW colleges. Dissemination of the simulations has continued during the final grant year through website announcements and downloads, conference presentations, and word-of-mouth. Bellevue College reported that the dissemination of the simulations during the last year of the grant has been extremely successful. In the first month after the simulations were posted on the DOL TAACCCT grant dissemination website, the VistA simulations were downloaded 79 times and the OpenEMR simulations were downloaded 183 times.

Offering Professional Development Courses in Health IT Content and Tools to Health IT Instructors

In the HeW proposal submitted to DOL, Bellevue College had identified a lack of faculty development resources as an important barrier to having faculty in nursing and allied health and IT programs use Health IT software as instructional tools in their courses. Accordingly, another consortium-level function that Bellevue College worked to carry out during the project was providing professional development opportunities for IT and Health IT faculty at the participating colleges to prepare them to teach Health IT content in the courses developed with grant funding. During the first year of the project, the consortium leadership team created a series of webinars and online modules, but these professional development materials were not widely used by the instructors assigned to teach grant-funded courses nor by other faculty members in the participating departments and programs. In interviews with the project managers and involved faculty, the evaluators were informed that only a few individuals from each college participated in this first round of professional development offerings, and those who participated didn't find the content very relevant to their practical concerns. Some staff members who participated described the training content as too basic for the curriculum specialists who had worked on developing course materials and too time-consuming for the busy instructors hired to teach the

courses. A nominal payment ($300) to compensate instructors for their time viewing the modules did not seem to help.

During the third year of the project, the HeW consortium staff redesigned its professional development curriculum tools to make faculty members aware of the instructional resources that Bellevue College had developed, including OLI version of the CAHIMS curriculum, the OpenEMR and VistA platforms available for hands-on access to EHRs in the classroom, and the simulations that Bellevue had commissioned to provide training on how to use the EHR screens without actually using the EHR software. "Our goal now," one respondent said, "is to make it as easy as possible for faculty to use the materials we have developed." The new round of professional development webinars was released in February 2015. Project managers at the participating colleges reported that some faculty members from their nursing and allied health programs accessed the course materials that introduced the EMR-STAR and VistA software developed for student use in the classroom. For example, the project manager at Whatcom reported that some of the college's nursing faculty members participated in these online courses because their department plans to use the VistA program to introduce students to EHRs in courses in Spring 2015.

Formatting and Organizing Grant-Funded Products for Dissemination

During the final year of the grant period, the consortium leadership team has been formatting the products developed under the HeW grant for dissemination to the field. Interested parties will be informed about the availability of the materials via conference presentations, webinars, and publicity about online resources such as the OLI curriculum. The response to date has been positive, with several major universities using the curriculum elements developed under the grant to organize the infusion of Health IT content into their nursing or allied health programs.

The major website designated by DOL for the dissemination of TAACCCT grant materials is www.skillscommons.org. For the HeW grant, the materials being prepared for dissemination on this platform by the Bellevue College consortium team include first, all curriculum materials developed under the grant (organized by instructional topic), and second, information about the additional resources that may be valuable to other practitioners—including EMR-STAR platform and the online training modules that use simulations of electronic student record systems, the information about how to develop prior learning assessment systems, the faculty development curricula, and how the participating colleges developed student support services. The final materials that will be uploaded to this site at the end of the grant period (so that they will be the first materials presented to interested viewers) will be catalogs of the topics covered: one for infusion topics and one for Health IT program topics.

Supporting Grant-Aligned Objectives

Additional activities at the consortium level were designed to

- support efforts by the participating colleges to recruit and prepare veterans and other experienced workers for training and employment in Health IT-related occupations;
- encourage colleges to use prior learning assessments to enable students to progress more quickly through their programs;
- encourage the articulation of community college associate degree programs to Bellevue College's professional baccalaureate programs in IT and Health IT; and
- promote the development of industry-education councils.

Below, we describe how the Bellevue College, as the lead college for the HeW project, supported each of these objectives.

Supporting Activities that Welcome Veterans to the Health IT Field

One of the distinctive features of the HeW grant has been its focus on recruiting veterans for jobs in the Health IT field. Activities aimed at prioritizing services for veterans have been carried out at both the consortium level and at individual colleges. At the consortium level, Bellevue College has promoted Health IT careers for veterans using three distinct activities: (1) contracting with the Health Information Management Systems Society (HIMSS) for the operation of a HIMSS Veterans Career Services Initiative; (2) hiring a veterans' coordinator at the consortium level to guide participating colleges in recruiting and serving veterans; and (3) launching a Health IT apprenticeship program for veterans.

Contracting for the Operation of a HIMSS Veterans Career Services Initiative

Under its contract to operate a Veterans Career Services Initiative, HIMSS initiated a "hero's welcome" program for veterans at its annual national conference, and sponsored attendance by veterans (via contributions from local HIMSS chapters) at the three conferences held during the grant period. HIMSS also carried out ongoing mentoring and support programs for veterans interested in entering the Health IT field. Bellevue College was very pleased with the activities carried out under this contract, and reported that, in each successive year of the grant, the activities for veterans at the HIMSS annual conference were expanded and enriched and the number of veterans attending the conference increased.

At the April 2015 conference, the activities for the eighteen sponsored veterans and other veteran conference attendees included a one-day "career boot camp" about successful transition from military service to a civilian career in the Health IT field. In addition, a "Welcome to Healthcare" booth and lounge were provided at each annual convention, so that veterans participating in the Veterans Career Services Initiative could connect with each other and with

employers and service organizations. As an ongoing service to veterans, interested veterans were invited to sign up for the vMentoring program offered by HIMSS, which connected them to mentors who are both military veterans and Health IT professionals. In addition, fourteen webinars on Health IT issues relevant to veterans were recorded and archived on the HIMSS web page, at www.himss.org/ResourceLibrary/TopicList.aspx?MetaDataID=3026.

Staffing a Veterans' Coordinator Position at the Consortium Level

After experiencing a series of setbacks in arranging for the employment of an individual at one of the participating colleges to serve as the project's veterans' coordinator, Bellevue College hired a consultant to serve as veterans' coordinator in the spring of 2014. The individual selected was well suited for this position by virtue of his status as a retired Navy base commander, his employment in the Health IT industry, and his subsequent advocacy and support for veterans making the transition from military to civilian employment. After being hired, the veterans' coordinator visited each of the participating colleges to see how he could assist them in conducting outreach to veterans for their grant-funded programs. Other activities carried out by the veterans' coordinator included making presentations on the positive qualities of veterans as employees to private sector businesses, informing veterans' service organizations about the training opportunities available as part of the HeW grant, and assisting the participating colleges in linking veterans enrolled in grant-funded programs to available veterans' services. The consortium leadership team expressed great appreciation for the activities carried out by this individual.

With the assistance of the veterans' coordinator, the consortium's student and employment services coordinator arranged to make weekly presentations during the spring of 2014 to transitioning service members at Joint Base Lewis-McChord for the purpose of recruiting veterans for the grant-funded programs. If exiting service members indicated interest, the student services coordinator referred them to relevant programs at one of the participating colleges.

Project managers at the individual participating colleges, several of whom were themselves veterans, also developed their own active strategies to recruit veterans.[10] Veterans' navigators and the veterans' service centers located at most of the participating schools were important resources for grant staff members at individual colleges. For example, the grant project directors at Whatcom and Spokane reported that they each worked closely with an on-campus veterans' services representative to help promote the grant-supported degree and certificate programs and to provide supportive services for veterans enrolled in HeW grant-sponsored programs.

[10] The material in this paragraph and the next deals with individual colleges, but we include it here because it is closely related with the activities of the veterans' coordinator at the consortium level.

Pierce reported that it had particularly strong local resources available to draw from in serving veterans: two of the college's four campuses are located on military bases. The college formed a veterans' services team that included staff members from general student services, the on-campus veterans center, school administrators, instructors, and grant-funded student navigators. Together, these team members were able to assist veterans in obtaining benefits and overcoming barriers such as homelessness, as well as to connect veteran students to the larger college community and to a local veterans and military family outreach and resource center.

Launching a Veterans' Health IT Apprenticeship Program

The third veterans-related objective under the HeW grant was the development of a veterans' Health IT apprenticeship program that would involve partnerships with one or more employers in the healthcare sector who could sponsor veterans as paid Health IT apprentices. As envisioned, the apprenticeships would have offered a combination of classroom training (drawing on the CAHIMS curriculum) and work-based training and would have provided supervision while the apprentices learned skills of gradually increasing complexity, culminating in mastery of the skills outlined in the Health IT apprenticeship plan. At the completion of the apprenticeship, the apprentices would be fully qualified to fill a Health IT position with the apprenticeship host organization or another employer.

Bellevue College and several of its contractors were diligent in their attempts to recruit a hospital or other healthcare provider that would be willing to sponsor apprenticeships. Initial prospects included a Veterans Administration (VA) hospital and several other hospitals around the U.S. Although it had previously indicated interest in sponsoring apprentices, the VA hospital had to back out due to budget cutbacks that occurred at about the same time the grant was approved by DOL. Finally, two years into the project, Bellevue College acknowledged that the consortium would not be able to find a sponsor willing to commit to realizing this grant goal. Funding for this activity was reprogrammed to support other grant-funded activities.

Promoting Use of Prior Learning Assessments

Use of prior learning assessments (PLAs) has been a priority for community colleges in Washington State since 2011, when the state passed legislation that promoted the awarding of college credit for prior learning and established a state work group to create a policy for PLA credit. Progress in implementing PLA policies and procedures has varied from college to college.

The Bellevue College consortium placed a high priority on promoting development of new PLA policies and increased use of existing PLA policies as part of the HeW grant. The consortium funded a half-time staff member on the Bellevue consortium team to explore opportunities for PLAs, share this information with participating colleges, and encourage them to take advantage of PLAs for students enrolled in grant-funded programs. The staff person who conducted this work was a veteran and paid particular attention to creating crosswalks between military job

descriptions and courses for which veterans might earn PLA credit.[11] He worked carefully with project managers from each college to document what had been done to provide credit to veterans for work completed in the military, and made suggestions about how to work with each college's administrators to increase the use of PLAs. Further, the consortium PLA specialist reminded project staff members at participating colleges that whether or not their college had an official PLA policy, individual instructors at most colleges have the ability to waive prerequisites or to provide course credit for students who hold a certificate or can demonstrate competence in some other way.

Individual colleges expanded opportunities for students to earn credits using PLAs in various ways.[12] The HeW grant proved to be a catalyst for changing Whatcom's college-wide PLA policy and procedures. With the support of the HeW consortium's PLA expert, the PLA coordinator at Whatcom proposed and obtained administration approval for a new policy that created course equivalences for the college-level examination program (CLEP) tests at Whatcom. Prior to the HeW grant, credits from CLEP general and subject exams could be used only for electives. Under the new policy, CLEP exams are matched to course equivalents and the resulting credits may be used to exempt students from required courses. Under this new policy, the HeW grant helped develop a CLEP test for one of the computer information systems courses that is a prerequisite for Whatcom's noncredit Health IT course, as well as for its associate degree program in cyber security. Students find out about the CLEP test through their advisors; if a student passes the test, he or she earns an exemption from this prerequisite course. In addition, the college planned to change its website so that students can learn about opportunities to earn prior learning credits.

At other colleges, the consortium's activities encouraging the use of PLAs to provide course credit were less transformative in terms of overall school policy. Spokane, Pierce, and NOVA already had PLA policies in place when the grant began. Spokane was developing challenge exams for several IT courses that are part of the college's mobile device management certificate program. At Pierce, PLAs were already widely used—program staff members said that most students enrolled in the grant-funded programs would receive some PLA credit, as the result of passing a CLEP exam, providing a portfolio of work completed, or presenting a professional certificate. At Pierce, if a student wanted to get credit for a course for his or her academic transcript, the student could "challenge" the course, pay thirty dollars, and, if successful in

---

[11] One product created by the PLA specialist on the grant team was a Health IT Employers Military Skills Locator web tool, designed to help employers identify the relevant skills that veterans might offer as a result of their prior military job assignments: http://emsl.hiteducation.org/pla.

[12] The material in this paragraph through the end of this section deals with individual colleges, but we include it here because it is details the implications of the consortium's promotion of PLAs.

demonstrating the required knowledge, get the credit. Alternatively, the student might get the requirement for the course waived but the course would not appear on the transcript.

Clark had implemented a PLA policy in July 2014, but this option was not yet well known among students or faculty during the grant period. Although none of the students enrolled in the HeW grant-funded programs had requested PLA credit at the time of the second site visit, the program manager expected that this option would benefit students enrolled in the grant-related programs by allowing them to obtain credit for the general education courses that are prerequisites for enrollment in the college's nursing and pharmacy technician programs. This had the potential to significantly cut the cost of completing general education requirements, and would allow prospective students to enroll in a grant-related program much more quickly.

At Renton and Bellevue, PLAs were not used. Bellevue College had a very restrictive policy on the use of PLAs. Instead of using PLAs, the HeW program at Bellevue focused on how to get individual instructors to waive prerequisites for particular courses, based on other means of demonstrating mastery of material. For example, knowledge of SQL programming, which is a prerequisite for the noncredit healthcare data analyst certificate, could be demonstrated by taking an online or free course, rather than an expensive college course. For the Health IT courses, the programs participating in the grant at Bellevue also looked for opportunities for students to request that instructors or program representatives let them take qualifying exams for course exemptions rather than supply formal transcripts. Renton is at the opposite end of the spectrum on prerequisites. At Renton, all programs are open enrollment (with no prerequisites) and all students enroll in the same courses regardless of their previous education level. Thus, prerequisites are not an option for anyone.

Developing Articulation Agreements

As the basis for articulation of other colleges' Health IT and IT programs with its two-year professional baccalaureate program in Health IT, Bellevue College convened representatives from each of the participating colleges to develop a shared understanding of "core" IT skills that should be mastered by students interested in transferring into Bellevue's two-year professional baccalaureate program in Health IT. Identifying courses that would satisfy articulation requirements was to be the first step in enabling students to transfer into this Bachelor of Applied Science (BAS) program.

Two colleges pursued articulation agreements with Bellevue's Healthcare Technology and Management BAS degree program. Clark College completed an articulation agreement for its AAB degree in health informatics. In addition, Bellingham was working toward establishing an

articulation agreement with Bellevue's Health IT BAS degree for its computer networking technology AAS program.[13]

Most of the Health IT programs that were developed under the HeW grant program were not eligible for articulation agreements with Bellevue College, because they did not include completion of an AA degree in either an IT or Health IT field and/or completion of general education requirements. Thus, the Health IT certificate programs developed by Whatcom, Spokane, Bellingham, and Renton under the HeW grant did not qualify for articulation agreements with Bellevue.

The remaining colleges with Health IT or IT associate degrees that might have met Bellevue's articulation requirements already had other articulation agreements that were suitable for the students in their programs. For example, Pierce's health informatics and integrated technology AA degree already had articulation with bachelor's programs at Central Washington University and Western Governor's University. Similarly, Whatcom did not pursue an articulation agreement with Bellevue College for its computer information systems AA program, because it had recently established an articulation agreement for those students to be able to transfer into a BA program in computer and information systems security at Western Washington University.

Promoting the Development of Industry-Education Councils

Even before the beginning of the HeW grant, Bellevue College promoted the formation of the Washington Healthcare Information Industry Education Council (WHIIEC), housed within the Washington Health Care Authority. WHIIEC brought together a broad spectrum of state healthcare employers and representatives of education and training providers active in training the Health IT workforce for quarterly meetings to collect stakeholder information about the skills that employers need in the Health IT workforce and to identify the educational resources available to meet those needs. Under the HeW grant, Bellevue College contracted with WHIIEC to carry out three tasks: (1) develop a Health IT education program inventory for prospective learners and advisors, (2) continue to convene employer and educator stakeholders to identify evolving workforce needs within the Health IT sector, and (3) disseminate information about the council to other states interested in forming their own Health IT industry-education councils.

From the council's location within the Washington Health Care Authority, WHIIEC staff members had an inside view of emerging demands for improved analysis of healthcare data and how such analysis could ensure the delivery of high-quality services, support broader definitions of health that include multiple aspects of longevity and quality of life, and demonstrate links between the

13 Interestingly, Bellingham was also work to articulate its computer networking technology AAS program to Bellevue's BAS degree in information systems and technology. Thus, students who completed the AAS degree at Bellingham would be able to choose whether they wanted to transfer to an applied bachelor degree that specialized in Health IT, or a general IT program.

federal payment structure for healthcare and improved health outcomes. One of the strategies developed by WHIIEC for building bridges between employer and educator stakeholders in Washington State was to arrange for educators to tour worksites where their students might be employed. It was hoped that this would encourage the development of student practicums and/or apprenticeships to complement classroom training. Thus, even though it did not directly interface with the community colleges developing Health IT programs under the HeW grant, WHIIEC was involved in anticipating future uses of Health IT in the public and private sectors and ensuring that educational institutions would be ready to support those uses with the programs they offered Health IT students.

Although Virginia did not set up organizational entities parallel to WHIIEC during the grant period, the grant did provide an opportunity for the state to hold discussions among stakeholders in the Health IT industry and in education.

Conclusion

The activities carried out by the consortium-level Health eWorkforce team made important contributions to the project's success. By providing a strong management and oversight structure, the consortium staff ensured that the project deliverables were completed on schedule and in compliance with DOL grant regulations. By providing a standardized template for curriculum development and reviewing college curriculum materials, the consortium team ensured that the curriculum products followed basic principles for effective educational practice (e.g., providing for hands-on practice by students, conducting continuous assessment of student progress, and making effective use of available online instructional tools and educational resources). The consortium team also supported and encouraged the participating colleges to develop expanded policies for PLA and take advantage of existing PLA policies to award students with credit for prior learning.

Several of the consortium-level accomplishments involved the creation of curriculum resources that are of potential value to a wide-ranging audience of Health IT educators in other educational institutions. These include the development of an interactive online curriculum on "Health Information Technology Foundations" now available through the Stanford University Open Learning Initiative, as well as software simulations developed for educational use on how to conduct basic tasks on several open-access electronic health records systems. Because these tools were not completed until the third year of the grant period, they were not available for early dissemination to the participating colleges. Nevertheless, these products deserve widespread dissemination to the field as valuable tools produced under the grant.

In the next chapter, we summarize the grant implementation experiences and accomplishments of the nine participating colleges that used grant funding to initiate new Health IT programs and infuse Health IT content into existing nursing, allied health, and IT programs.

III. The College Level: Developing New Programs, Enhancing Existing Programs, and Supporting Students

In this chapter, we focus on college implementation, summarize major findings from the 42-month period of grant operations, from start-up through the end of the grant period.[14] We look first at findings from the new Health IT programs and the two IT programs that were infused with Health IT content. We then review findings from the infused nursing and allied health programs. We then take a close look at student support services before concluding with an examination of how grantees approached sustainability—what features of the grant they found worth sustaining and how they planned to sustain these features.

Overview of Grant-funded Program Development and Enhancement

Across the nine participating colleges, the TAACCCT grant supported the initiation of eleven new Health IT certificate programs and the infusion of nineteen preexisting nursing and allied health programs and two preexisting IT programs with content related to the design and use of electronic healthcare information systems. See Exhibit III-1 for an overview of all new and infused programs. As shown in Exhibit III-1, two colleges (Clark and Clover Park) participated only in the infusion of Health IT content into existing nursing and allied healthcare programs. The remaining seven colleges initiated or enhanced more than one type of program with the grant. The number of programs supported with grant funding at each college ranged from one (at Clover Park) to seven (at Bellevue College).

Exhibit III-1: Overview of Grant-Funded Programs

College	New Health IT Program(s)	Infused IT Program	Infused Nursing and Allied Healthcare Program
Bellevue	4	0	3
Bellingham	1	1	2
Clark	0	0	2
Clover Park	0	0	1
NOVA	1	0	4
Pierce	1	0	1
Renton	0	1	2
Spokane	3	0	1

[14] Three of the participating colleges concluded operations (other than support of the evaluation and grant close-out) at the end of the 36th month of the grant period. The remaining six colleges chose to continue to offer classes and provide student services through the 42nd month of the grant (as allowed by DOL).

College	New Health IT Program(s)	Infused IT Program	Infused Nursing and Allied Healthcare Program
Whatcom	1	0	3
TOTAL	11	2	19

As described in the previous chapter, the HeW grant leadership team at Bellevue College guided the development of and reviewed the new and revised course curricula for these 32 programs, and supported implementation at the individual colleges by developing and launching a cloud-based electronic medical records software platform for instructional use (EMR-STAR) as well supporting the development of an interactive online version of the CAHIMs preparation curriculum available through the Stanford Open Learning Initiative (OLI).

At each of the individual colleges, the TAACCCT grant supported curriculum development staff (paid on an hourly basis), a dedicated full-time grant manager, and part-time or full-time student support staff members who recruited and supported participating students and provided academic assistance to promote student retention and successful program completion. Additional features of the HeW program design supported by the consortium leadership team and implemented across the participating colleges included the recruitment and enrollment of veterans as a specific priority population for the grant, and support and utilization of prior learning assessment (PLA) systems as a means of awarding credit for knowledge and skills gained by students through previous education, training, or work experience.

New Health IT Certificate Programs

Under the HeW TAACCCT grant, six of the nine participating colleges developed a new curriculum, adapted an existing curriculum, and/or piloted one or more new Health IT certificate programs, for a total of 11 new Health IT certificate programs. As described in the previous chapter, although one of the participating colleges (NOVA) had anticipated developing an associate degree program in Health IT under the TAACCCT grant, the program was not approved by the college involved because the IT departments' curriculum review committee viewed this programs as too closely related to an existing IT associate degree program. Exhibit III-2 lists the new Health IT certificate programs initiated with grant support, the number of credits (or noncredit hours) required to complete the certificate, and the total number of students that enrolled in and completed the certificate during the grant period. As shown in Exhibit III-2, a total of 398 students enrolled in the new Health IT programs during the grant period, of whom 160 had completed their programs by the end of program operations in March 2016.

Exhibit III-2: Grant-Funded New Health IT Programs

New Health IT Certificate Program	Credits or Hours	Total Enrolled During Grant	Program Completers as of Spring 2016
Bellevue			
Certified Associate in Healthcare and Information Management Systems (CAHIMS) (for credit)	15 credits	20	7
Certified Associate in Healthcare and Information Management Systems (CAHIMS) (noncredit)[15]	150 hours	4	4
Healthcare Data Analytics Certificate (for credit)[16]	30 credits	0	0
Healthcare Data Analyst Certificate (noncredit)[17]	227 hours	36	16
Bellingham			
Health Information Technology Certificate	64 credits	35	13
NOVA			
Health Information Technology Career Studies Certificate (for credit)	23 credits	16	3
Pierce			
Healthcare Database Management and Design Certificate	40 credits[18]	68	31
Spokane			
Certified Associate in Healthcare and Information Management Systems (CAHIMS)	15 credits	5	3
Mobile Device Management Certificate	10 credits	109	5
Mobile Software Development Certificate	15 credits	51	24
Whatcom			
Healthcare Information Technology Security and Privacy Workshop (noncredit)	33 hours	54	54
Total		398	160

Source: Bellevue College Administrative Data (August 2016)

15 This three-course noncredit program was offered by the Continuing Education Department.

16 This was designed as an upper-division certificate program by the academic department that had initiated a professional baccalaureate degree in the Health IT field. No students enrolled in this course because it was very expensive and had a large number of prerequisite courses.

17 This program was designed as a noncredit program for working professionals already employed in the healthcare or IT fields. It was offered at a much lower tuition than the corresponding for-credit program and attracted substantial student interest.

18 Required prior completion of 25 IT credits before enrollment.

New Program Development

Rather than developing standardized curriculum frameworks for Health IT certificate programs across the participating colleges, Bellevue College, as the project's lead, allowed each college to determine the scope and scale of its new programs, influenced by the particular expertise or interest among faculty members or the demand for particular skills in each local area.

Curriculum development, approval, and review for the new Health IT programs and courses was a strong emphasis during the first 12 months of the HeW grant and continued into the second year of the grant, as colleges piloted and refined their curricula. One of the initially proposed programs (a Health IT associate degree program was not approved by the curriculum review committee, because the committee felt that the proposed new program was not differentiated enough from an already existing IT associate degree program. The Bellevue leadership team worked with this college to develop an alternative program to meet the college's TAACCCT grant commitments. At the time of second-round site visits in December 2013 and January 2014, several programs were still putting final touches on some courses.

Not all of the courses in the new Health IT certificate programs had to be developed as new courses. At most colleges, a number of the proposed courses had already been developed and approved for use in other Health IT or IT programs at the college. The curricula for the foundation Health IT certificates (the CAHIMS Preparation Certificates at Bellevue and Spokane and the Health IT Career Studies Certificate at NOVA) had already been developed prior to the grant, although NOVA refined several of its courses. Three of the six remaining projects included either one or two new Health IT courses developed under the grant. The colleges with the most ambitious curriculum development tasks for their Health IT programs included Bellingham (which developed three new courses for its Health IT certificate program), Pierce (which infused Health IT content into six IT courses as well as developed a new course in electronic health records), and Spokane (which developed five new courses across its two mobile applications certificates).

Between the first and second round of study site visits, most colleges participating in the HeW Consortium continued to refine their Health IT certificate programs. Since the curriculum development positions had only been funded during the first grant year in most colleges, grant-funded curriculum development staff played a reduced role during this period. The expiration of the curriculum development positions caused responsibility for course modifications to shift from these individuals to program managers and instructors.

During the second grant year, colleges began to shift their focus from curriculum planning to piloting the new courses and supporting cohorts of enrolled students. For the most part, curricula had already received needed approval from employer advisory and curriculum approval boards. During the second and third grant years, grant staff made only small curriculum

improvements, such as modifying individual exercises or updating technology, to keep the new courses running smoothly. During the second and third years of the grant, some Health IT programs began using the EMR-STAR platform more extensively, in response to the refined EMR-STAR platform developed by the consortium's EMR-STAR contractor and the increased availability of technical assistance to interested colleges.

New Program Characteristics

In this section, we briefly review the characteristics of the new Health IT certificate programs, including the number of credits required for certificate completion, the academic department that housed the new certificate programs, and the extent to which students had to demonstrate prior training and/or work experience in IT or Health IT in order to enroll in the programs.

As shown in Exhibit III-2, the number of credits or class hours (for noncredit programs) required for Health IT certificate completion varied widely, from a low of ten credits (for Spokane's mobile device management certificate) to a high of 64 credits (for Bellingham's health information technology certificate).

The Health IT certificates developed under the HeW grant were generally targeted to individuals who already had a background in either Health IT or IT system development or support. Most programs made it clear that completing the certificate curriculum, by itself, would not be sufficient to prepare a student for a job in the Health IT field.

Several programs required completion of extensive prerequisite courses demonstrating a mastery of IT programming or networking basic skills. Two typical examples follow:

- Bellevue required new students in its credit-bearing healthcare data analytics certificate as well as its noncredit healthcare data analyst certificate to have an associate degree or a bachelor's degree and at least two years of work experience in a healthcare- or IT-related professional field.
- Pierce required applicants to its healthcare database management and design certificate to have completed at least 25 credits (5 specific courses) in computer information systems and networks.

Another four Health IT certificates developed under the TAACCCT grant were closely related to existing IT certificate and degree programs offered within the sponsoring department. As a result, current IT students were often recruited for participation.

- Spokane targeted its new 15-credit certificate for developing mobile applications to CIS students who were already trained in software development. Due to the many prerequisites, "you almost have to take the whole CIS program to complete the mobile application certificate," said one of our respondents.

- Spokane's mobile device management certificate was initially advertised as a free-standing certificate. However, the majority of the enrolled students during the pilot period were already students in the college's network design program.
- Although it did not require extensive prerequisites, Bellingham's health information technology certificate closely paralleled the curriculum for the college's existing computer networking certificate (with requirements for the completion of five existing computer networking courses as well as three Health IT courses). According to program staff, 80% of the students enrolled in the program were also enrolled in the computer networking certificate program.
- Whatcom's noncredit health information technology security and privacy workshop primarily attracted students who were already enrolled in the college's computer information systems programs.

Three new Health IT certificate programs did not specifically require completed course work in IT topics. These included the relatively brief free-standing 15-credit certificates at two colleges (Bellevue and Spokane) that offered a curriculum designed to prepare students to pass the Certified Associate in Health Information and Management Systems (CAHIMS) credential. NOVA's 23-credit healthcare information career studies certificate was similarly offered as a free-standing course with no prerequisites. Spokane attempted to link the CAHIMS course to its other Health IT certificate programs but met with only limited success. Colleges that offered the CAHIMS courses said it was important to make students aware that this course was designed to help students apply the technical computer skills learned in other work or education settings to jobs within healthcare delivery settings.

The curricula for the new Health IT programs often drew on the content of "generic" IT courses, but tailored this material for use in the Health IT program by adding courses or modules on HIPAA requirements for data confidentiality, features of electronic health record systems, and detailed examples of how IT skills and processes are used in a healthcare delivery context.

The departments that sponsored the new Health IT certificate programs under the TAACCCT grant varied from college to college. The majority of new Health IT programs developed under the grant (six of ten) were housed within information technology or computer information sciences departments at the participating colleges. These departments accounted for 322 students (over 80 percent of all students enrolled in Health IT programs under the TAACCCT grant). The remaining four were in healthcare departments (two programs) or continuing education (two programs).

The new Health IT programs that had a close relationship with existing IT and computer information technology programs appeared to utilize that relationship in a number of ways. First, these Health IT programs had access to a pool of students already enrolled in IT courses from which students interested in the new programs could be recruited. Second, courses for the new

Health IT programs could be drawn, in many cases, from existing IT courses that were adapted for the Health IT certificate curriculum. Third, several programs established prerequisites that students already enrolled in another IT program were likely to have already completed. Finally, faculty members and administrators in the programs that had existing associate degrees in IT-related fields already had a basic familiarity with the major Health IT employers in their regions and an understanding of the specific job descriptions and skills required by employers for new hires.

Existing IT Certificate Programs Infused with Health IT Content

Partway through the HeW grant, the grant scope was expanded to include the infusion of Health IT content into existing IT certificate and degree programs at two of the participating colleges, Bellingham and Renton. Data on the basic facets of these programs are shown in Exhibit III-3.

Exhibit III-3: Health IT-Infused IT Programs

College	New Infused IT Certificate Program	Credits or Hours	Total Enrolled During Grant	Program Completers as of Spring 2016
Bellingham	Computer Network Support Certificate	64 credits	75	34
Renton	Computer Network Technology Certificate	74 credits	60	50
	Total		135	84

Source: Bellevue College (August 2016)

The Health IT and infused IT programs are approaching a closely related objective—preparing students to work as IT professionals in a healthcare setting—from different directions. The different starting points result in a distinct difference between the two types of programs: infused computer networking and IT certificate programs remain IT programs primarily and contain much less Health IT content than the Health IT programs previously described. In one of the programs described above, an existing course on IT ethics and careers was infused with information about Health IT security requirements. In another program, two courses were infused with Health IT content. One class was expanded to include some medical terminology, HIPAA, and privacy information. The other class, on business communications and human relations, was infused with information about how to do a job search specifically in the Health IT industry.

Existing Nursing and Allied Health Programs Infused with Health IT Content

As shown in Exhibit III-4, 18 existing nursing and allied health programs were infused with Health IT content. Across all fields, 10 were certificate programs, seven were associate degree programs, and one was a bachelor's degree program.

Exhibit III-4: Nursing and Allied Health Programs Infused with Health IT Content

College	Program	Certificate	Associate Degree	Bachelor's Degree	Nursing	Other Allied Health
Bellevue	Associate Degree in Nursing		♥		♥	
	Baccalaureate Degree in Nursing			♥	♥	
	Radiologic Technology Certificate	♥				♥
Bellingham	Associate Degree in Radiologic Technology		♥			♥
	Associate Degree in Nursing		♥		♥	
Clark	Associate Degree in Nursing		♥		♥	
	Pharmacy Technician Certificate	♥				♥
Clover Park	Hemodialysis Technician Certificate	♥				♥
NOVA	Associate Degree in Nursing		♥		♥	
	Associate Degree in Respiratory Therapy		♥			♥
	Certified Clinical Medical Assistant	♥				♥
	Return to Workforce Nursing (noncredit)	♥			♥	
Pierce	Medical Office Assistant Certificate	♥				♥
Renton	Medical Assistant Certificate	♥				♥
	Pharmacy Technician Certificate	♥				♥
Spokane	Associate Degree in Health Information Management		♥			♥

Whatcom	Associate Degree in Science in Nursing					
	Medical Assistant Certificate					
	Physical Therapy Assistant					
	Total Programs	10	8	1	8	11

As shown in Exhibit III-5, a total of 2,678 students were enrolled in the infused nursing and allied health programs during the TAACCCT grant period, and of these, 1,371 had completed their certificate or degree programs by the end of spring quarter 2016.

Exhibit III-5: Students Enrolled in Grant-Funded Health IT-infused Nursing and Allied Health Programs

Certificate or Degree Program	Credits or Hours	Total Enrollment During Grant	Program Completers as of Spring 2016
Bellevue			
Associate Degree in Nursing	72	247	163
Baccalaureate Degree in Nursing	180	23	9
Radiologic Technology Certificate	103	129	91
Bellingham			
Associate Degree in Radiologic Technology	151	47	47
Associate Degree in Nursing	67	273	223
Clark			
Associate Degree in Nursing	114	375	125
Pharmacy Technician Certificate	67	140	91
Clover Park			
Hemodialysis Technician Certificate	47	164	127
NOVA			
Associate Degree in Nursing	69	572	143
Associate Degree in Respiratory Therapy		38	
Certified Clinical Medical Assistant	–*	62	30
Return to Workforce	– *	3	
Pierce			
Medical Office Assistant Certificate	63	112	38
Renton			
Medical Assistant Certificate	72	132	112
Pharmacy Technician Certificate	77	36	30
Spokane			

Certificate or Degree Program	Credits or Hours	Total Enrollment During Grant	Program Completers as of Spring 2016
Associate Degree in Health Information Management	103	80	24
Whatcom			
Associate Degree in Science in Nursing	135	61	28
Medical Assistant Certificate	80	89	61
Physical Therapy Assistant Full-time	111	52	28
Physical Therapy Assistant Part-time	111	43**	1
Total Students		2,678	1,371

Note: *Noncredit program. **Of the students enrolled in the physical therapy assistant program at Whatcom, 52 were enrolled in a full-time classroom-based model, and 43 were enrolled as part-time students in an online model. Of completers, 28 of 29 were from classroom-based model.

Selecting Programs for Infusion

The participating colleges gave several different reasons for choosing particular programs for infusion. In several instances, the selected program was undergoing other changes at the same time, such as other curricular revisions (as in Bellingham and Whatcom's Nursing programs) or turnover of instructors (as in Renton's Medical Assistant program).

In several colleges, programs were chosen for infusion because the colleges expected the Health IT content to have a large positive impact on students. For example, Clark's nursing program was selected for infusion because it was a large program. At Renton, college administrators felt that infusion might be of particular value for students in the Medical Assistant program because it would better prepare students for further education/training, which would ultimately expand their access to higher paying jobs.

Administrators or instructors in some programs were particularly enthusiastic about infusing Health IT content into existing programs. Multiple colleges noted that a specific instructor or dean within a department was especially interested in Health IT and asked to have infusion occur within the program. For example, at Bellevue, one nursing instructor volunteered to develop an infused curriculum and implement it in required laboratory courses. At NOVA, a program director felt strongly that the Medical Assistant program should cover EHRs and decided to develop and teach the infused curriculum herself. At other colleges, deans or provosts became champions of infusion for specific programs. Examples include NOVA, where the provost strongly supported infusing Health IT content into the Nursing program, and Pierce, where both the Vice President of Workforce Development and the Dean of Applied Technology and Allied Health encouraged the infusion of the Medical Office Assistant program.

In one program, staff members volunteered to be included in the curriculum infusion process because they expected the grant would help them purchase needed equipment. At this college, a lead instructor mistakenly thought the grant would include support for new computer and medical equipment for the program.

Infusing Health IT Content into Nursing and Allied Health Programs

Colleges infused an array of Health IT content into the selected Nursing and Allied Health programs. The most frequent content areas selected for infusion were activities that called for hands-on practice with EHRs. Other content areas frequently included were information on "Health IT fundamentals," such as introductory Health IT concepts and terminology and data security/privacy and HIPAA legislation. Several programs identified computer skills and information technology as topics for infusion, ranging from basic information about the Internet and how computers work to more intensive information about databases and data entry and information transfer procedures. The following list includes the array of Health IT content areas that colleges infused into the chosen programs.

- Hands-on practice with EHRs and electronic medical records (EMRs)
- Lectures about EHR/EMR
- Health IT fundamentals
- Health IT history
- Health Insurance Portability and Accountability Act (HIPAA) requirements and Health IT legislation
- Data security/privacy
- Computer technology/IT
- Use of advanced medical technology
- Clinical applications: Health IT for patient safety; efficacy of care; medical databases
- Mobile health technology
- Specific health information systems

The level of health it content infused into the nursing and allied health programs varied. As shown in Exhibit III-6, about half (9 of 19) of the infused programs received a moderate degree of infusion of Health IT content, while five received high levels and six received low levels.[19]

19 Programs described as having three or fewer Health IT modules or four hours or less of infused Health IT content were rated as "low." Programs described as having four or more brief Health IT modules or a total of five to nine hours of infused Health IT content were rated as "medium." In addition, if no information was available on the hours of instruction, but we had information that the program offered students opportunities for hands-on practice with electronic records systems, the program was also rated as "medium." Programs that developed a new Health IT course or had a total of 10 or more hours of infused Health IT content were rated "high."

Exhibit III-6: Degree of Infusion of Health IT Content by Program

Program	Level of Health IT Infusion
Bellevue	
Associate Degree in Nursing	MEDIUM
Baccalaureate Degree in Nursing	HIGH
Radiologic Technology Certificate	HIGH
Bellingham	
Associate Degree in Nursing	MEDIUM
Associate Degree in Radiologic Technology	LOW
Clark	
Associate Degree in Nursing	MEDIUM
Pharmacy Technician Certificate	MEDIUM
Clover Park	
Hemodialysis Technician Certificate	LOW
Northern Virginia	
Associate Degree in Nursing	MEDIUM
Associate Degree in Respiratory Therapy	MEDIUM
Certified Clinical Medical Assistant (noncredit)	MEDIUM
Return to Workforce	MEDIUM
Pierce	
Medical Office Assistant Certificate	HIGH
Renton	
Medical Assistant Certificate	HIGH
Pharmacy Technician Certificate	MODERATE
Spokane	
Health Information Management	LOW
Whatcom	
Associate in Science in Nursing (ASN)	MEDIUM
Medical Assistant Certificate	HIGH
Physical Therapist Assistant Full-time A	LOW
Physical Therapist Assistant Part-time A	LOW

Current Students' Satisfaction with New Programs and Infused Courses

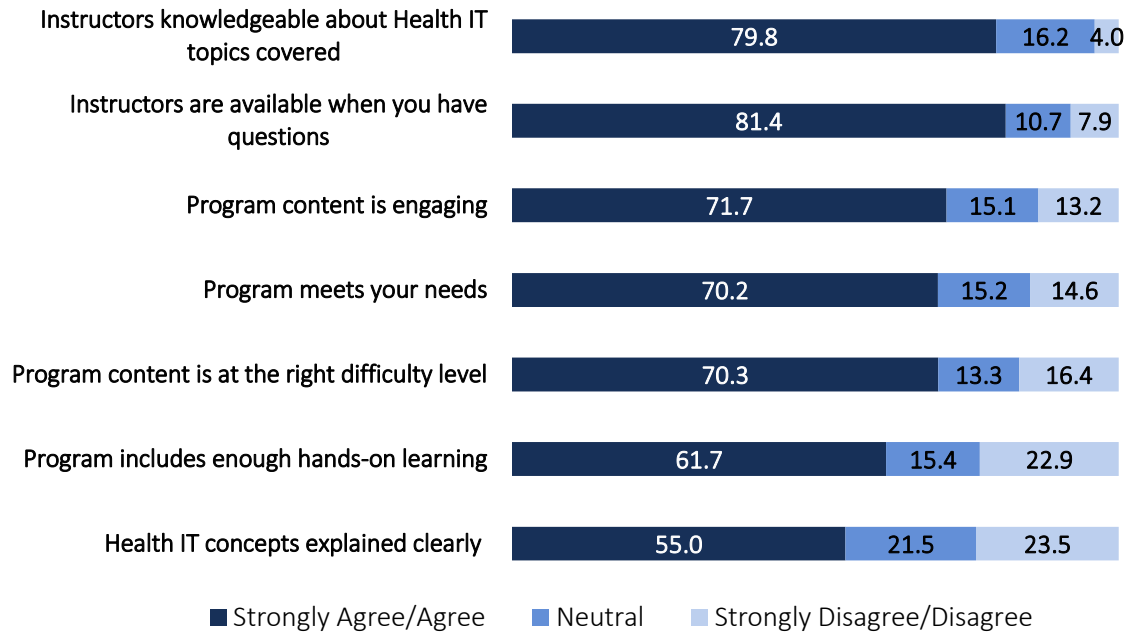
During the spring quarter 2014 and the spring quarter 2015, SPR's survey subcontractor contacted all current students enrolled in the grant and asked them to complete an online survey. For students in new Health IT programs, the focus of the survey was on how satisfied students were with their programs. For students in existing programs newly infused with Health IT content, the survey focused on how satisfied students were with the infusion of Health IT content into their program curriculum. Results in this report are based on the second wave survey of HeW participants administered in spring 2015.[20]

New Health IT Programs

As shown in Exhibit III-7, students in new Health IT certificate and degree programs were generally positive about the Health IT content of their programs. More than three quarters of survey respondents agreed or strongly agreed that the instructors were knowledgeable and available to answer questions about Health IT. Seventy percent agreed or strongly agreed that the program content was engaging, at the right level of difficulty, and met their needs. The two areas for potential improvement were in the amount of hands-on learning and the clarity of the Health IT concepts as explained in class. A little less than a quarter disagreed or strongly disagreed that there was adequate applied practice or clarity.

[20] In the second round of participant surveys, we collected responses to the online participant surveys from 23 of 200 health IT program participants for a 26.5% response rate, and 224 of 1003 participants in Nursing and Allied Health programs for a 22.3% response rate. Because of the relatively low response rates, we investigated the possibility that survey respondents were different from non-respondents on a number of key characteristics, thus possibly inducing non-response bias. As the analysis presented in Appendix A indicates, we estimate the level of non-response bias for the Nursing and Allied Health groups to be low. Thus, for this group, we present unweighted survey responses. In contrast, differences between Health IT potential and actual respondents tended to be larger, especially in regards to Pell status and gender. For this reason, the report presents weighted survey responses for Health IT participants, as described in Appendix A.

Exhibit III-7: New Health IT Student Satisfaction with Health IT Program Content



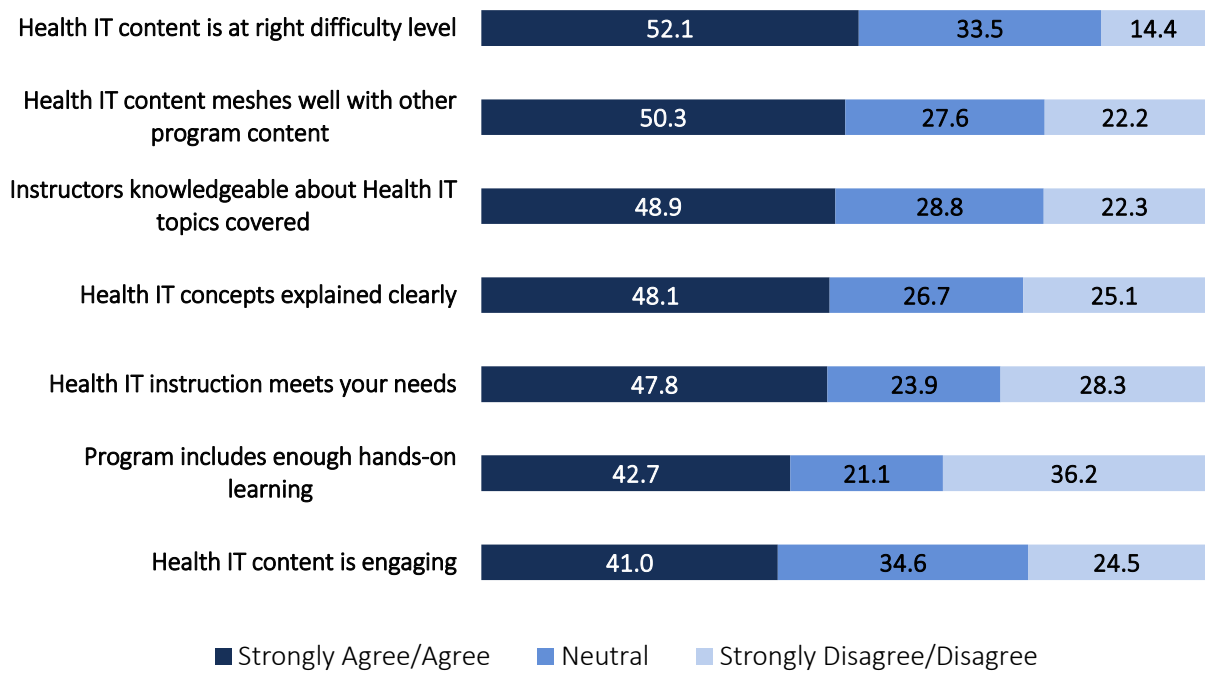
Source: Health IT Participant Survey Spring 2015 (N= 23)

IT-infused Nursing and Allied Health Programs

As shown in Exhibit III-8, when responding to a survey question about the Health IT content of their programs, about half of nursing and allied health participants who completed the survey agreed or strongly agreed that the Health IT content was at the right skill level, that it meshed with the other content, and that the instructors were knowledgeable and explained the concepts clearly. One area where students indicated some dissatisfaction was in the quality or amount of electronic health records training, where nearly a third of survey respondents disagreed or strongly disagreed that the Health IT content met their needs.

This student input is consistent with comments provided by grant staff members and faculty members about the specific curriculum tools made available under the grant. Several respondents commented that EMR-STAR (particularly in its earliest version) was difficult to access, that it was difficult to communicate with the developers, that the system was “clunky” or not functional for the needs of specific programs (e.g. nursing instructors reported that their students could not edit or add patient information). Since the faculty members and administrators in most of the infused programs are enthusiastic overall about continuing to infuse Health IT content in their nursing and allied health curricula, the survey results suggest that the participating colleges need to consider expanding or improving the opportunities provided for hands-on student practice with real or simulated Health IT records.

Exhibit III-8: Nursing and Allied Health Student Satisfaction with Infused Health IT Content



Source: Nursing and Allied Health Participant Survey Spring 2015 (N = 224)

Recruitment and Student Support Services

In this section, we provide an overview of implementation study findings related to two important non-instructional facets of the HeW project: efforts to recruit students and enroll them in grant-funded programs and the support services provided to students enrolled in grant-funded programs.

Recruitment Strategies

Because the existing programs that were infused with Health IT content already had reputations in their communities and pipelines of students interested in enrollment, most of the recruitment efforts associated with the TAACCCT grants were linked to recruiting students for the new Health IT programs.

In many of the participating colleges, project managers and student support staff members shared responsibility for outreach to and recruitment. A number of the grant-funded staff members who worked part time on the grant also could assist with program recruitment as part of their other responsibilities at the college. For example, one of the individuals who acted as the HeW grant-funded student navigator at Clover Park was also an I-BEST program staff member who was already participating on a student recruitment team for the college.

Connections to the colleges' existing outreach and marketing efforts—both for the colleges at large and for the departments within which grant-funded programs were located—were key to successful recruitment. All but three colleges described developing linkages with regular college outreach venues in order to advertise their programs and recruit students.

Colleges put their outreach capacities to work for the grant in different ways. At Whatcom, the college's marketing department developed flyers for the new Healthcare Information Technology Security and Privacy noncredit certificate course. For Bellingham's Health IT certificate, the student navigator and project manager worked with the college's marketing and outreach department to develop outreach materials.

In addition to working with existing recruitment platforms at the colleges, grant staff members employed several other outreach strategies:

1. Off-campus outreach. Colleges advertised in local newspapers and industry publications and flyers were posted at local hospitals and clinics to reach incumbent workers seeking career advancement and lateral moves.
2. On-campus outreach. Program staff members advertised in course catalogues and posted flyers in the student services office, conducted visits to classes with a natural connection to the grant-funded programs, presented Health IT information sessions, and offered advising appointments with potential students.
3. Connecting with the public workforce system. All but one of the participating colleges described their relationships with the local WorkSource centers as having a strong outreach component. At Spokane, the student navigator worked part-time for the grant and part-time for the local WorkSource center. Both Clover Park and Pierce noted their positive relationships with Pierce County WorkSource, and WorkSource staff who assist individuals in identifying appropriate training programs have referred individuals to HeW grant-funded programs at both of the colleges.
4. Social media. More than half of the programs included a social media component in their outreach strategy. Typically, this occurred through the Facebook or LinkedIn page of the college, department, or specific program.

In order for the consortium as a whole to meet its enrollment goals, effective recruitment of students was important for all programs. However, because enrollment was not an especial concern for infused nursing and allied health programs (as noted above), grantees focused their recruitment efforts on reaching out to specific priority populations. In particular—and in accordance with the grant goals—veterans and qualified veteran spouses were targeted.

There is a large military presence in Washington State and many points of contact for direct outreach to veterans. Participating colleges sought to connect with the veteran community via military bases, community organizations that serve veterans, and college-specific veterans'

services. For example, programs connected with campus veterans' resource centers and staffed tables at veterans' career fairs. In Spokane, grant staff attended a monthly Veterans Task Force meeting. NOVA conducted its veterans outreach by cultivating employers who are interested in hiring veterans—as internship placement sites and eventual employment placement—as well as by reaching out to a veterans' job consortium called Veterans Talent. Pierce College's workforce development department actively recruits veterans for education programs, including the new Health IT program, via its membership in RallyPoint 6, a local consortium of public, private, and community-based partners that serve veterans.

WorkSource, the system of workforce centers created as part of the state's workforce development system, has been another key site for direct recruitment, in part because it includes the Veterans' Employment and Training Service, a federal program, as well as other state and local veterans' employment services. For example, at Clark, the student navigator provided program recruitment flyers to the TAA and to Veterans' Representatives on the Southwest Washington Workforce Development Council, the board overseeing the public workforce system in the southwest region.

At Clark, a critical strategy for bringing in students from targeted groups was reserving designated slots for students who met target criteria. For example, for the registered nursing program, the college reserved up to three slots per cohort for qualified military veterans, eligible spouses, or TAA-eligible workers. For the pharmacy technician program, up to two slots were reserved.

As the grant period drew to a close, the focus on recruitment and outreach naturally waned. Grant-supported programs stopped enrolling new students between September 2015 and March 2016, depending on the grant proposals and influenced by the length of the different certificate and degree programs. Instead, more emphasis was placed on supporting program completion, employment placement, and on tracking and reporting student outcomes.

The total number of students enrolled in the grant exceeded by over 50 percent the project goal of 2,093 students served. By the time enrollment of students in grant-funded programs across the participating colleges had finished (different colleges stopped enrollment at different times), a total of 3,211 students had been enrolled.

Characteristics of Enrolled Students

As demonstrated in Exhibit III-9, the largest group of students enrolled in the grant participated in nursing and allied health programs infused with Health IT content under the grant (83 percent of all students served under the grant). A total of 533 students (17 percent of all students enrolled under the grant) were enrolled in new Health IT programs created under the grant or in existing IT programs whose curriculum was enhanced through infusion with Health IT content.

Exhibit III-9: Characteristics of Students Enrolled in HeW TAACCCT Grant

	HIT/IT Programs N=533		Nursing/Allied Health Programs N=2,678		Total Enrollees N=3,211	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Gender						
Male	376	70.5	459	17.1	835	26.0
Female	157	29.5	2,219	82.9	2,376	74.0
Race/Ethnicity						
Hispanic	32	6.0	177	6.6	209	6.5
Asian	68	12.8	328	12.3	396	12.3
Black	35	6.6	219	8.2	254	7.9
White	342	64.2	1,764	65.9	2,106	65.6
Other	32	6.0	168	6.3	200	6.2
Missing	24	4.5	22	0.8	46	1.4
Age in Years						
25 or less	131	24.6	667	24.9	798	24.9
26 - 30	103	19.3	659	24.6	762	23.7
31 - 40	142	26.6	754	28.2	896	27.9
41 or more	153	28.7	582	21.7	735	22.9
Missing	4	0.8	16	0.6	20	0.6
Veteran						
Yes	75	14.1	179	6.7	254	7.9
No	426	79.9	2,484	92.8	2,910	90.6
Missing	32	6.0	15	0.6	47	1.5
Employment Status at Program Entry						
Employed	197	37.9	1283	48.9	1,480	46.1
Not Employed	322	62.04	1340	51.09	1,662	51.8
Missing	14	2.6	55	2	69	2.1
Enrollment as Full-Time or Part-time Student						
Full-Time	416	78.0	2,247	83.9	2,663	82.9
Part-Time	117	22.0	431	16.1	548	17

	HIT/IT Programs N=533		Nursing/Allied Health Programs N=2,678		Total Enrollees N=3,211	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Pell Grant Eligible						
Yes	276	51.8	1,162	43.4	1,438	44.8
No	237	44.5	1,501	56.1	1,738	54.1
Missing	20	3.8	15	0.6	35	1.1

Source: Bellevue College Administrative Data (August 2016)

Across all programs, the typical student participating in the HeW-funded programs was female (74 percent), white (65 percent), and had not served in the military (91 percent). However, within these general patterns, there was substantial variation. Although the nursing and allied health certificate and degree programs that were infused with Health IT content enrolled a high percentage of female students (83 percent), this contrasted with the Health IT and IT programs, which served a majority of male students (71 percent).

Across both the Health IT and nursing and allied health programs, students exhibited a broad range of racial and ethnic identities, including Asian (12 percent), black (between 7 and 8 percent), Hispanic (between 6 and 7 percent) and other, including identifying with multiple groups (6 percent). Also, across both Health IT and nursing and allied health program participants, students enrolled in the grant ranged in age from under 25 to over 41, with about equal proportions of students in different age categories within that range. Students enrolled in the Health IT and IT programs were somewhat more likely to be over 40 years of age than students in the nursing and allied health programs.

Veterans were a priority target group for the HeW grant. A total of 254 students identified as veterans were enrolled in the grant (8 percent); a higher percentage of veterans enrolled in the Health IT and IT programs (14 percent of all students) than in the nursing and allied health programs (7 percent of all students). The percentage of veterans enrolled in the Health IT and IT programs is notable because it is nearly double that of the percentage of veterans in the general population.[21]

According to the data recorded at program intake, nearly half of all students were employed at the time they enrolled in the program. The majority of students (82 percent) were enrolled as full-time students in their academic programs. A slightly higher percentage of the students in

21 http://fivethirtyeight.com/datalab/what-percentage-of-americans-have-served-in-the-military/

the Health IT and IT programs were attending school part-time than in the nursing and allied health programs, though for both groups this was less than a quarter of students.

Providing Student Support Services

In addition to their responsibilities related to recruitment and outreach, consortium colleges were responsible for providing support services to students. The assistance provided was of two primary types—nonacademic and academic. Nonacademic services included providing students with assistance with financial aid, life skills, and job search efforts—services viewed as essential for ensuring that students could resolve problems that would otherwise jeopardize their ability to complete their programs or find jobs related to their training. Nonacademic assistance was primarily provided by part-time or full-time "student navigators." To complement the support that student navigators provided, most of the partner colleges also used academic success coaches, who were charged with helping students complete their academic programs successfully. Specifically, academic coaches offered assistance with study skills and test-taking strategies, organized study groups, and made referrals to additional resources, such as tutoring, as needed. At some colleges, academic support services available via the grant were particularly well-developed. For example, at Renton, the student instructional support specialist actually sat in the I-BEST-style classroom with the students to support students with ongoing instruction[22]; Bellingham hired an instructional technician who did small-group tutoring for students enrolled in difficult courses.

The dedicated support offered to students enrolled in grant-funded programs by the student navigators was popular with students and administrators. In fact, more than half of the colleges expressed the opinion that student support services helped retain students in programs and successfully complete them.

Two key issues emerged in the design and delivery of student support services over the course of the grant period: (1) operationalizing the roles of student support staff members and addressing turnover in these positions and (2) recognizing that employment services were a high priority as students completed their programs.

Operationalizing Student Support Staff Roles

During the grant, partner colleges operationalized the roles of the student navigator and academic coaches in three different ways. Representing the first mode, Bellevue, Bellingham, Renton, and Spokane hired two different part-time staff members, one to serve the academic support role and the other for the nonacademic student support role. In several of these colleges, these part-time grant staff members had parallel commitments on other work projects

22 Washington's Integrated Basic Education and Skills Training Program (I-BEST) teaches students literacy, work, and college-readiness skills so they can move through school and into living wage jobs faster.

within the college. In some cases, this helped the individual be more effective in assisting students, because of his or her knowledge of the college system and linkages to other services. Taking a second approach, Clark, Pierce, and Whatcom hired a single full-time employee to serve both roles. This staffing structure allowed nonacademic and academic support to be more integrated. Moreover, these student support staff members had more flexibility in how and when to provide services. The third approach was taken by Clover Park and NOVA, which hired half-time student navigators and determined that a grant-funded academic coach was not needed by their programs, in part because academic support was already built into them. At Clover Park, for example, the main instructor for the college's grant-supported hemodialysis program provides academic support to students.

As the grant period drew to a close, staffing roles at the participating colleges changed; often the project manager and student support service roles were condensed into one and focused on post-grant sustainability. For example, at Clark, the program manager (who had also been the student navigator) worked to transfer all customized student support materials from her office to the general student services department.

Like all grant-funded staff positions, student support positions diminished as the period of grant performance drew to a close. Similarly, as the last enrollments of students into grant-funded programs occurred, there were fewer students needing to access the services. A countervailing trend occurred at several colleges, however: these colleges reported that students increased their use of support services as the grant approached its close because they were more familiar with the services and with the navigator.

Helping Students Prepare for and Find Employment

As the grant period continued and more students approached the end of their programs, demand for employment-related supportive services increased. Responding to this demand, student support staff members provided a range of job-related supportive services, including resume and cover letter preparation, job search assistance, LinkedIn profile assistance, mock interviews, job fairs, and networking. In some cases, these services were offered during class time, as in Renton's Business Communications and Human Relations class for the Health IT-infused Computer Network Technology certificate. In other cases, job search support was provided during lab periods, as with Whatcom's EMR hands-on lab, at which the student navigator would often conduct practice interviews for the Medical Assistant Certificate students. In other cases, career services were provided via workshops, as with NOVA's resume workshop, as well as through partnering with career services for the college at large, as exemplified by the NOVA job fair. In general, partnerships with local employers and the local workforce system made training and employment opportunities more accessible to students. Once again, strong partnerships and coordination were critical for the effective delivery of employment-related services.

One of the most effective employment strategies, particularly for nursing and allied health programs, was arranging for students to work at paid or unpaid internships with an organization that would likely have the ability to extend an offer of permanent employment at the end of the internship. Most of the partner colleges included mandatory practicums in their infused nursing and allied health programs. Internship or externship programs were less common as part of the new Health IT programs or infused IT programs, though several colleges reported that they would like to further develop and grow in this area. The degree to which student support staff members assisted students with securing internships varied among the partner colleges. At Pierce, for example, both the project manager and the program navigator met with local employers, attended networking events, and met with the director of workforce development at Pierce College to find potential internship opportunities. As with other types of support services, the focus on connecting students to employers was influenced by what was already available to students from the college at large. For example, the Clark College Career Services Office employs a Health Care Employer Relations Specialist who interfaces with the health care industry on students' behalf. Thus, although Clark's student navigator also sent out job postings to grant-funded students, she could point students to other robust career-related services as well.

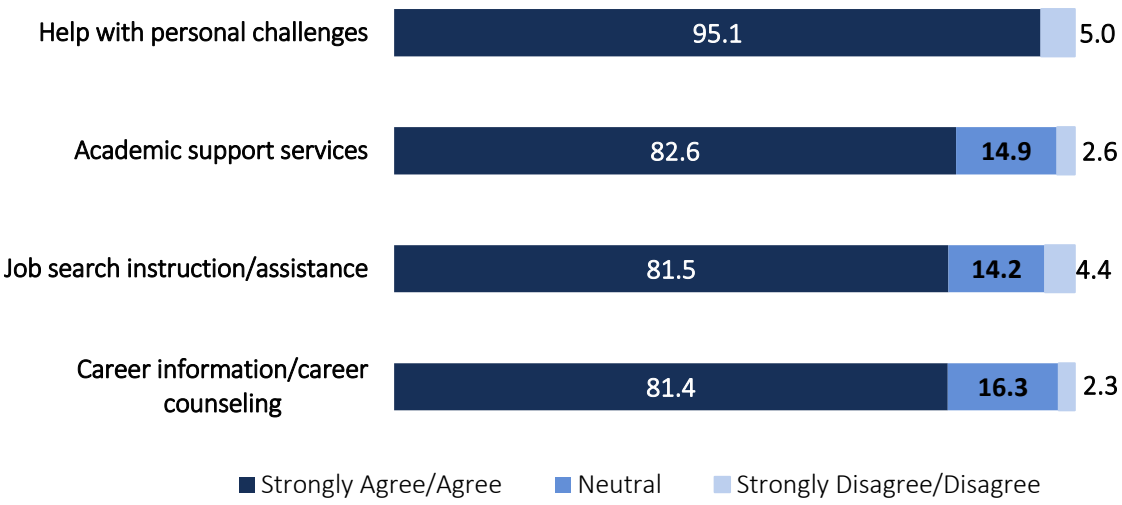
Student Satisfaction with Student Support Services

For students enrolled in the Health IT programs, the most common type of assistance received—as reported by students—was job search instruction and assistance (59% of Health IT participant survey respondents indicated that they received this type of service). For nursing and allied health students, the most common type of assistance reported was academic support (66% of nursing and allied health participant survey respondents indicated that they received this type of service). Overall, more nursing and allied health students reported receiving the array of student support services – academic support, help with personal challenges, career information, and job search assistance – than did Health IT program students. More than half of nursing and allied health student respondents reported receiving each type of service, while somewhat fewer than half of Health IT student respondents reported receiving help with personal challenges and academic support services, and about half reported receiving career information.

As shown in Exhibits III-10 and III-11, student satisfaction with support services was quite high in both types of programs – new and infused Health IT programs as well as infused nursing and allied health programs. Students in Health IT programs who reported receiving any student support services held positive opinions about the support services they received. More than 80 percent of these students indicated that they were satisfied with all of the types of student services they received (help with personal challenges, academic support, job search assistance, and career information). Students in nursing and allied health programs were somewhat less enthusiastic about expressing satisfaction with support services. However, more than half said they were satisfied with all four types of services identified, and nearly three-quarters were

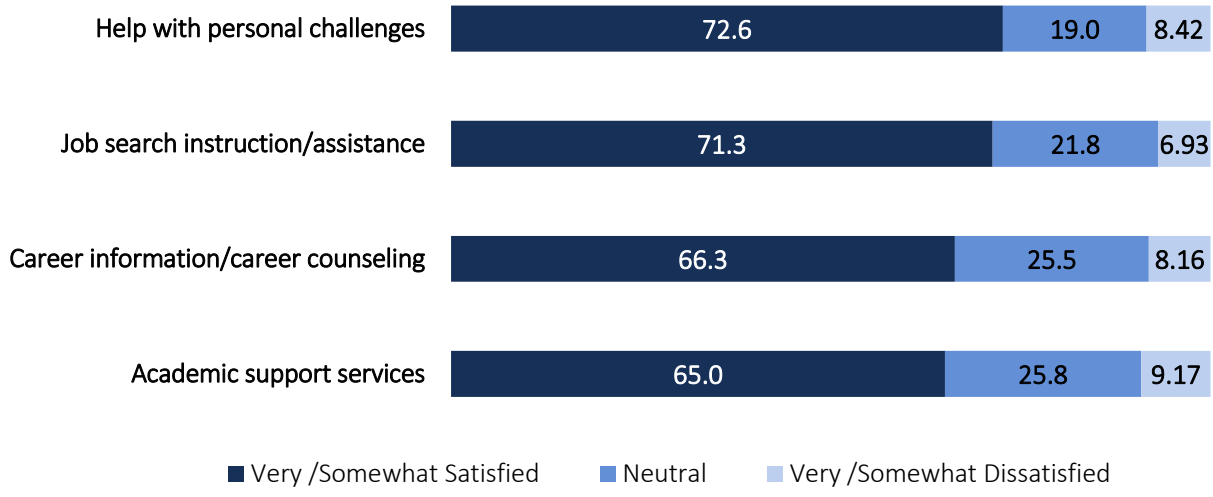
satisfied with the help they received with personal challenges. One reason for the slight disparity between the two types of programs may be that nursing and allied health students had other robust services available to them. It is also possible that the students in the new programs received more individualized assistance from the student navigators at some colleges, given that support services were an integral part of the vision for the new programs.

Exhibit III-10: Satisfaction with Support Services Among New Health IT and Infused IT Program Students



Source: Health IT Participant Survey Spring 2015 (N=23)

Exhibit III-11: Satisfaction with Support Services Among Nursing and Allied Health Students



Source: Nursing and Allied Health Participant Survey Spring 2015 (N=224)

IV. Outcome Study Findings

Introduction and Background

The ultimate objectives of the grant-funded interventions of the Health eWorkforce project at the college level—developing new programs, infusing the curricula of existing programs, piloting these program innovations, expanding student support services—were to prepare individual students for employment in the nursing/allied health and Health IT fields. This chapter helps assess the consortium's success in realizing this objective by describing the outputs and outcomes of the HeW initiative at the individual participant level—the services participants received while enrolled in their programs, the instruction they received, and the educational and labor market outcomes enrollees obtained after graduating from these programs.

As noted in Chapter 3, the two major training interventions of the Health eWorkforce initiative—creating new Health IT programs and infusing nursing and allied health programs with Health IT content—presented very different challenges. The existing nursing and allied health programs selected for Health IT infusion already had visibility in the community, access to information about the labor market demand for program graduates, a stable flow of student applications, approval for program courses and credentials, and, in many cases, existing arrangements for the delivery of academic and student navigation supports. They also had already developed strong relationships with employers in the community as a result of pre-existing practicums/internship networks and past employer experience hiring program completers. The new Health IT programs, in contrast, were starting essentially from scratch. In order to create these new programs, the colleges had to assess the labor market demand for Health IT professionals, propose and gain approval for the new programs, develop course outlines and detailed course curricula, conduct outreach to recruit students, and provide students with career information and job search supports to find employment in the new field. The two existing IT programs that were infused with Health IT content had some of the same advantages of existing nursing and allied health programs, although they, like the new Health IT programs, were also trying to prepare students for a new set of specialized employment opportunities in the Health IT sector.

The very different challenges faced by the new versus infused programs can be expected to result in different outputs and outcomes for participants. For ease of presentation in this chapter, we present the aggregate outputs and outcomes of the new Health IT and infused nursing and allied health programs side by side. However, we discourage readers from interpreting any differences in the outcomes of these two groups of programs as an indication of their relative success because of the differences in the program contexts, as described above.

We begin with a description of the enrollment outputs of the initiative in Health IT and nursing and allied health programs; this is followed by a description of the academic outcomes for both

types of programs and findings from a multivariate model that examines the association between individual-level outcomes, student characteristics, and program features. We continue with a description of the main labor market outcomes of the initiative, and follow this with a presentation of the findings from multivariate models that examine how different student and program features are associated with variations in employment and earnings.

Enrollment Outputs

At the individual student level, outputs most notably consisted of the numbers of students enrolled in programs funded by the grant. As described in Chapter 3, during the grant period, 398 students were enrolled in new Health IT programs (at seven colleges), 135 students were enrolled in IT programs infused with Health IT content (at two colleges), and a total of 2,678 students were enrolled in existing nursing and allied health programs that were infused with Health IT content across all nine participating colleges. Thus, of the total of 3,211 students enrolled, 12.4 percent were enrolled in the new Health IT programs, 4.2 percent were enrolled in infused IT programs, and 83.4 percent were enrolled in nursing and allied health programs.

Academic Outcomes

The primary academic outcomes include the retention rate (the proportion of all enrolled student who successfully completed their certificate or degree or were still active in the program at the end of the evaluation period) and the completion rate (the proportion of program exiters who successfully completed a certificate or degree rather than leaving the program without earning their intended certificate or degree. We first present the unadjusted aggregate outcomes achieved by HeW students, and then describe how different factors are associated with the likelihood of successfully completing a program.

Unadjusted Aggregate Outcomes

About a third of the enrolled students were still enrolled in their programs at the end of the evaluation period.[23] A higher percentage of nursing and allied health program students were still active in their programs at the end of the grant period compared to Health IT and IT students, probably because the nursing and allied health programs were generally of longer duration.

By the end of the evaluation period, of all the students who enrolled in TAACCCT-funded programs during the grant period, about half had completed their program, while 16 percent exited the program without completing their intended certificate or degree (see Exhibit IV-1 below). Overall, the retention rate was about 84 percent. As with enrollments, there were differences between Health IT programs and nursing and allied health programs. A relatively

[23] Administrative data provided by the project documented student outcomes through spring quarter 2016, as provided to SPR by Bellevue College in August 2016.

higher percentage of Health IT students exited prior to completing their programs compared to nursing and allied health students. The lower rate of retention for the Health IT programs could be an indication that the curricula and instructional methods needed further refinement or, alternatively, that the enrolled students were not well-matched to their programs in terms of academic preparation or career objectives.

The retention rate was also significantly lower for certificate programs than for either noncredit or associate degree programs. This may be due to several reasons. First, more than a third of participants in certificate programs were enrolled in new Health IT programs, which were still getting established. Second, the generally lower academic prerequisites for students in certificate programs, compared to students in associate degree programs, meant that certificate programs tended to enroll students with lower levels of academic preparation who were less likely to be successful in their programs.

Exhibit IV-1: Educational Outcomes of HeW participants

	Total Participants	Still Active in Program	Completed Program	Retention Rate (percent active + percent completed)	Exited Before Completion
Type of program					
New Health IT/Infused IT	533	14.4%	45.8%	60.2%	39.8%
Infused Nursing and Allied Health	2,678	37.5%	51.2%	88.7%	11.4%
Type of credential					
Noncredit	101	52.5%	45.5%	98.0%	2.0%
Certificate	1,474	15.6%	56.4%	72.0%	28.0%
Associate	1,613	48.6%	45.2%	93.8%	6.2%
Baccalaureate	23	56.5%	39.1%	95.6%	4.4%
Consortium	**3,211**	**33.6%**	**50.3%**	**83.9%**	**16.1%**

Source: Bellevue College Administrative Data (August 2016)

During the evaluation period, a total of 1,615 students completed academic credentials, including 46 students who completed noncredit certificates, 831 students who completed for-credit certificates, 729 students who completed associate degrees, and nine students who completed baccalaureate degrees (see Exhibit 4.2).

Exhibit IV-2: Academic Credentials Completed during HeW Grant by Type of Program

Type of Program	Non-Credit Certificates Completed	For Credit Certificates Completed	Associate Degrees Completed	Baccalaureate Degrees Completed	Total
New Health IT/Infused IT					
Number of Students	16	228	0	0	244
Percentage by Type of Credential	6.6	93.4	0.0	0.0	100.0
Infused Nursing and Allied Health					
Number of Students	30	603	729	9	1,371
Percentage by Type of Credential	2.2	44.0	53.2	0.7	100.0
All Programs					
Number of Students	**46**	**831**	**729**	**9**	**1,615**
Percentage by Type of Credential	2.9	51.5	45.1	0.6	100.0

Source: Bellevue College Administrative Data (August 2016)

Multivariate Model of Academic Outcomes

A multivariate analysis of outcomes goes beyond descriptive analysis and can provide a richer perspective. The main advantage of using multivariate modeling is statistical control, i.e. the ability to calculate the association between an outcome (dependent) variable and particular explanatory (independent) variables while holding all the other independent variables constant. Statistical control is important because it is likely that the student outcomes discussed in this chapter are associated with multiple individual and group-level characteristics, including previous employment history, gender, race/ethnicity, local labor market dynamics, and others. Using multivariate regression techniques allows us to disentangle how each factor is associated with outcomes while holding the others constant. Further, it enables us to examine two important research questions: a) whether outcomes varied significantly by subgroups; and b) if an association exists between any of the various program features and the outcomes while controlling for covariates.

In this section we present the findings from a multivariate model of program completion.[24,25] The findings described below are based on a multivariate model that includes both Health IT and IT

24 Successful program completion is a yes/no (dichotomous, or dummy) variable. The obverse is exiting the program before successful program completion, or dropping out.

program exiters and nursing and allied health program exiters. This model should be considered as exploratory rather than confirmatory—in other words, we do not have strong theory-grounded hypotheses about what might be causing outcomes to be different by groups, or what components of the initiative might be associated with higher outcomes.

The model of completion was estimated using three sets of independent variables, most of which have already been introduced in this report. First, we included socio-demographic characteristics such as age, gender, race/ethnicity, and employment status at intake, described in Chapter III. A second set of predictors included variables measuring characteristics of the TAACCCT-supported programs at the participating Health eWorkforce colleges, such as the type of program (noncredit, certificate, associate, and baccalaureate program), and whether students participated in a new program versus an infused program. Third, we included variables that indicated the level of individualized student support received by individual students, as measured by the frequency with which program participants were reported to have had individual interactions with grant staff members. Although, as noted below, there are some concerns about the completeness of these data, we believe that the variables obtained from this source can still be used successfully as predictors without biasing results.[26] Lastly, we controlled for college-level characteristics by adding college dummy variables to the multivariate model.

We restricted the model of completion to program exiters—i.e., participants who exited their program either by completing it or by dropping out. Thus, the multivariate model examines the probability of a positive outcome at program exit (completing the program) compared to that of an undesirable one (dropping out of the program).

Exhibit IV-3 below shows the results of the multivariate model focused on educational outcomes.

25 The modeling strategy used was logistic regression, which is an appropriate strategy for regression with dummy dependent variables. A full description of the statistical methodology used to estimate the multivariate models is offered in Appendix B.

26 SPR asked all grant staff members to keep a diary of their individual interactions with participants and provided a template for collecting the data. Student navigators were expected to record the date of each interaction, the type of interaction (whether the meeting was about offering academic advice, career and job related advice, or assistance with personal/life issues). However, conversations with consortium-level staff members revealed that these interactions were not always faithfully recorded, probably resulting in the overall under-reporting of these meetings. In addition, it appears that the gaps in reporting might vary by college. Despite these issues, the data can still be successfully used as a covariate in an exploratory multivariate regression models because the models already control for a variety of factors (including the college where student support was provided) that may be associated with uneven reporting.

Exhibit IV-3: Multivariate Analyses of Completion for HeW Exiters

	Completion
Individual-level Characteristics	
Age (up to 25 years old is reference category)	
26-30 years	1.8
31-40 years	1.5
41 years or older	-5.7**
Female (male is reference category)	0.0
Race / Ethnicity (white is reference category)	
Hispanic/Latino	-2.3
Asian	-7.7***
Black	-9.0**
Other	-2.8
Pell Grant receipt	-3.3*
Employment status at intake	2.0
Program Characteristics	
Student Status: full time (part-time is reference category)	10.6***
Infused program (new is reference category)	0.0
Nursing and Allied Health (Health IT/IT) is reference category	11.7***
Type of Program (Certificate program is reference category)	
Associate's	4.1
Baccalaureate	6.0
Noncredit	23.1***
Service Receipt	
Assistance with academic issues (# meetings)	1.6***
Assistance with career/job search (# meetings)	13.7***
Assistance with personal issues (# meetings)	-3.3***
Constant included	Yes
College fixed effects included	Yes
Pseudo R squared	0.266
Observations	2,030

Notes: Robust standard errors; *** p<0.01, ** p<0.05, * p<0.10; numbers represent changes in predicted probability of the outcome associated with a variable or category of a variable.

Source: Bellevue College (August 2016)

A variety of factors are significantly associated with successful completion. Participants in the oldest age bracket (41 years or older) were somewhat less likely to experience a positive exit compared to participants who are younger, and Asian-American and black participants were less likely to complete successfully compared to white participants. Moreover, receiving a Pell grant was associated with a three percentage point decrease in the probability of completing the program. This finding suggests that those receiving Pell grants—an indicator of financial need—may be less likely to complete successfully because of financial barriers that cause them to return to work rather than remain in school.

In addition, participants were 10 percentage points more likely to complete their program if they were enrolled full-time rather than part-time, and almost 12 percent more likely to complete successfully if they were enrolled in an infused nursing and allied health program rather than in a new Health IT or an infused IT program. This latter result is consistent with the unadjusted findings described above that show that almost half of the exiters from the new Health IT and infused IT programs dropped out before completing their program. We can only speculate what factors led to the higher dropout rate for these programs. Participants may have held misconceptions about what the programs could do for them when they enrolled, the new programs may not have met these expectations, or participants may have been more likely than those in more established programs to face severe financial pressures or academic challenges.

The results also show that participating in a noncredit program is associated with a higher probability of successful completion than participating in any of the other programs. This result may be attributed to the generally shorter duration or possibly less strenuous requirements for completing a noncredit program. One of the noncredit programs included in the initiative was a brief workshop; another was a noncredit program that targeted professionals already working in the IT that was flexible enough to accommodate part-time study. The flexibility of the latter program may have made it easier for working professionals to complete the program despite the more general disadvantage experienced by part-time students in completing programs, as shown by the model.

Interestingly, the model of successful completion shows that there was a significant relationship between the receipt of individualized student services from grant staff members and successful program completion. The model shows that each additional one-on-one session with a staff member concerning academic issues led to a modest increase in the probability of successfully completing the program. Further, each additional session concerning career issues boosted the probability of successful completion by an increment that was much larger than the boost provided by each additional session of academic-related counseling. The stronger relationship between career support and successful academic outcomes may be because academic coaching tended to be quite brief while career-focused meetings tended to be longer in duration. In addition, career-focused meetings with program staff members may have made students more

motivated to complete the program in order to realize the potential employment benefits expected after completing the training. In contrast to the positive associations identified above, receiving individualized assistance with personal issues appeared to slightly decrease the likelihood that a student would successfully complete the program. We do not interpret this as evidence that the actual assistance caused participants to drop out; rather, we speculate that receipt of assistance with personal issues may be a proxy for having significant personal challenges that may have interfered with successful completion of students' studies.

Labor Market Outcomes

The evaluation examined several measures of the labor market outcomes achieved by students enrolled in the HeW initiative: employment during the first quarter after program exit, employment during the fourth quarter after exit, quarterly earnings during the first quarter after completion, and quarterly earnings during the fourth quarter after exit. These outcomes were measured only for students who completed the program successfully during the grant period, but apply to all program completers, whether or not they were employed at program entry.

Unadjusted Aggregate Outcomes

As shown in Exhibit IV-4, 59 percent of all students that successfully completed their programs were employed at some point during the first quarter after program exit, with average earnings across all completers of about $4,000 per quarter. Among completers with earnings, the average earnings during the first quarter was $6,686. The data suggest that labor market outcomes continued to improve after program exit, as both employment rates (75 percent) and mean quarterly earnings (over $7,000) were higher in the fourth quarter after completion compared to the first quarter after completion. Among completers with earnings, the average earnings during the first quarter totaled $9,594.

The comparison between the first and fourth quarter after the quarter of exit must be interpreted with caution because the data for labor market outcomes during the fourth quarter after program exit were drawn from a smaller subset of all completers—comparatively fewer completers had graduated from their programs four quarters prior to the point of extraction of earnings data for this report than had exited one quarter prior to the time data were collected. A full comparison would not be possible until four quarters of data were available for all (or most) students who had completed the program[27].

27 To examine whether employment rates and mean earnings improved between the first and fourth quarters after completion for the same individuals, we calculated employment rates and mean earnings one quarter after completion and four quarters after completion just for the subset of completers who had completed four quarters or more before the data were extracted. T-tests of the differences between employment rates and earnings in the two quarters (not shown, but available on request) showed that the differences were statistically significant at p=0.1. This suggests that, indeed, labor market outcomes of participants increased over time after completion.

Even with these data limitations, however, some interesting patterns are revealed by the data. Students who completed the new Health IT programs or the infused IT programs appeared to trail behind completers of infused nursing and allied health programs in both employment and earnings outcomes. For example, employment rates of Health IT and infused IT program completers are at least 15 percentage points lower than employment rates for completers of nursing and allied health programs for both the first quarter and the fourth quarter after completion. In addition, post-program earnings tended to vary with the level of credential earned, with completers of baccalaureate programs earning the most on average, followed by completers of associate degree programs and certificate programs. For students in the noncredit programs, both employment rates and quarterly earnings were substantially lower than for students in the other types of programs.

Exhibit IV-4: Employment and Earnings Outcomes During the First and Fourth Quarters after Completion of HeW Programs

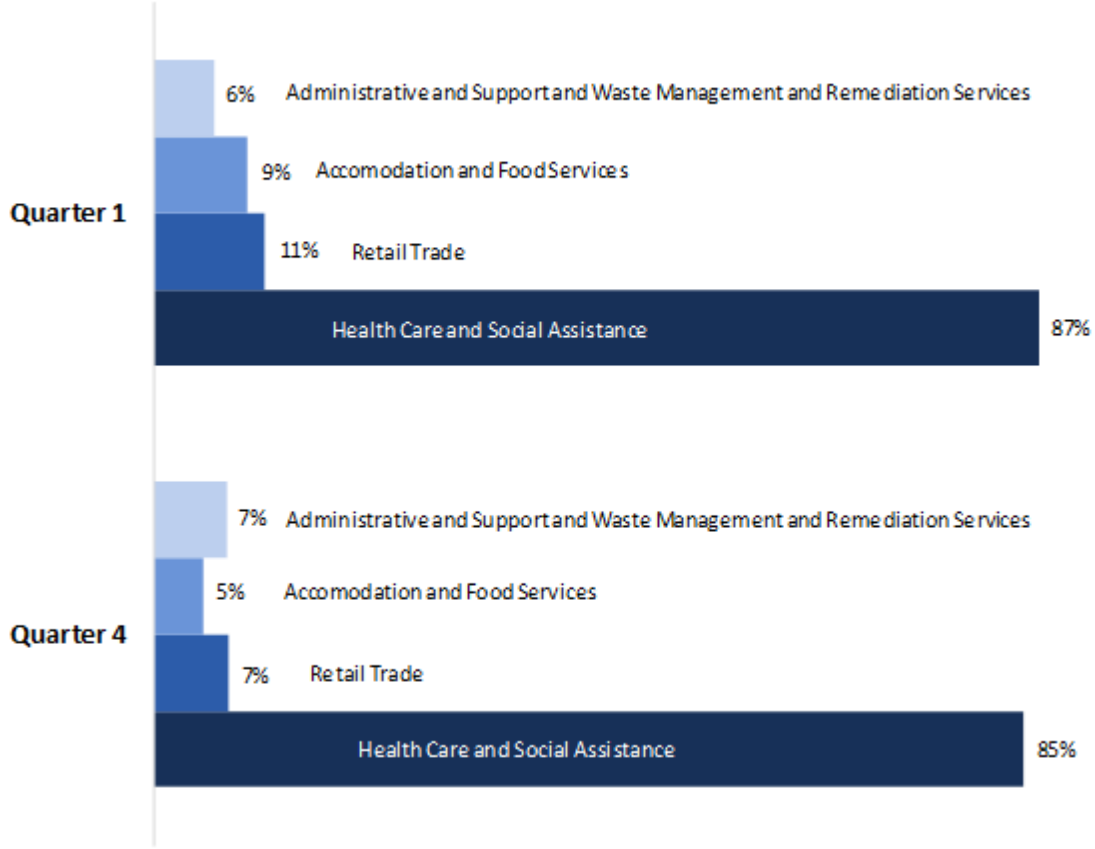
	1st Quarter after completion				4th Quarter after completion			
	# Completers	Percent Employed	Mean Quarterly Earnings, All Completers	Mean Quarterly Earnings, Completers with Earnings	# Completers	Percent Employed	Mean Quarterly Earnings	Mean Quarterly Earnings, Completers with Earnings
Type of program								
New Health IT and Infused IT	237	45.6%	$2,694.6	$5,813.3	103	59.2%	$3,972.8	$6,643.0
Infused Nursing and Allied Health	1,298	61.2%	$4,214.7	$6,810.5	634	77.6%	$7,800.6	$9,972.8
Type of credential								
Associate	660	57.4%	$4,181.3	$7,215.2	244	86.8%	$9,750.6	$11,149.3
Baccalaureate	9	88.9%	$17,400.9	$17,400.9	1	100.0%	-	
Certificate	821	61.5%	$3,755.2	$6,038.0	308	71.0%	$5,982.3	$8,351.9
Noncredit	45	22.2%	$2,675.4	$11,236.8	0	0.0%	-	
Consortium	**1,535**	**58.8%**	**$3,980.1**	**$6,686.4**	**737**	**75.0%**	**7,260.9**	**$9,593.8**

Sources: Washington State Employment Security Department (2016) and Virginia Employment Commission (2016)

The data obtained from the two state unemployment insurance agencies allowed us to review the industry of employment of completers who found a job. As shown in Exhibit IV-5, the employment of completers of nursing and allied health programs appears highly concentrated—virtually all of them, as expected, worked in the healthcare sector. Despite slight variations, the

comparison between the first and the fourth quarter after the quarter of completion appears essentially unchanged.

Exhibit IV-5: Industry of Employment
During the First and Fourth Quarters after Completion of Nursing/Allied Health Programs

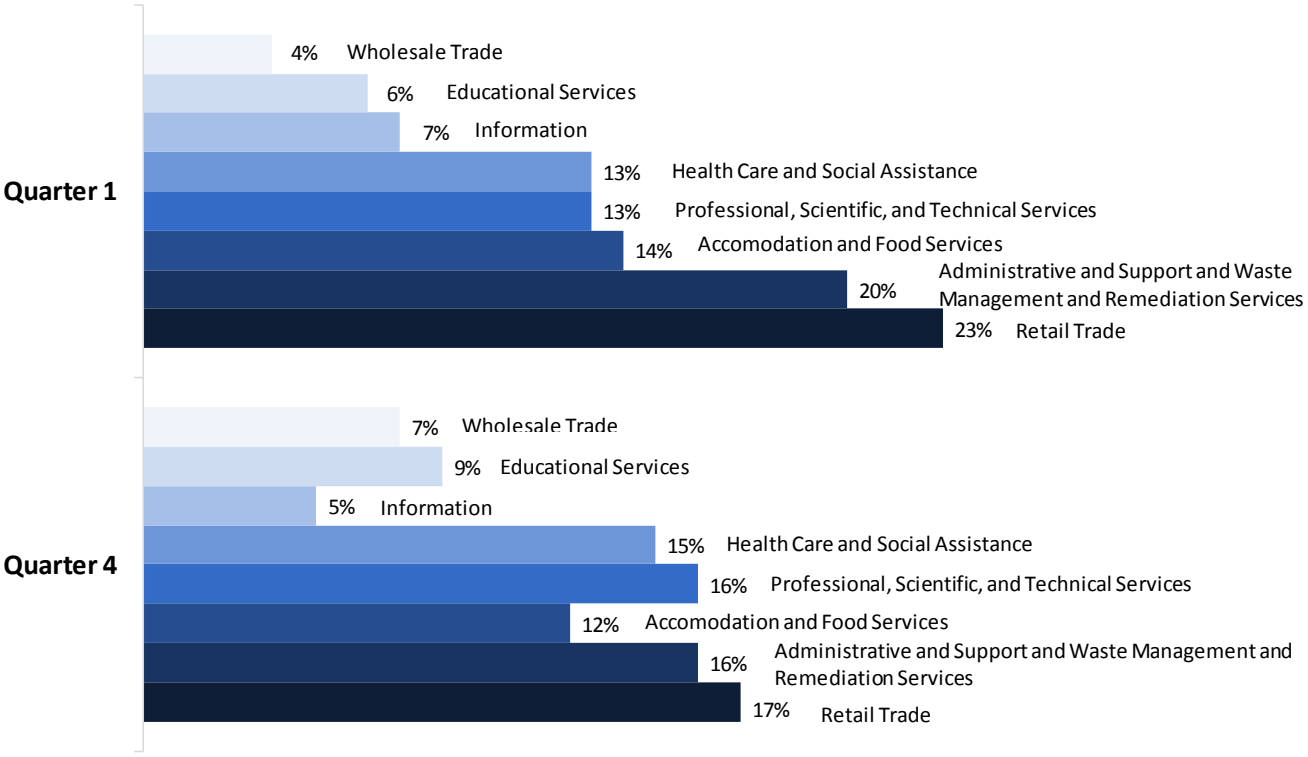


Note: Since some completers held multiple jobs each quarter, the percentages shown in this chart may add up to more than 100 percent. In addition, the chart only displays percentages for industries whose overall proportion exceeded five percent.

Sources: Washington State Employment Security Department (2016) and Virginia Employment Commission (2016)

As shown in Exhibit IV-6, the Health IT completers found employment in a wide range of industries. While it is difficult to determine which jobs may relate to the Health IT training, a number of the jobs do not appear to be in training-related fields (particularly employment in accommodation and food services and retail trade.) However, the overall percentage of those employed in these fields decreases from 37 percent in the first quarter after the completion quarter to 29 percent by the fourth quarter, suggesting that the Health IT program completers may have taken longer to find training-related jobs.

Exhibit IV-6: Industry of Employment
During the First and Fourth Quarters after Completion of Health IT Programs



Note: Since some completers held multiple jobs each quarter, the percentages shown in this chart may add up to more than 100 percent. In addition, the chart only displays percentages for industries whose overall proportion exceeded five percent.

Sources: Washington State Employment Security Department (2016) and Virginia Employment Commission (2016)

Multivariate Analysis of Employment-related Outcomes

In the multivariate analysis, we examined four labor market outcomes: employment status in the first quarter after completion, employment status in the fourth quarter after completion, earnings in the first quarter after completion, and earnings in the fourth quarter after completion. The employment models were restricted to all students who had completed the grant-funded programs during the study period. We also restricted the models to only those completers for whom data were available for the full follow-up time period. For example, in the models of employment and earnings at four quarters after completion, we restricted the sample to include only the completers who had at least four full quarters between their completion quarter and the quarter when employment data were extracted. Exhibit IV-7 below shows the results of the four multivariate models focused on employment and earnings outcomes.

Exhibit IV-7: Multivariate Analyses of Labor Market Outcomes after Completion of HeW Programs

Independent Variables Included in Model	Employment status 1st quarter after completion	Earnings 1st quarter after completion	Employment status 4th quarter after completion	Earnings 4th quarter after completion
Individual-level Characteristics				
Age (up to 25 years old is reference category)				
26-30 years	3.1	$1,091.2***	4.1	$1,191.5**
31-40 years	-2.0	$1,172.4***	1.4	$1,104.3*
41 years or older	2.2	$1,001.1***	-1.8	-$229.1
Female (male is reference category)	-2.1	-$785.9**	2.0	$258.1
Race / Ethnicity (white is reference category)				
Hispanic/Latino	-3.8	-$160.5	-6.7	-$1,255.5
Asian	-3.3	-$278.4	9.0**	-$139.5
Black	7.0	$410.5	-4.0	$293.3
Other	-2.6	-$841.0**	-0.9	-$1,063.8
Pell Grant receipt (non-receipt is reference category)	-2.5	-$805.3***	0.0	-$226.1
Employment status at intake (not employed is reference category)	41.1***	$3,099.5***	17.7***	$2,087.1***
Program Characteristics				
Student Status: full time (part-time is reference category)	5.7	$169.5	3.3	$886.3
New or Infused program (new is reference category)	-0.8	$30.1	-0.4	-$1,355.0
Nursing and Allied Health (Health IT/IT is reference category)	16.9***	$2,276.1***	10.3	$1,131.2
Associate Degree program (Certificate program is reference category)[28]	-1.0	-$112.2	-3.3	-$1,870.9**
Service Receipt				
Assistance with academic issues (# meetings)	0.5	$127.3	0.9	$339.2***
Assistance with career/job search (# meetings)	0.5	$153.1	-2.5	-$11.8
Assistance with personal issues (# meetings)	-2.3**	-$289.4**	1.2	$131.8
Constant included	Yes	Yes	Yes	Yes
College fixed effects included	Yes	Yes	Yes	Yes
Pseudo R squared[29]	0.225	0.293	0.162	0.307
Observations	1,285	1,431	690	693

28 Completers of noncredit and baccalaureate programs were excluded because of their very small numbers.

29 For the earnings models, the reported statistic is actually R-squared (not pseudo R squared) since these models were estimated as standard regression (OLS) models, as appropriate for continuous dependent variables.

Notes: Robust standard errors; *** p<0.01, ** p<0.05, * p<0.10; numbers in Models 2 and 4 represent changes in predicted probability of the outcome associated with a variable or category of a variable; numbers in Models 3 and 5 represent changes in the mean predicted value of the dependent variable associated with one category of a variable or a unit change in the independent variable (for continuous variables).

Sources: Bellevue College (2016); Washington State Employment Security Department (2016) and Virginia Employment Commission (2016)

Model (1), which examines employment status during the first quarter after the quarter of program completion, shows that being employed at program intake is the strongest predictor of employment at one quarter after completion: those employed at program intake have more than 40 percentage points more likely to be employed one quarter after they completed their program than those who enter a program unemployed. In another very significant relationship, completers of nursing and allied health programs were almost 20 percent more likely to be employed during the first quarter after completion than students who completed Health IT and IT programs. Once again, nursing and allied health programs appear to benefit from having more rapid pathways into employment that are supported through the use of internships and practicums prior to program completion.

In addition, students who received assistance with personal issues had a lower likelihood of being employed, a finding similar to that in the multivariate results noted above for successful program completion. As before, we hypothesize that completers who received assistance with personal issues were more likely to have experienced personal barriers that prevented them from finding a job. With the exception of the differences already mentioned, it appears that the post-program employment rates in the first quarter after completion are roughly similar across most subgroups.

The same general patterns hold for model (2), which examines earnings in the first quarter after completion. Those who were employed at intake have, on average, earnings that are about $3,000 higher than earnings for students not employed at intake; each additional meeting with a program staff member to discuss personal issues is associated with a reduction of about $300 in quarterly income.

The findings from models (3) and (4), which examine labor market outcomes during the fourth quarter after completion, are much less conclusive, likely because of the smaller sample size. In the model of employment during the fourth quarter after exit (model 3), employment at intake is the only significant predictor, and its effect appears considerably weaker compared to the findings from model (1). The model of earnings (4), however, shows the receipt of academic advice from a student support staff member as a significant predictor of higher earnings.

Conclusion

In terms of promising practices, it appears that infusing Health IT content into nursing and allied health programs can reach large numbers of students and can be implemented relatively quickly. Without an impact study, we cannot assess whether the infusion of Health IT information into the curriculum of clinical training programs was instrumental in increasing the employability or earnings potential of nursing and allied health program completers. However, the widely recognized increasing need for workers in nursing and other allied health occupations to be able to work in settings that use EHRs, improving the Health IT knowledge and skills of students in clinical healthcare programs appears to be an essential content area for preparing future clinical workers for jobs in the healthcare sector.

Our multivariate analyses suggest that providing intensive student support is a promising practice across both nursing and allied health programs. The data indicate that providing one-on-one advising to students on academic and career issues can increase significantly the probability that students will complete their programs of study. The multivariate analyses also suggest that student support services are associated with positive labor market outcomes.

Our analyses suggest that creating new Health IT programs is more challenging than infusing Health IT content into existing programs. The lower rates of completion reported for students in the Health IT programs suggests that it may take time for new programs to gain acceptance among employers as a source of skilled workers. The relatively lower levels of employment and earnings for graduates of the Health IT programs shows that it is not easy for graduates of new programs to market themselves to employers with job openings in the Health IT field. These findings do not mean that new programs should not be pursued. However, our study suggests that future builders of similar initiatives should have a detailed understanding of the demand for Health IT workers in their local labor markets regions and how employers go about recruiting and hiring new workers.

Finally, our study also serves as a reminder that community colleges enroll many persons with significant educational and labor market barriers who need significant help to achieve positive outcomes. Participants in the older age groups and who are members of certain racial and ethnic minorities were shown to be less likely to complete their programs. In addition, participants who received Pell grants, as well as participants who were counseled on personal issues, were significantly less likely to experience successful educational and labor market outcomes. These findings suggest that there is a continued need to support members of these groups in order to increase the overall success of community colleges in accomplishing their employment and training mission.

V. Conclusion

In this concluding chapter, we review the overall accomplishments of the HeW Consortium and assess the strengths, challenges, and lessons learned about how to prepare students for emerging Health IT occupations as well as preparing students in nursing and allied health programs for working in an environment that increasingly depends on Health IT knowledge and skills.

Findings from the Implementation Study

At the consortium level, the grant funding was used to support several bold initiatives that were intended to benefit the Health IT field beyond the programs at the participating colleges in the HeW consortium. These initiatives included the development of a Health IT apprenticeship program for veterans, the implementation of a cloud-based platform that would provide educational institutions access to a wide variety of EHR systems for instructional use, a national initiative to welcome veterans to the Health IT field, and the development of additional instructional tools and resources. Although the veterans' Health IT apprenticeship was not realized, and a sponsor was not found to continue to operate a cloud-based platform to provide educational institutions with access to EHRs for instructional purposes after the end of the grant, the Health IT educational resources developed by the Bellevue College leadership team have the potential for widespread dissemination and use throughout the nation in the coming months and years. These resources include an interactive version of the CAHIMS curriculum now available as "Health Information Technology Foundations" on Stanford University's Open Learning Initiative website at http://oli.stanford.edu/health-technology/ and eight different multi-media instructional modules on how to use EHRs that provide simulations of two of the open-access EHRs.[30]

The participating colleges, with the assistance of consortium-wide leadership, reached many of the project goals that were to be realized at the college level. These included developing and piloting new Health IT certificate programs, infusing the curriculum of a wide range of nursing and allied health programs with Health IT content (knowledge and skills), enrolling students in grant-funded programs, and providing substantial academic and career navigation services to enrolled students to promote successful completion of their chosen programs.

As the project unfolded, the focus and scope of the grant-supported programs evolved in some interesting ways. Ultimately, the goal of infusing nursing and allied health programs with Health

[30] These modules will be available as part of the HeW consortiums materials on the DOL TAACCCT dissemination website at http://www.skillscommons.org/handle/taaccct/469.

IT content—initially treated with caution and some resistance by the participating colleges—was embraced enthusiastically by many of the participating colleges as both students and employers showed strong interest in what it could achieve. The infused nursing and allied health programs ended up enrolling substantially more students during the grant period[31] than the new Health IT programs. In addition, two of the participating colleges expanded the number of clinical programs included in the infusion initiative during the grant period, and some colleges are considering adapting the Health IT infusion curriculum modules for use in the curriculum of additional clinical programs in the future.

In contrast, the success to date of the new Health IT programs has been more mixed. The initial plan to create a new associate degree-level Health IT program at NOVA was not realized because the sponsoring department was concerned that the new Health IT degree would not be substantially different from an existing IT associate degree. Although a majority of the new Health IT programs were piloted successfully during the grant period and are being continued as valuable additions to college program offerings, two of the newly created programs are inactive or are being discontinued by their college sponsors because they had very limited success attracting students or were not felt to impart the exact skills and experience that program graduates need to find employment in the Health IT field. Taken together, these implementation experiences suggest the difficulty of gaining widespread employer acceptance of a new occupational training program, particularly in a rapidly changing field.

Findings from the Outcome Study

The outcomes summarized in Exhibit V-1 show that the initiative exceeded its target goals in terms of the number of students enrolled and the number of students who completed credentials during the evaluation period. However, it fell somewhat short of the goal of having 76 percent of program completers find employment after exiting. Although the evaluation will not be able to update outcomes for the 1,000-odd students still active in their programs at the end of the grant period, as these active students complete their programs, the total number of completers who earn credentials and enter employment will increase over time.

[31] This is not surprising since the nursing and allied health programs were pre-existing programs with large numbers of enrolled students prior to the HeW initiative, whereas the new Health IT programs had to start from scratch to recruit and enroll students.

Exhibit V-1: Summary of Project Outcomes Versus Targets

Outcome	Grant Target	Achieved	Percent of Target
Students Enrolled	2,093	3,211	151.0%
Students Completed Credential	1,423 (68% of enrolled)	1,615 (51% of enrolled)	113.5%
Students Employed After Exit	1,082 (76% of completers)	903 (59% of completers)	83.5%

Source: Bellevue Community College TAACCCT Grant Proposal and Outcomes from Bellevue College Grant Database, 2016

The detailed outcome findings described in Chapter IV paint a similarly mixed picture of the initiative's achievements. For example, the differential in the rate of employment for program completers in the infused nursing and allied health programs and the Health IT and infused IT programs raises some concerns about the effectiveness of the new Health IT training programs. (Although 61 percent of program completers in nursing and allied health were employed sometime during the first quarter after program exit, only 46 percent of program completers in Health IT and infused IT programs were employed during the same period.)[32,33]

The multivariate analysis of student outcomes provides important evidence showing that the delivery of more intensive student support services—including both academic supports and career counseling and job search support—was associated with an improved likelihood that students will complete their selected programs as well as a probability that quarterly earnings will be higher. This finding is important evidence supporting the efficacy of enhanced support services for students enrolled in TAACCCT grant-supported programs.

The multivariate analyses also showed that older students (41 years of age or older), members of some minority groups, low-income students (those eligible for Pell grants), and individuals who received more support for personal issues were less likely to complete their programs than other students. In addition, students 25 years of age or less, low-income students, and individuals who received more support for personal issues were likely to receive significantly lower quarterly wages than other students within the first quarter after program completion. These findings serve as a reminder that community colleges enroll many persons with significant educational and labor market barriers who need significant help to achieve positive outcomes and suggest

[32] Administrative data showed that only a few students who completed the targeted credentials subsequently enrolled in follow-on educational programs. We suspect that a number of students who completed certificates in the Health IT and infused IT programs may have still been enrolled in associate degree programs in which their certificate programs were imbedded. This may help explain the relatively lower employment rates after program completion.

[33] Measured outcomes for completers of both types of training increased about 15 percentage points between the first and fourth quarters after program completion.

that there is a continued need to support members of these groups in order to increase the overall success of community colleges in accomplishing their employment and training mission.

Plans to Sustain Grant-Funded Programs and Priorities

Numerous aspects of both the new Health IT programs and the infused Health IT and nursing and allied health programs were successful enough that the participating colleges want to sustain them beyond the grant period.

New Health IT Programs

As the end of the grant approached, the participating colleges began to assess the success of the new grant-funded programs and plan for their continuation after the end of the grant period. Commitment to continuing a particular new Health IT program was influenced by the level of student interest in the program, the extent of faculty commitment to it, and whether the program was perceived as beneficial to the respective departments and the college at large. Exhibit 3-12 summarizes the plans to sustain the new Health IT certificate programs at each college. Six of the ten new Health IT certificate programs will be continued after the end of the grant period.

Several certificate programs are perceived as being of significant value to the sponsoring departments:

The noncredit healthcare data analyst certificate at Bellevue is highly valued by the continuing education department that houses this program because it has attracted strong interest from working professionals in the IT and Health IT fields. Program participants expect to use the skills they are learning to advance in their careers in the field.

The health information technology certificate at Bellingham is valued as an important part of the career pathway leading to the computer networking associate degree at this college. The department credits the certificate program with increasing the demand for entry-level IT courses at the college and encouraging certificate students to stay on to complete the AA degree.

The healthcare database management and design certificate at Pierce is viewed as adding value to the college's health informatics and integrated technology (HIIT) associate degree program.

The mobile device management and mobile software development certificates at Spokane are viewed as innovative programs, and a decision has already been made to imbed the constituent courses into other certificate and degree programs within the CIS department. However, in the process of becoming part of the regular IT programs, they could be at risk for losing their distinctive "Health IT flavor," if the health-specific examples for instruction and problem sets that were created by means of the grant infusion are cut in favor of more generic IT examples.

Exhibit V-2: Plans for Sustaining New Health IT Certificate Programs

New Health IT Certificate Program	Plans for Continuation After Grant?
Bellevue	
Certified Associate in Healthcare and Information Management Systems (CAHIMS)	Yes. Certificate is now offered as a noncredit certificate program through the continuing education department.
Healthcare Data Analytics Certificate (for credit)	No. Program was never offered due to low student interest. Noncredit version of certificate is more attractive to potential students because it is less expensive and better tailored to needs of working professionals in the field.
Healthcare Data Analyst Certificate (noncredit)	Yes. Program is viewed as highly successful in preparing working professionals to be healthcare data analysts. Program is designed to accommodate part-time students and has reasonable cost, due to hybrid format that offers instructor involvement in an online delivery format.
Bellingham	
Health Information Technology Certificate	Yes. Program is valued for attracting more students to the computer networking program and encouraging students to stay on and complete the computer networking associate degree. This certificate was credited with increasing the demand for entry-level IT courses at the college.
NOVA	
Health Information Technology Career Studies Certificate (for credit)	No. Program has been discontinued, due to low student interest, and faculty concern that program did not prepare students sufficiently for Health IT jobs.
Pierce	
Healthcare Database Management and Design Certificate	Yes. Development of shared EHR course has increased cooperation between the business and Health IT departments. Certificate is viewed as adding value in relation to the existing Health IT associate degree program.

Spokane	
Certified Associate in Healthcare and Information Management Systems (CAHIMS)	Uncertain. Program had low enrollment during grant period.
Mobile Device Management Certificate	Yes. Student demand is strong. Has been adopted as a required part of network design and management AA degree.
Mobile Software Development Certificate	Yes. Viewed as a highly innovative program.
Whatcom	
Healthcare Information Technology Security and Privacy Workshop (noncredit)	No. Rather than developing a for-credit certificate in health information technology, the college decided to pursue different priorities including a new applied bachelors of science (BAS) degree in IT networking and a new applied associate (AAS-T) degree in cybersecurity.

Infused Nursing and Allied Health Programs

Overall, infusing Health IT content into existing allied health and nursing programs was considered by the participating colleges to be a success. In almost every case, participating colleges plan to maintain the infusions of Health IT content into existing nursing and allied health program after the grant is over. In fact, the radiologic technician program at Bellingham is the only infused program for which the Health IT content will not be retained. With respect to that program, the program manager explained that the program was already very full and that the radiologic faculty had not found the Health IT content as useful as they would have liked it to be. At the other colleges, the perspective of interviewed program managers and faculty members was that the students benefited from the exposure to electronic health records, HIPAA requirements, data security, and clinical applications. In general, programs with the least exposure to computing and technology were felt to benefit the most from the infused content. For example, the program manager at Pierce College felt that the students in the Medical Office Assistant program, housed in the Business Technology department, especially benefitted from infusion, as that program has historically included a lower level of technology. This was also true of Renton's Medical Office Assistant program.

Exposure to electronic health records was considered the most important aspect of curriculum infusion, although participating colleges had different opinions about why. In numerous cases, college respondents opined that exposure to a variety of EHR systems was beneficial even if the students did not use the particular systems on which they were trained (Open EMR or VISTA) in

their eventual internships or employment. Respondents at Bellingham, Clark, NOVA, Pierce, and Spokane noted that EHRs were a content area which the nursing and allied health programs had been lacking and that the grant offered a valuable opportunity to update nursing curricula for the era of electronic health records. Bellingham, Clark, Renton, and Whatcom all specified their intention to maintain EHR training content. (At Spokane, the instructor had provided labs for EMR practice even before the grant.) Project managers indicated that even faculty members who had been anxious about the inclusion of EHRs (either due to lack of familiarity on their part or because the program was already very full) are eager to continue offering EHR exposure and classroom practice because it is popular with students and of obvious value for the labor market.

The Health IT infusion was perceived as having value for other reasons, too. As expressed by respondents at Bellingham, the HeW grant raised the overall awareness of Health IT, made *Health IT* a recognized term in the college's common vocabulary, and clearly defined a set of skills that were perceived as necessary for nursing and allied health students to master in order to find jobs in the contemporary healthcare field. For instance, respondents at NOVA commented that the added Health IT content allowed nursing students with an Associate's Degree to compete for employment with those holding a Bachelor's Degree. At Spokane, the project manager suggested there was value in "simply integrating more technology" into the Health Information Management Associate's program.

Bellevue noted that the grant-funded staff members at each college had successfully "passed the baton" of infused content to the individual programs that will be sustaining it after the end of the grant. At Clover Park, the curriculum enhancements, especially videos and materials on electronic charting, are planned to be retained. At Pierce, the Electronic Health Records class – one of the truly new aspects of the infused curriculum – will be maintained. At Spokane, the health information management program will maintain the Health IT content infused during the grant. Spokane's program manager reported that faculty members and administrators in both the MA and nursing programs saw value in the infused Health IT content and as a result altered the delivery of their programs so that there is a greater emphasis on Health IT. The Whatcom project manager noted that, despite the intention of most colleges to maintain the infused content, it is up to the respective department coordinators to decide.

Student Support Services

Many of the participating colleges were impressed by the provision of robust student services and are looking for ways to maintain them. At Bellingham, the student support services aspect of the grant will be re-absorbed into Bellingham's general advising services and the advising duties of faculty members. At Clark, the Nursing program has hired a part-time retention specialist and plans to hire a full-time person. Also at Clark, other resources developed during the grant have been distributed throughout the college network of service options. For example, the Career

Services Office at the college is going to continue to provide specifically tailored employment services using materials developed under the grant.

Other colleges also made progress toward sustaining student support services. At Renton, the grant-funded staff was able to use the success of the student instructional support specialist in the medical assistant program to support a request for a similar I-BEST funded instructional support specialist for this program moving forward.[34] At Pierce, the grant-funded Healthcare Database Management and Design students and other students in the Computer Information Systems (CIS) Department will continue to be served by the grant student navigator, who as of September 2015 had taken on the role of student navigator for the whole CIS and Computer Network Engineering Departments, paid for via another grant. At Spokane, the partnership with WorkSource Spokane, which was created through the grant, offers students a "bridge" to public workforce system services that did not exist before.

Whatcom, while noting the value of the student support services, does not have the funds to sustain the position of student navigator after the grant ends. However, the project manager indicated that she would like to use student outcomes to assess the effect of the student navigator position, which might help make the case for Whatcom to secure funding for this type of position in the future.

Use of Prior Learning Assessments

For several colleges, the expanded use of prior learning assessments was another aspect of the grant that will be sustained after the grant is over. Although PLAs were not used extensively by the grant-supported students, Bellingham, Clark, and Spokane indicated that the work on PLAs done during the grant was valuable to the college at large. At Bellingham, the PLA information will be provided to general advising services staff members so that they can further promote PLAs after the grant ends. Clark was already working on incorporating PLAs before the grant, and that will continue. Clark also hired an Advising Credential Office point person to work on this. At Spokane, the program manager reported that the students who typically use or apply for PLAs are from the armed forces. According to the program manager, the use of PLAs during the grant created the foundation for increased usage of PLAs in the future.

Emphasis on Services to Veterans

Several of the colleges already had robust services for veterans, as both Washington and Virginia have large veteran populations. In a few cases, the focus of the grant on recruiting veterans resulted in continuing attention to recruiting and supporting veterans in additional programs. In

[34] Washington's Integrated Basic Education and Skills Training Program (I-BEST) teaches students literacy, work, and college-readiness skills so they can move through school and into living wage jobs faster.

Bellingham, for example, a new grant includes a plan for developing comprehensive support for veteran students in nursing and other allied health programs. At Clark, the college has a recently established a Veterans Resource Center, which the grant-funded programs took pains to reach out to and develop relationships with at the beginning of the grant. Those relationships have continued and are likely to maintain the heightened awareness of Health IT as an attractive potential field for veterans exiting from the military.

Lessons Learned

The nine colleges that participated in the HeW initiative faced a number of different challenges in preparing students for Health IT occupations. Although each college attempted to realize project goals in different contexts and encountered unique challenges, there are some common themes in the challenges encountered, and a number of lessons learned apply to the HeW project as a whole.

Infused Nursing and Allied Health Programs

It can be challenging to infuse Health IT content into nursing and allied health programs because of the following factors:

- Major EHR software venders may be resistant to making their products accessible for use in an online instructional platform for use by students enrolled in public occupational training programs.
- Developing an EHR software platform and populating the database with fictional case data that can be used in specific instructional activities is a complex undertaking.
- Nursing and allied health programs have limited "room" for the insertion of new curricular content about EHR systems.

A few specific lessons can be drawn from the HeW implementation experience in infusing Health IT content into nursing and allied health programs:

- Hands-on exposure to EHRs or simulated EHRs was perceived as a valuable enhancement of the program curriculum by nursing and allied health students.
- Even more valuable to students were courses that imbedded information about the use of EHRs into multiple courses and applied it to multiple clinical topics (rather than offering a separate free-standing module on EHRs without linking it to the rest of the curriculum).
- Students particularly valued practicums and internships that allowed them to apply their knowledge about EHRs in a real work setting.

New Health IT Programs

Some of the new Health IT programs faced major challenges to successful implementation:

- Program graduates were not as well-positioned to find jobs in the regional labor market as expected.
  - Representatives from several colleges reported that there were fewer openings for Health IT positions within their region than they had realized.
  - Several programs reported that employers were looking primarily for job seekers that already held 4-year degrees or even graduate degrees in the Health IT field.
  - Programs that lacked intensive IT coursework or prerequisites were particularly concerned that their program completers would not be attractive to employers in the Health IT field unless they already had substantial training or work experience in the IT field.
  - Unlike the nursing and allied health programs, the new Health IT programs did not already have established internship or practicum programs. Although several colleges began recruiting employers to create internships for Health IT students, progress in developing these work-based training opportunities was modest.

Several specific lessons can be drawn from the experience of designing and implementing new Health IT programs and infusing Health IT content into existing IT programs:

- Taken together, these implementation experiences suggest the difficulty of gaining widespread employer acceptance of a new occupational training program, particularly in a rapidly changing field. [35]
- Several programs found it helpful to explicitly link new Health IT curricula to existing IT degree programs as a new area of specialization for students in existing IT programs.
- A largely untested market for Health IT programs among the participating colleges comprised professionals already working in the Health IT or IT fields. One college found that there was substantial student interest in a noncredit healthcare data analytics program targeted to working professionals in related fields.

In conclusion, the HeW initiative offers a powerful example of how a group of colleges can work together over a three-year period to develop programs that better prepare their students for rapidly expanding job opportunities in the Health IT sector.

The HeW TAACCCT grant experience shows that a grant-funded collaborative can be a powerful force for helping colleges infuse Health IT content into existing training for nursing and allied healthcare occupations.

The experiences of the colleges that developed new Health IT programs suggest that it is difficult to develop new training programs in a new occupational field that is not yet well developed. A

[35] Although each participating college were required to develop relationships with local workforce investment boards and employer advisory boards in designing the new programs, programs were particularly disadvantaged by the absence of prior experience working with employers hiring for emerging Health IT positions.

review of the experiences of the HeW colleges in developing new Health IT certificate programs suggests that colleges would do well to carefully research the specific skills and experience that employers are looking for when they hire Health IT specialists. In addition, the limited success of graduates of the Health IT certificate programs in the labor market suggests that it will be important in the future to link certificate programs to additional training opportunities that will allow students to gain more advanced skills over time.

Appendix A: Estimating and Compensating for Nonresponse Bias in Participant Surveys

The study team investigated the possibility that the relatively low response rate for the surveys (especially for the web-based surveys might have resulted in biased survey findings as the result of differences between the characteristics of survey respondents and the characteristics of the full pool of eligible survey participants. To estimate the extent of potential non-response bias, we compared survey respondents in Health IT and Nursing and Allied Health program to their respective group of potential survey participants. The variables used for comparison were obtained from administrative data collected by the HeW Consortium, and were available for all potential survey participants. The evaluators included all the variables that were believed to be likely to be associated with survey responses and that were available at the time the analyses were conducted. These variables included age, gender, race and ethnicity, student status (full-time versus part-time), veteran, and Pell status. As described in Table A, below, the differences between actual and potential survey respondents tended to be small for the Nursing and Allied Health program groups. Because of the small differences, we estimate the level of non-response bias to be low. Thus, we opted to report the unweighted survey responses in the main text, primarily because such raw counts are more easily interpretable than weighted responses. In contrast, differences between Health IT potential and actual respondents tended to be larger, especially in regards to Pell status and gender. For this reason, the report presents weighted survey responses for Health IT participants.

To correct potential nonresponse bias for Health IT participants, the evaluators weighted the survey responses using each completer's propensity to participate in the survey. A logit model was estimated wherein participation in the survey (a dichotomous variable) was regressed on a set of participant characteristics including age, gender, race and ethnicity, student status, veteran status, disability status, and Pell status. This logit model generated a predicted probability for each participant that represents that participant's propensity to participate in the survey. Subsequently, survey responses were weighted using the inverse of this propensity, such that the responses given by participants with a lower propensity to participate in the survey were given more importance compared to responses of participants who were more likely to participate in the survey. A comparison of weighted and unweighted survey results for the selected variables (shown in Exhibit A-1 below) suggests that weighting may have reduced nonresponse bias.[36]

36 The above analyses do not preclude the existence of nonresponse bias caused by student characteristics that were not measured. Although the analyses were based on data available for potential and actual survey respondents, it is possible that potential and actual survey respondents differed based on characteristics that were unmeasured (for example, the level of student motivation). If that were true, unmeasured differences could also cause significant nonresponse bias.

Exhibit A-1: Comparison between the Main Characteristics of Program Participant Survey Respondents and Population

	Infused Nursing and Allied Health Program Participants		Health IT and Infused IT Program Participants		
	Unweighted Survey Data (n=224)	Universe (n=1003)	Unweighted Survey Data (n=53)	Universe (n=200)	Weighted Survey Data
Age					
18-25 years	33.5	32.2	11.3	15.0	14.0
26-40 years	24.1	24.9	11.3	15.5	12.4
40+ years	42.4	42.9	77.4	69.5	73.5
Gender					
Male	15.6	17.5	34.0	51.0	50.1
Female	84.4	82.6	66.0	49.0	49.9
Ethnicity					
Hispanic	7.3	6.5	1.9	4.0	2.4
Asian	9.6	12.0	15.1	14.1	13.7
African American	7.3	7.0	7.6	5.5	7.2
White	73.6	69.3	62.3	67.3	66.8
Other	2.3	5.2	13.2	9.1	9.9
Student status					
Full-time	86.0	85.1	77.4	84.5	83.3
Part-time	14.0	14.9	22.6	15.5	16.7
Veterans					
Yes	7.7	7.1	13.2	18.0	22.1
No	92.3	92.9	86.8	82.0	77.9
Disability					
Yes	2.7	3.3	7.6	12.8	15.1
No	97.3	96.7	92.5	87.2	84.8
Pell Status					
Yes	38.5	39.1	45.3	56.4	58.6
No	61.5	60.9	54.7	43.6	41.4

Percentages do not always sum to 100 because of rounding.

Appendix B: Methodological Note

Multivariate Modeling of Student Outcomes

To assess the relation between various program components and program outcomes, we developed multiple regression models where the dependent variable were outcomes of interest, measured at the individual level. We focused on three Health eWorkforce participation outcomes: program completion; post-program employment; and post-program earnings.

The advantage of using regression modeling is statistical control, i.e. the ability to calculate the association between the dependent variable and each independent variable while holding all the other independent variables constant. Using multivariate regression allows us to calculate the association between various program features and the outcomes while controlling for covariates, thus improving the precision of our regression estimates.

Stated in equation form, the outcome Yi for student i was modeled as a function of a vector of individual characteristics X_i (such as age, ethnicity, and gender), a vector of program participation HeW_i (measuring characteristics of TAACCCT-funded programs in which an individual was enrolled), services received by students from grant staff members (Z_i)and a random error component r_i. For numeric dependent variables, such as earnings, the linear regression model has the following form

$$Y_i = \beta 0 \quad + \beta_1 X_i + \beta_2 HeW_i + \beta_3 Z_i + r_i \ (1),$$

Where Y_i is the value of earnings for individual i, β_0 is the intercept, β_1 is a regression coefficient indicating the strength of the association between socio-demographic characteristics and student outcomes, β_2 is a regression coefficient indicating the strength of the association between program characteristics and student outcomes, β_3 is a regression coefficient indicating the strength of the connection between student services and student outcomes, and r_i is a random error term.

For binary dependent variables, such as program completion, we used a logit model to predict the probability that a case experienced the outcome (e.g., employment) during the observed period compared to the probability of not experiencing the outcome (e.g., not being employed). Logit models had the following form

$$\ln \frac{p_i}{1-p_i} = \beta_0 + \beta_1 X_i + \beta_2 HeW_i + \beta_3 Z_i + r_i \ (2),$$

where p_i is the probability that individual i experiences the outcome and other parameters are defined as above.