Consortium for Healthcare Education Online

Final Evaluation Report

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Released December 2016

RUTGERS
Education and Employment
Research Center

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This workforce solution was funded by a grant awarded by the U.S. Department of Labor's Employment and Training Administration. The solution was created by the grantee and does not necessarily reflect the official position of the U.S. Department of Labor. The Department of Labor makes no guarantees, warranties, or assurances of any kind, express or implied, with respect to such information, including information on linked sites and including, but not limited to, accuracy of the information or its completeness, timelines, usefulness, adequacy, continued availability, or ownership.

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Table of Contents

EXECUTIVE SUMMARY

TAACCCT Program/Intervention Description and Activities

Project and Purpose

Under the CHEO grant, consortium colleges were tasked with developing or redesigning identified allied health programs to expand or create hybrid and online delivery options. The intention of the grant was to "develop the interest and aptitude of displaced workers to pursue allied health careers by studying online or in a hybrid environment in their community—building rural areas' capacity to fill jobs with local residents."[1] Schools were to incorporate NANSLO (North American Network of Science Labs Online) lab activities into coursework to enable science and allied health students to complete science labs remotely. Consortium colleges were also to hire an intensive advisor—called a career coach—to assist students from registration through graduation. The project further required schools to expand and/or develop relationships with employers and workforce representatives in their communities and to create stackable credentialing programs with viable career pathways for students.

Interventions

Across the eight consortium colleges, the following interventions were evaluated:

Intervention	Proposed Change Effect
Design/Redesign courses to online/hybrid format	Increase access to courses for rural and non-traditional students
Incorporate NANSLO lab activities into coursework	Allow students to take science labs from anywhere; increase access
Integrate intensive advising through a career coach	Identify and remove barriers to success for students; increase retention and completion; increase job placement
Build/expand relationships with employers and local workforce representatives	Increase employer buy-in for programs; place students in jobs
Create stackable credentials	Allow multiple entry and exit points for non-traditional and incumbent-worker students; create career pathways leading to allied healthcare jobs
Develop a portal for students to plan their future career in healthcare	Create a user-friendly tool for students to explore and plan their future healthcare career, take assessments, and create résumés
Create and use OER resources	Develop material to expand the available online database of open education resources; reduce cost of learning materials for students; increase collaboration among faculty

[1] CHEO Technical Proposal, p. 3.

The following components of the above-listed interventions were evaluated:

- Use of an instructional designer to collaborate with faculty on course design/redesign
- Career coach role at each college
- Development of simulations/use of equipment in programs
- Development and use of career pathways/stackable credentials
- Job placement
- Recruitment of target population
- Development and use of internships/clinicals

Populations Served

CHEO programs were meant to serve primarily rural students, mostly adult or otherwise nontraditional[2] students, and mostly TAA or TAA-like students. Across the consortium, students served were primarily rural, predominantly nontraditional, and a majority of students were TAA-like—unemployed or underemployed.

Evidence-based Model

The proposed strategies for online and hybrid delivery were based on strong research about adult learning, blended learning models, and best practices in online career and technical education courses (Benson et al, 2004). Research indicates that online and hybrid learning models have a strong affinity with adult learning theory, which stresses the need for autonomy, self-direction, and relevant learning as key design elements (Ausbum, 2004). A strong body of evidence on blended learning models supported CHEO's approach, and the CHEO model was based on research from the University of Central Florida (Graham and Dziuban, 2008) and the Center for Technology in Learning at the U.S. Department of Education (Means, Toyama, Murphy, and Jones, 2009). Research about online labs confirms that students' use of remote labs affords more authentic inquiry, trustworthiness of data, a greater personal investment, and a greater sense of presence and reality, and students express a stronger preference for remote labs over performing a similar experiment with simulated data (Jona et al, 2011). In addition, remote labs allow collaboration among learners, while kits and online simulations usually do not. Ultimately, NANSLO's remote labs were to support improved completion rates by eliminating the geographic and scheduling barriers that students report causes them to drop out (Kennepohl and Shaw, 2010). There is also strong evidence to support CHEO's student coaching strategy. In a recent randomized experiment of mostly nontraditional students that took place over two years, researchers found that the students who were randomly assigned to a coach were more likely to persist during the treatment period and were more likely to be attending the university one year after the coaching had ended. Coaching also proved to be a more cost-

[2] For more on nontraditional students served by CHEO, including a definition of nontraditional students, see Part II, Section I of this report.

effective method of achieving retention and completion gains when compared to previously studied interventions such as increased financial aid (Bettinger and Baker, 2011).

Evaluation Design Summary

The evaluation of CHEO used the framework of developmental evaluation as the guide for both the implementation and outcomes evaluations. The project was focused on expanding access to and improving institutional capacity for healthcare training and education in primarily rural areas of western states. It was hypothesized that this could be achieved using three primary tools and activities: technology, student supports and community engagement. Data was collected in a variety of ways including site visits, interviews, focus groups, document review, surveys, activity tracking systems and attendance at project meetings and events.

The implementation evaluation was guided by several broad research questions. More detailed research questions were also posed for many of the activities and interventions in the grant. Those are discussed throughout the main report.

Program and Strategy Design:

- How did colleges understand the goals of CHEO?
- How was CHEO operationalized at the consortium level?
- How was CHEO operationalized at each college?

Program Operations:

- How were the key components (technology, student supports and community engagement) implemented at each college?
- What promising practices emerged in implementation?
- What challenges emerged in implementation?
- What role did partner organizations play? How did they collaborate?
- Are colleges scaling and sustaining policies and practices that emerged from CHEO? If so, how?

The outcomes evaluation considered students served at each college and a multivariate regression model. Outcomes examined include students served, credentials achieved, grades achieved and employment and wage outcomes.

There are several caveats in interpreting results in the outcomes analysis:

- The data used in the statistical analysis is limited in terms of timeframe and quality. For the employment and wage outcome analysis in particular, only five out of eight colleges provided wage data, and for two of those colleges, wage data was only available up to the third year of the grant period. These issues create the potential for underestimation in wage outcomes.

In the cohort comparison analysis, since CHEO interventions could be introduced at the consortium, college, or course level, it is impossible to disentangle the effect of each particular intervention and to draw conclusions and inferences regarding the causal impact of specific CHEO treatments.

Implementation

Institutional Capacity

- In all cases, CHEO goals were well-aligned with the institutional goals of consortium schools. These included:
    - An institutional objective to move toward more online and hybrid course offerings
    - A priority to build career pathways and to create/expand stackable credentials
    - A focus on "active learning" in the classroom
    - Expansion of allied health programs
- Because institutional goals and CHEO goals were closely aligned, institutional buy-in was present, which encouraged both faster implementation as well as sustainability planning
- Institutional capacity was built by restructuring programs to create multiple entry and exit points (i.e., the creation of stackable credentials), the purchase of foundational and technologically advanced equipment, and the expansion of programs to better serve rural and nontraditional students

Key Steps Taken at Program Level

Each of the eight consortium colleges leveraged internal, consortium-level, and external relationships to inform, redesign/build, and execute their respective curriculum and programs.

- Internal collaboration included:
    - Faculty working with instructional designers to transition courses to online/hybrid formats
    - Faculty working with instructional designers to find appropriate OER content and integrate it into courses
    - Faculty working with instructional designers to create and upload OER content to SkillsCommons
    - Project leads working with faculty and staff to order appropriate equipment and material for programs
    - Internal IT departments working with faculty to offer assistance and professional development relative to online/hybrid course offerings

    - Staff/faculty utilizing workstudy students to work in NANSLO nodes
    - Faculty working together to create and share new teaching techniques and technology
    - Career coaches and faculty working together to present program information to students

- Consortium-level collaboration included:
    - NANSLO staff working with faculty to introduce NANSLO labs
    - Faculty and NANSLO staff working together to develop over 12 new NANSLO lab activities
    - Career coaches sharing promising practices and challenges with other coaches
    - Project leads sharing promising practices and challenges with other project leads

- External collaboration included:
    - Faculty and employers working together to develop new/redesigned curriculum and to choose equipment for purchasing
    - Faculty and employers working together to integrate soft skills into the classroom
    - Career coaches and workforce representatives traveling together to visit employers and attend job fairs
    - Employers visiting classrooms to discuss job expectations and career paths with students

- All eight consortium colleges were able to implement their programs with fidelity to the original model even with unexpected delays occurring at some colleges.

- Delays in implementation at some schools included issues related to space renovation, equipment ordering and delivery, appropriate staff recruitment, and program acceptance.

Strengths and Weakness at the College Level

Consortium schools exhibited an array of strengths and weakness. Relative to strengths, most schools were able to effectively:

- Collaborate internally and externally to build stronger programs that were better tailored to their respective job markets
- Empower faculty members to embrace online/hybrid technology
- Build and expand relationships with employers and workforce centers
- Recruit nontraditional students
- Place students in jobs

Relative to weaknesses, some schools had difficulty:

- Convincing some faculty members of the benefits of transitioning certain courses to online/hybrid formats, especially some "hard science" courses
- Incorporating NANSLO lab activities into courses and receiving buy-in from some faculty regarding the usefulness of NANSLO
- Building relationships with their local workforce office
- Expanding relationships with employers, especially relative to educating employers about the benefits of certificates to students
- Finding use for the PlanYourHealthCareer.org portal—at some schools the portal replicated services available on similar websites that were already in use; also, since the roll-out of the portal was delayed, implementation was late and the usable period of time for the portal was short

Participant Impacts and Outcomes

During the four-year grant period, the CHEO program served a large number of students with diverse demographic backgrounds at eight community colleges in five states:

- Over 12,000 participants enrolled in at least one CHEO-redesigned course, and over 6,000 participants enrolled in a specific CHEO-redesigned healthcare program
- Overall, enrollments increased over the course of the grant
- The students served by CHEO programs were:
    - Predominately female (69 percent)
    - Nontraditional—over half (59 percent) were 25 or older
    - About 20 percent nonwhite, with the majority of minority students identifying as Hispanic
    - Part-time students with jobs—nearly 70 percent of CHEO participants were enrolled in college part time, and over 50 percent of them were incumbent workers upon enrollment

The CHEO-redesigned program had positive impacts on many course-level, program-level, and post-completion-employment outcomes:

- Across all colleges, 83 percent of CHEO students passed their courses with a grade of C or above
- CHEO intervention increased students' success rate in program courses by 4-11 percent across the two colleges in our comparison study
- CHEO students were less likely to withdraw from their courses—only about 7 percent of course enrollments in the CHEO cohort were withdrawn versus about 10 percent of historic cohort enrollments
- Slightly over 20 percent of CHEO participants completed at least one CHEO credential, among which 57 percent were short-term (less-than-one-year) certificates, 12 percent were medium-term (one-to-two-year) certificates, and 31 percent were two-year associate degrees

Key Lessons

- Institutional capacity matters:
    - Relative to transitioning curriculum and programs to online and hybrid formats, institutional capacity in terms of assistance for faculty, such as instructional designers, technology, and release time, were all associated with an increase in faculty positivity toward redesigns
    - Schools that had previous plans to accomplish goals that were aligned with CHEO goals seemed to have more buy-in and more acceptance of CHEO goals

- Institutional buy-in matters:
    - Not all faculty will favor a transition to online/hybrid course delivery
    - Especially relative to converting curriculum to hybrid and online formats, faculty were more likely to respond favorably to the change if the institution was fully on board with the transition
    - Adoption of the NANSLO online science labs was met with resistance, and use of the labs was only occurring at two of the eight colleges by the end of the grant period

- The degree of online material used to make a course "hybrid" varied substantially across the colleges. Some schools called courses hybrid if portions (such as the syllabus) were simply accessible through the learning platform, while others called a course hybrid if it was converted at least 80 percent to an online format with 20 percent or less of instruction occurring in the classroom or lab.

- Career pathways and stackable credentials were not used by students to the degree expected during CHEO:
    - Although six of the eight schools had stackable programs available and qualitatively it seemed students were interested in stacking credentials, quantitative student outcomes reveal that very few students actually stacked credentials

- Career coaching was both qualitatively and quantitatively effective at increasing retention and completion; however, none of the career coach positions were sustained after the end of the grant period.

Next Steps for Research

- Re-examine retention and completion outcomes after more time has elapsed
- Re-examine employment outcomes after more time has elapsed
- Examine sustainability and scaling of CHEO activities over time

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INTRODUCTION

The Consortium for Healthcare Education Online (CHEO) is a U.S. Department of Labor (USDOL) Trade Adjustment Assistance Community College and Career Training (TAACCCT)-funded grant project intended to develop new or redesigned online and hybrid courses leading to credentials in healthcare fields in high demand across the western United States. CHEO is an interstate consortium consisting of eight colleges located in Colorado, Wyoming, South Dakota, Montana, and Alaska. The partner colleges are Pueblo Community College (PCC), Otero Junior College (OJC), Red Rocks Community College (RRCC), Laramie County Community College (LCCC), Lake Area Technical Institute (LATI), Great Falls College Montana State University (GFC MSU), Flathead Valley Community College (FVCC), and Kodiak College (KoC).

The CHEO project's organizational structure includes an administrative team led by a project director who reports directly to PCC's president and is the primary contact to USDOL. The administrative team consists of a grant administrator, a project accountant, a data analyst, and an administrative assistant, and it falls under the supervision of the project director who also has direct oversight of the PCC career coach and instructional designer. The administrative team is responsible for all programmatic activities conducted by partner colleges and contractors as well as fiscal, data, and reporting processes. Each partner college hosts an onsite CHEO team and leverages operating resources such as support from information technology, human resources, procurement, accounting, facilities, and admissions offices and academic departments.

This is the final report for the CHEO project, and it is separated into three parts. Part one summarizes grant-related activities since the interim report was written, covering the period from December 1, 2014, through August 1, 2016. This section addresses the progress made relative to grant goals and provides updates to implementation topics discussed as part of the interim report. Part two takes an in-depth look at each of the three topics that were significantly developed under the grant—career pathways, intensive advising, and the use of technology in healthcare instruction. Part three discusses student outcomes relative to all four years of the grant. The three parts are summarized as follows:

Part I: Implementation Update
Part II: Impact Findings
- Section I—Career Pathways
- Section II—Intensive Advising
- Section III—Technology in Teaching in Allied Health

Part III: Outcomes
- Section I —Introduction and Definitions
- Section II —Employment and Wage Outcomes
- Section III – NANSLO Outcome Comparison
- Section IV – Multivariate Regression Evaluations of Student Outcomes by College

METHODS

The Education and Employment Research Center at Rutgers University was hired to provide a third-party implementation-and-outcomes evaluation for CHEO. This final report uses qualitative and quantitative data and analysis and provides outcome measures. The qualitative methodology for this report includes content analyses of consortium goals and activities to date; relevant proposals and project-, college-, and contractor-specific statements of work; quarterly reports; career coach tracking spreadsheets (also called "stitched-in reports"); strategic plan information and materials; and project websites. EERC team members also conducted phone and in-person interviews with CHEO staff, faculty, and students. Throughout the course of the project, the EERC team interviewed 59 staff members (including career coaches, project leads, and instructional designers), 47 faculty members, and 60 students. In addition, EERC team members acted as participant–observers at many project workshops, including those for faculty, project leads, instructional designers, and career coaches. Finally, members of the EERC team have "observed" conference calls with project leads and career coaches and joined in webinars. Most interviews were taped and transcribed; non-taped interviews involved extensive note taking. These transcriptions and notes, as well as the documents cited above, were coded through the use of NVivo qualitative data management software and analyzed by EERC team members.

Quantitative data were received from the Colorado Community College System as well as from each of the non-Colorado schools. More specific information about the data pull, its parameters, and the tools used to analyze the data set is included in the Outcomes section of the report to follow.

In the discussion of course-level outcomes, "Passing" grades represent course grades of C or better. Some courses were graded as P/NP (Pass/No Pass), S/U (Satisfactory/Unsatisfactory), etc. Because the thresholds for earning these marks and their equivalency to letter grades were not known, all grades in these courses were coded as "other" in the grade tables. The occurrence of these grades was very infrequent, so the resulting data loss was small; still, their omission could result in a slight underestimation of passing rates in certain courses.

With regard to credentials earned, all credentials earned by CHEO students were counted, not just those earned in the redesigned CHEO program of study. Only those credentials earned during the study period of the respective school were counted.

In the final section of this report, when wage and employment outcomes are discussed, Unemployment Insurance data is used for analysis. All reported wages are quarterly earnings. Wage data were not available for all schools, and the schools that did have it had data sets covering different periods. Thus, some completers—CHEO students who earned a credential—could not be included in the wage analyses because they were not included in the data received by EERC.

PART I: IMPLEMENTATION ACTIVITIES

Introduction

Part one of this report is an update on implementation activities taken since the interim report was written—specifically, during the period spanning December 1, 2014, through August 1, 2016. Each of its main sections briefly summarizes activities undertaken by consortium schools as outlined in the grant statement of work. These summaries are followed by a discussion of related implementation activities since December 1. Often, the implementation discussions are accompanied by examples that highlight promising practices as well as descriptions of how some schools modified their implementation activities to respond or adapt to challenges they encountered.

Program Design/Redesign

Program design or redesign was a central goal of the CHEO project. Hence, implementation activities at consortium colleges were largely centered on the creation or redesign of programs and courses. This section explores and updates implementation activities through the end of the grant project that were focused on these efforts, including the development of new course models, the use of instructional designers to assist faculty and staff in program redesign, and the creation and incorporation of open education resources (OER) as required by the grant statement of work. This section concludes by exploring faculty perceptions of the program/course redesign processes and student perceptions of the resulting courses and programs. The development and delivery of educational technology that incorporates allied health curriculum will be discussed at greater length in part two of the report.

Hybrid and Online Courses

CHEO was intended to "develop the interest and aptitude of displaced workers to pursue allied health careers by studying online or in a hybrid environment in their community—building rural areas' capacity to fill jobs with local residents" (CHEO Statement of Work p.3). Consortium colleges were thus tasked with creating or expanding hybrid or online course delivery as part of the development or redesign of their identified allied health programs. Most of this transition took part during the first year and a half of the grant project.

Overall, consortium schools have continued to run their redesigned programs during the final year of the grant, making subtle changes and "tweaks" to course curriculum, delivery, and structural frames—such as expanding the times during which courses are offered (including nights and weekends), addressing scheduling issues, and adding instructors to serve additional sections. Colleges have also incorporated the lessons they have learned into their programs to better serve students. For example, in the last year of the grant, program personnel at LATI noticed an increase in online students dropping its MLT program. They found that online MLT students struggled to keep up with their face-to-face-classroom counterparts. Consequently,

staff at LATI are considering decompressing the online program to include an additional semester. This will allow students to continue to take the program online while giving them the time they need to complete it successfully. Staff believe students who choose to take the program online are more likely to be part-time students and/or students with work or home responsibilities. These students may need to divide their time between these responsibilities and school; extending the program an additional semester may accommodate them better.

Role of Instructional Designers

In the final year of the grant, instructional designers provided support to faculty in a variety of ways. For example, PCC's instructional designer helped develop and deliver a fully online course to prepare instructors across all four PCC campuses to teach online. The training course "focuses on the pedagogy of teaching online—how it's different from face-to-face, how to manage groups [online], how to build community online, and how to build student success online—and retention." In addition, the college began offering faculty a brown-bag lunch on the first Friday of each month allowing faculty to "drop in" for help with technology-related issues. At FVCC, CHEO grant funds allowed the instructional designer to be trained in video editing—a skill she put to use assisting faculty and creating videos using the school's new lightboard technology.[3]

In the final year of the grant, instructional designers were heavily focused on preparing OER material for upload to the SkillsCommons repository to meet grant deadlines. The upload process requires material to be tagged and packaged to meet archive requirements. One instructional designer described the exercise as "tedious."

OER Creation and Incorporation

Under the CHEO grant, consortium colleges were encouraged to use OER in the creation/redesign of their online or hybrid courses. Consortium colleges were also required to create or redesign their courses/programs so that they could be uploaded to SkillsCommons and licensed as OER for use by other educators and institutions. The SkillsCommons repository consists of discipline-specific learning materials, learning exercises, and web pages designed to enhance the teaching experience.[4] The deadline for uploading materials to SkillsCommons was moved from March 2015 to summer 2015. All colleges uploaded required material to the repository.

The CHEO grant provided an opportunity for colleges to learn about and implement OER. Many personnel were not familiar with the concept and were unaware of the amount of material that was available. Although faculty members found some material helpful, they also

[3] See the Interim Report (Edwards, McKay, Mattoon, & Rua, 2015) and the Faculty Brief (Mattoon, Edwards, & McKay, 2016) for a full description of the lightboard technology.
[4] The repository is available at https://www.skillscommons.org/.

consistently referred to the challenge presented by the sheer quantity of OER material available and the amount of time required to sort through resources to find the "diamond in the rough." The quantity and quality of OER materials varies widely across disciplines and courses.

This challenge, however, spurred collaboration and creativity. CHEO grant money and priorities provided opportunities for faculty members to sort through available OER, often with the assistance of an instructional designer. When no suitable resources were found, faculty were encouraged to create their own. At many colleges, such as GFC, faculty preferred to create their own OER material to assure it met their high standards. At FVCC, access to the lightboard—a legible writing surface that allows instructors to write as if on a whiteboard while facing a recording device to communicate with distance students, itself an OER product—allowed faculty there to create a significant amount of their own material that they could also make available as OER. For the development of CHMY 105, for example, faculty and staff developed approximately 50 videos.

As previously reported,[5] there was significant confusion early in the grant about the requirement and process for uploading courses to the repository. This was largely due to a delay in instruction from USDOL as to which repository would be used to house the material and the process for uploading it. However, more information became available in the spring of 2015, which helped ease confusion and provide a path forward. Training was provided at the annual CHEO meeting in May 2015. The training helped staff who felt previously unprepared by providing clearer information on packaging and uploading. Since accessibility requirements were not well known at the outset of OER course development, many colleges found that they had to go back through materials they had already created and update them, which proved to be quite time consuming. For example, videos shot and edited by the colleges needed to be closed-captioned before they could be licensed as OER. The process of closed-captioning was time consuming for staff, so student employees were hired at some colleges to add the transcription. At GFC, staff attempted to use automatic closed-captioning technology. However, it performed so poorly that CHEO staff hired a third-party company, 3Play Media, to correct the captions. This is something the school has had issues with across all programs, not just CHEO programs.

Consortium colleges' faculty and staff may continue to make changes to course material or add new material to SkillsCommons after the grant period has ended if they choose to do so. At the time of writing, instructional designers at four of the eight consortium schools plan to continue this activity in partnership with faculty.

[5] See the Interim Report (Edwards, McKay, Mattoon, & Rua, 2015).

Faculty Perception

Over the course of the grant period, a sizable positive shift in faculty perception and practice around online and hybrid teaching occurred at consortium colleges. Grant personnel credit CHEO with improving awareness about what can be accomplished in the online environment. Faculty members echoed this belief, noting that once they were introduced to potential strategies for adapting their courses to the online environment, they felt more capable or willing to explore available resources for online teaching. One faculty member mentioned that she had a moment where she thought "oh, I totally get it now. I can do this." Faculty members did not just learn about new tools—they became "aware of available resources," which changed their viewpoint about the "quality and the possibility of online . . . instruction." However, some faculty members retained significant reservations about the feasibility of online education for all students and in all disciplines—particularly those in the hard sciences.

Student Perception

Overall, CHEO schools have reported fairly positive feedback from students taking the new hybrid and online courses. One faculty member characterized the students' response as "tremendous." Students across the consortium reported that they appreciated the ability to rewind and re-watch the video materials as many times as they needed to master the material. However, some students are more suited to online/hybrid learning than others, and some faculty have subsequently reported receiving mixed responses to their courses. Students are easily distracted and can quickly fall behind in an online course. These students might be better served in a traditional classroom where teachers can hold them accountable face-to-face.

North American Network of Science Labs Online: NANSLO

NANSLO is a network of laboratories at colleges in the United States and Canada that offer remote science activities to students through the use of robotics and a web interface. The CHEO grant specified that 1) CHEO partners would collaborate to develop twelve lab exercises to be used in courses related to allied health and other sciences and 2) faculty in the designed/redesigned CHEO programs would incorporate NANSLO labs into courses using one of the available nodes. The grant also specified that a third node would be developed and added to the NANSLO network that would allow NANSLO to serve more chemistry, biology, physics, and healthcare students. The network of three nodes was intended to expand students' online access to science labs and to increase the variety of lab activities that could be integrated into online courses.

Expansion

Under the CHEO grant, the NANSLO network was tasked to expand and improve the capacity of the North Island College (NIC) and Colorado (CCCS) nodes, to develop a new node located in Montana, and to develop 12 new experiments. GFC MSU housed the newest of the three

NANSLO nodes, which was built under the CHEO grant and completed in the summer of 2014. The equipment was installed in early summer 2014, and the remote capabilities were live by August 2014. The consortium met and exceeded all of its initial NANSLO goals, including node expansion and the creation of new labs. A detailed description of NANSLO outcomes is discussed below in Part III Section III.

Over the course of the CHEO grant, CCCOnline accounted for the largest percentage of enrollments in courses that utilized a NANSLO lab. CCCOnline was also the only school that utilized the physics NANSLO lab. Four CHEO colleges used a NANSLO lab in the Spring 2015 term.

Sustainability and Scaling

Demand for NANSLO was uneven across the consortium; some colleges embraced the remote labs more than others. The three NANSLO nodes presented a particularly difficult issue for their hosts with regard to sustainability—the nodes take up significant space, require several lines of funding to staff, and require equipment that may prove to be expensive to maintain. Lack of demand contributed to the decision on the part of CCCS to eventually close the Colorado node. KoC (which uses the NIC node) and GFC MSU (which uses its own node) were the only two CHEO schools still actively using NANSLO labs at the time this final report was written.

The CCCS (Colorado) node never gained sufficient traction developing buy-in from faculty to justify the extensive costs associated with operating it. As a result, CCCS decided to shut down the Colorado node in December 2015. There was concern among CCCS leadership that the return on investment was insufficient; they expected the cost of maintaining the node to reach over a hundred thousand dollars a year, and there was limited demand across the colleges and from the CCCOnline courses. In addition, although over 20 additional labs had been created during the course of the CHEO project, there were still not enough lab activities available through NANSLO to allow all CCCOnline courses to replace all of the kit labs they previously used with the new technology. Since NANSLO ultimately was not able to be a complete replacement, its expense and upkeep made the technology cost prohibitive in the eyes of CCCS leadership.

The Montana node, housed at GFC MSU, transferred from grant funding to completely funded by the college at the end of the CHEO grant. The NANSLO lab was moved into the college's e-learning division, which provides online learning support for the entire school. The node's lab manager position was retained 50 percent and combined with an instructional designer position for the additional 50 percent. Both the administration and faculty at GFC MSU are "really committed" to the new technology and recognize value in maintaining the NANSLO lab at the college.

The end of the CHEO grant and the move to the e-learning division has resulted in a shift in emphasis for the Montana NANSLO lab. Originally, the node was focused on new lab development to help meet CHEO targets for the number of new labs developed under the grant. Now that the grant is finished, the focus will shift to maintaining the activities currently offered as well as finding new users for the technology. As a result, GFC MSU will not expend resources to create new lab activities or enhancements; instead, the lab will focus on the delivery of existing labs to students. The NIC node, on the other hand, will remain a "development" node, creating new lab experiments and expanding equipment over time. The CCCS node was the "most visible with the most users," and its closing led to concerns that the NANSLO network overall—and its two remaining nodes—would lose exposure as a result. This is one primary reason GFC MSU is solely focused on sustaining its node and bringing in new users. Currently, NANSLO staff at GFC MSU is working to expand use of its node within Montana; they are also in the beginning stages of developing pilot programs with some out-of-state schools. There does not appear to be significant interest in the use of the Montana NANSLO node by other CHEO consortium schools.

Intensive Advising (Career Coaches)

A primary goal of the TAACCCT CHEO project was the provision of "support services for students provided by professionally trained career coaches." As such, each of the consortium colleges was mandated to employ a career coach. Serving as intensive advisors, career coaches were tasked with working with CHEO program students, local employers, and community workforce centers to help ensure the engagement and success of students throughout their education and into employment. Seven of the eight consortium colleges hired career coaches; the eighth college already employed a similar position at the school and thus used the funds earmarked to hire a career coach to hire for other roles at the college.[6]

By the third year of the grant, as the consortium began to focus on targets including graduates, employed students, and use of the hub, coaches started to feel tension between the roles they had developed within their individual institution and overall grant goals. Several coaches felt like they were still trying to figure out their roles. When asked "what would you do differently if you could?" several coaches replied they would try to understand their job description better.

Although coaches were highly successful in helping students navigate their programs, retaining students in the programs, and guiding students on their career paths, the coach position has proven to be difficult to sustain. Most consortium colleges have been unable to find a way to justify the cost of maintaining the position once grant funding ends. Of the seven consortium colleges that hired a career coach under the CHEO grant, only two of them report that they have plans to sustain the career coach role or related services after the end of the grant: PCC and RRCC. The grant "helped articulate the need for someone in [the career coach] position" at

[6] See the Career Coach report for detailed information about the role of coaches at each of the colleges as well as the success of the coaches and the implementation challenges faced by each school.

PCC, so when they developed their new career/transfer center, the design included additional career coach responsibilities such as managing the college's relationship to the local workforce center and developing a college-wide system for job search placement. Between January and March of 2016, RRCC used CHEO funds to hire staff to shadow the career coach; the school is currently assuming the staffing cost necessary to continue to offer students the "core career coach duties" through the end of their fiscal year, at which time they plan to reevaluate the position and duties.

PlanYourHealthCareer.com

The CHEO PlanYourHealthCareer hub was conceived as an integral part of meeting the goal of improving employment outcomes for TAA-eligible workers. The hub is a web-based portal that is meant both to promote careers in healthcare fields and to support students pursuing those careers with a wide variety of tools and services. Students can explore potential career paths; connect to Bureau of Labor Statistics (BLS) data, which give them state and national wage estimates for particular careers; explore how to stack certificates in the pursuit of particular healthcare jobs; take career assessments, which help them define potential career and educational paths; create résumés; build e-portfolios; and learn how to interview.

Grant management at PCC worked with College in Colorado (CIC) and Kuder, a software company that designs online career planning systems, to create the CHEO hub. Additionally, CIC was to provide ten trainings to prepare coaches to use PlanYourHealthCareer and update them on the progress of its development. Hub trainings began in year two and extended into year three. While coaches had the ability to log on and get familiar with the site, it was not populated with historical data until after November 2014. Largely because of delays, coaches did not actively begin to use the tool until the third year of the grant.

In addition to providing students with information about careers in healthcare fields, the hub was also intended to serve as a data collection tool for career coaches. The system was meant to help coaches keep notes and student records that would allow them to track students throughout the course of their programs and even after graduation. Because of the delays in rolling out the hub, however, coaches never used the hub for data collection as it was intended. As of January 2016, only one of the consortium colleges was collecting data through the hub.[7] Students were also slow to adopt use of the hub due to its late rollout. Over the course of the final grant year, only three colleges reported continued student usage of the hub subsequent to its initial rollout. Student usage was low for several reasons. At LATI, the hub duplicated a service that was already being provided by a South Dakota State site, SDMyLife. RRCC also had a similar service, Career Connect, which was already established and familiar to students and employers. The duplicative nature of the hub confused these students about the value addition it was providing, which dissuaded use. With the departure of GFC's career coach in the fall of

[7] KoC was collecting information on student interests including their career assessment.

2015, students there did not have anyone to introduce them to the hub or to monitor their usage of it.

The sustainability of the hub was still very much in question at the time this report was written. As part of the grant, the hub was to be maintained through 2017—long after the end of the grant. Only one college, however—LCCC—reported a plan to continue using the hub through 2017. LCCC used Kuder assessments before the CHEO grant, and after the hub rollout they shifted to having students complete their assessments through the hub. The school intends to continue to use it for the Kuder assessments as long as it remains available but does not plan to sustain it after 2017. The school will then likely shift back to using Kuder assessments through the platform already available at the school.

Industry and Workforce Partnerships

Another goal of the CHEO grant was to develop partnerships between the participant colleges and their workforce centers, as well as between the colleges and local employers. At most schools, career coaches were tasked with developing and maintaining these relationships. Workforce and industry connections were key to the development of internship sites, student job placement, and staying abreast of recent changes in the labor market.

Colleges recruited local employers to be part of industry advisory boards to assist them with designing and steering their programs to ensure they meet employer needs and to maximize student employability. Three of the eight consortium schools identified their advisory board meetings and membership as a critical strategy for engaging industry partners across the grant. Additional schools cited the role of their career coach in building industry relationships, as well as preexisting industry–college relationships, as similarly important. These relationships, however forged, principally provided schools with information on industry trends, feedback on proposed courses and course designs, and feedback on how to help prepare students to be hired.

Colleges also worked directly with individual employers. Especially in more rural areas, school staff have long-established relationships with local industry. At PCC, staff and faculty pointed out that the school serves a "small area," and because of the national demand for medics, it was "getting harder for agencies to hire from outside the area." This meant that agencies were coming to the college to send incumbent workers to courses that the employers would pay for. Similarly, RRCC characterized their relationships with employers as a "community thing" in which employers saw themselves as benefiting from the state-of-the-art equipment that the CHEO grant made available. One staff member commented that without CHEO, "it would have been very difficult for some of the companies and manufacturers in the area to get their people trained on such high-tech stuff."

Consortium colleges identified a surprisingly uniform set of significant contributions that industry partners made to their program redesigns under the CHEO grant: 1) employer feedback on curriculum and equipment purchases, and 2) employment outcomes for students.

RRCC's employer partners, for example, have been very enthusiastic in their feedback to college staff:

> The feedback that we get from the employers is that we hit it. We hit the nail on the mark. The students are coming out prepared, they have what they need, they are attractive employee candidates, and it's been perfect for the grant.

These relationships are integral to the development of new internship sites. As colleges seek to expand their programs to serve more students, the availability of clinical and internship locations in which to place these students is a major limiting factor. PCC has had to cap their paramedic class because of space constraints at clinical sites. Current market conditions for paramedics make it difficult to develop more. Expanding and adding employer relationships has helped some schools increase the number of clinical or internship sites they have available. For example, over the last year RRCC has been able to expand the number of slots available in its nursing refresher program by adding a second clinical site. The school is also developing a new clinical agreement to add another site for its CNA students to utilize.

Looking back over the course of the grant, the majority of consortium schools reported a productive, positive relationship with their local workforce centers. Tracking referrals made directly from workforce centers is difficult; students do not necessarily mention to college staff that they have come from the workforce center, and not all referred students end up contacting the college. In addition, colleges have not developed systems specifically designed to track these students as they interact with different personnel at each college. However, colleges across the consortium self-reported that they were receiving referrals throughout the final year of the grant.[8] For example, over the last year of the grant, GFC MSU's career coach characterized its local workforce center as "always very receptive." GFC MSU experienced delays in finalizing its programs, which set back its ability to effectively market its programs to the local workforce center, but the school has since received several referrals and has established a good working relationship with local workforce staff.

To effectively market its programs and the CHEO grant's benefits, LCCC compiled a packet containing a letter about the program, a list of program classes, and information about the PlanYourHealthCareer hub, which it sent to every workforce center in the state of Wyoming. LCCC had to work to overcome a negative perception on the part of local workforce centers that had developed as a result of shorter courses and for-profit programs in the area—offered by other institutions—that had been producing lower quality graduates. Over time, the school was able to build stronger relationships with those workforce centers, and once local offices saw the quality of LCCC's graduates, trust was built and referrals became more common.

[8] For information on both employer and workforce relationships during early and mid-implementation of the grant, see the CHEO interim report (Edwards, McKay, Mattoon, & Rua, 2015).

Summary

Throughout the final year of the grant, consortium colleges refined implementation efforts, developed promising practices, and shifted some implementation processes in response to challenges that emerged. Sustainability also became a focus during this period. One of the key elements of the grant that became institutionalized at most of the CHEO colleges was the design/redesign of allied healthcare programs. This had a major impact on faculty members—discussed in detail in part two below. The grant had additional significant and long-term effects on two schools relative to the integration of NANSLO—something that allowed these schools to expand their healthcare programs to rural students through the use of online science labs. Career coaches also had a huge impact on students, programs, and employer and workforce relationships. At least two schools are working to integrate the role/services of the coach into their programs beyond the grant period. Although implementation was not without challenges, each of the consortium colleges was able to navigate the process successfully and make structural and institutional changes to positively impact its allied healthcare programs—and students.

PART II: IMPACT FINDINGS

Introduction

Part two explores the impact of the CHEO grant by focusing on the three areas of the grant that had the most impact across the consortium: career pathways, intensive advising, and the integration of technology in teaching healthcare. Each section below takes an in-depth look at one of these impact areas. Qualitative and quantitative methods are integrated to paint a focused and contextual picture of the impact of each element.

Section I: Career Pathways

Career Pathways

The CHEO grant focused on redesigning courses and programs into hybrid and online formats to better serve rural students; developing intensive advising strategies to help nontraditional and at-risk students succeed; and creating or redesigning programs leading to entry-level careers in allied healthcare. A closely related, implicit goal of the project was to establish clear allied healthcare education and career pathways for students. The statement of work articulated that goal by noting that:

> [E]stablishing clear allied healthcare pathways across the region will be of great service to students. By providing access to stackable certificates and degrees across the CHEO partner programs, students will have more opportunities to climb multiple ladders to successful allied healthcare careers. (CHEO Statement of Work, 2)

Creating career pathways has become part of a national agenda for community colleges. Recent federal goals for college completion—often tied to funding for colleges—have caused states and institutions to rethink the structure and focus of education pipelines, including alignment of educational credentials and the labor market and the relationship between academic and applied courses. Career pathways offer entry-level training, including the completion of short- and intermediate-term certificates, but should also "enable students to keep moving up to higher-level college programs over time. Ideally, pathway certificates and degrees are closely connected to employer needs in a particular industry, thereby ensuring that educational progress is matched by increased employment and earnings" (Strawn, 2016).

From the outset of the grant, all the consortium colleges were very focused on labor market alignment of their new and redesigned programs, and most of them integrated the creation of stackable credentials into their work plan for the CHEO grant. Six of the eight colleges created programs that stacked in additional CHEO certificates or degrees, and all eight colleges created or redesigned certificate programs that at the very least led to other healthcare-related degree programs at their college or at other colleges. Most of the institutions focused on creating opportunities for students to receive a short-term certificate that would lead directly to employment and thus allow them to secure a job and work part time as they continued their education. Several programs were created in tiers, or "steps," specifically for this reason, allowing students to combine multiple certificates. Many CHEO programs stacked to create a "ladder" to an applied associate degree. A few programs were also created or redesigned with transfer in mind; these programs were designed for those students who wanted to continue their education beyond an associate degree. Since community colleges serve a large number of nontraditional students, CHEO institutions gave much consideration to this population, offering hybrid courses, part-time programs, and short-term credentials that could be combined over time. By doing this, grant institutions planned to better serve nontraditional students through specified healthcare career pathways.

Research Questions

This section takes into consideration the implicit grant goal of creating integrated career pathways and explores several research questions relative to this goal:

1. Was a student's ability to stack credentials—to move through a career pathway—made easier by the CHEO grant?
2. Were students overall, and were nontraditional students in particular, successful in stacking credentials throughout the course of the grant?
   Were students overall, and were nontraditional students in particular, successful in finding employment with these credentials?

A much broader, overarching question is also informed by these data. This question gets at the larger agenda of career pathways and explores whether recent national reforms are working:

3. Are community colleges students overall, and are nontraditional students in particular, able to secure entry-level work and then continue their education while working, such that they are able to progress up the healthcare education/career ladder?

What this third question is really asking is: *Are healthcare career pathways viable?*

Throughout the remainder of this section of the report, the research questions set forth above will be answered using a combination of qualitative and quantitative data. The following subsections are divided by topic relating directly the above-specified questions. First, the data will be discussed relative to whether CHEO helped institutions create pathways for students. Next, data is explored relative to whether the stacking of credentials was made easier for students because of the CHEO grant. The discussion will then shift to an examination of whether students were successful in stacking credentials during the course of the grant and how successful they were in both securing employment in entry-level positions and continuing with their education.

Creation of Pathways in CHEO

Career pathways are commonly defined as:

> [A] series of structured and connected education programs and support services that enable students, often while they are working, to advance over time to better jobs and higher levels of education and training. Each step on a career pathway is designed explicitly to prepare students to progress to the next level of employment *and/or* education. Career pathways target jobs in industries of importance to local and regional economies. They are designed to create avenues of advancement for the underemployed, the unemployed, incumbent workers, new and future labor market entrants, and to produce a steady supply of qualified workers for employers. (Career Ladders Project, 2013, att. 2, p. 6)

All eight colleges successfully used CHEO to develop career pathways for students. Each of the eight consortium colleges fell into one of two broad categories relative to its creation of career pathways: 1) colleges that focused on stackable programs leading to an AAS degree or to multiple certificates that could be received independently or 2) colleges that focused on AAS programs that did not contain certificates to stack but encouraged transfer to a four-year university. The USDOL defines a stackable credential as one that is "part of a sequence of credentials that can be accumulated over time to build up an individual's qualifications and help them to move along a career pathway or up a career ladder to different and potentially higher-paying jobs" (Oates, 2010, 2.6). One administrator commented on the utility of stacking credentials for a variety of students:

> I think the stackability piece . . . From an administrative perspective, that's been so cool. And that helps us to address . . . all of those different populations of people. You can

> make it work in a high school—like a pathway from junior high on where students actually get stuff that they can stack together, to save them time toward their college degree. You can do it for the displaced worker. You can do it for anybody. I mean, really, truly, it does create so many wonderful options for people. So just that model, I think, has meant a lot to . . . education in general, I think.

The CHEO grant offered institutions the resources necessary to create and redesign programs that integrated career pathways. Some colleges focused more on stackable certificates, while others focused more on associate degree programs designed to transfer. The discussion that follows illuminates two models community colleges can follow in creating integrated career pathways in their institutions.

Stackable Programs Model

Six of the eight consortium colleges created stackable certificate programs or redesigned existing programs to include stackable certificates. Each of these colleges fully embraced the concept of stacking to allow students multiple entrance and exit points and to give students multiple career path options. One consortium instructor explained her perception of how stacking can work for students:

> So say I come here [enrolled as a student] and I just get my certificate so that I can be a phlebotomist. And then I go and I do that [find employment as a phlebotomist]. Then I can build on there with the next-step credential and the next-step credential and the next—I mean, I could keep going.

The excitement of administrators, staff, and faculty translated into the creation of multiple stackable programs across the consortium. FVCC's new pre-health certificate program features two tracks, allowing students to choose between the certified nursing assistant (CNA) or emergency medical technician (EMT) certificates. Both tracks offer courses that are prerequisites for associate degree programs in applied sciences at the college. Thus, students now have several career pathways at FVCC: They may work full time after earning their certificate; they may work part time after earning their certificate while continuing to work toward an applied associate degree; they may apply what they have learned and continue their education full time, pursuing a bachelor's degree at a four-year university; or they may add additional certificates to their résumé by continuing to attend FVCC full or part time.

GFC MSU created similar pathways. Students can now earn a phlebotomy or EMT certificate and then may choose to continue their education to earn an applied associate degree at the college. Students can also choose to earn multiple certificates. Since the school is affiliated with Montana State University (MSU), students may also choose to transfer their credits to MSU and pursue a bachelor's degree at any time after completion of their program. This is an added bonus for students who may wish to take a break from education and work for a time before continuing their education.

PCC redesigned several programs under the grant, but only one—emergency medical technician—followed a stackable model. This program, along with other preexisting programs at PCC, leads to a variety of other programs that build on similar skills. The ease with which students can pass through these pathways has encouraged many of them to continue their education. The basic medical technician program naturally leads to its intermediate-level counterpart, but it also leads into several other programs just as seamlessly, including the paramedic program, fire science program, and a number of other healthcare programs. Similarly, the school's medical coding program has a total of three associate degree tracks. Aside from stacking within the college, students also have the option to transfer. PCC staff has been working with Adam's State University to allow medical coding students to transfer to its healthcare management degree program, for example. Some students in PCC's radiologic technician (rad tech) program have chosen to continue their education via online bachelor's degree programs offered by Weber University in Utah. Other rad tech students choose to begin working when they finish the program. Based on demand, PCC is working on expanding the program to allow students to come back and stack credits for more certifications. The college is also currently working with the state to potentially allow the college to offer a bachelor's degree in rad tech. Thus, in experimenting with programs during the CHEO grant, PCC created a number of programs that offer students multiple options.

RRCC developed two additional certificates beyond the core nurse aide certificate that students could stack. The college's nurse refresher certificate program was not designed to be stackable, but it does include a cardiac life support certificate. LCCC created three tiers to its medical lab tech program, which is now offered entirely online. Students are able to stack certificates, and the program allows multiple exit points. KoC's applied associate degree program is divided into two parts; the first term leads to a certificate, and the second leads to an associate degree.

Many of these schools also have articulation agreements in place with four-year universities that allow students to transfer their credits and continue their education toward a bachelor's degree or beyond. For example, KoC is directly affiliated with the University of Alaska network, and, as mentioned previously, GFC MSU is directly affiliated with Montana State University (MSU).

Transfer Programs Model

OJC and LATI did not create stackable programs under CHEO, although each college created its programs with transfer in mind. OJC's medical lab technician (MLT) AAS program, for example, was envisioned as a step toward a bachelor's degree in medical laboratory science (MLS). Students completing the AAS could continue their studies at a four-year school to earn their bachelor's degree because the science courses taken as part of the MLT were designed to transfer. Students could also choose to "lattice" the AAS—to earn an additional certificate in a similar healthcare program—with a certificate in phlebotomy in order to add additional skills to their résumés. The phlebotomy and MLT programs share the same initial course requirement,

which allows students to condense both time and cost if they choose to earn both certificates. Other programs that lattice with the MLT program include CNA, licensed practical nursing (LPN), and emergency medical services (EMS).

OJC's faculty and staff envisioned the phlebotomy certificate and the MLT program as alternatives to nursing for those students who found nursing was not a good fit. One OJC staff member commented that faculty and staff began to think about this as an advising option: "'If you're interested in the healthcare field but nursing isn't for you, then maybe this is.' And so we've had a few students who have started [nursing] and opted out after first semester and moved toward the phlebotomy [certificate]."

LATI redesigned their MLT program to create options for students who may have work or home responsibilities. The part-time option allows students to complete the program while working or attending to other duties, making it a great option for nontraditional students. LATI also encourages students to transfer to an MLS bachelor's degree program or to work as an MLT before transferring, giving students flexibility.

Many of the CHEO institutions chose to create or redesign programs focused on giving students the opportunity to earn certificates while they wait to get into nursing or other limited-entry programs. This also gives students options. Students may 1) decide to forgo nursing in favor of launching straight into a career with their new certificate (such as phlebotomy or MLT), 2) use their new certificate to work for a time before continuing on to nursing school, or 3) simply benefit from the increased education by applying the knowledge to their future nursing career.

Although the CHEO colleges successfully created career pathways for students, some schools were more successful than others in translating these pathways into actual opportunities for their students. A major goal of the CHEO project was to foster existing or create new articulation agreements to allow students to transfer credits to a 4-year university and continue their healthcare-related education. Some institutions were simply not able to realize this goal. For example, KoC has articulation agreements with all three of the University of Alaska four-year colleges. All of the courses in KoC's medical office program are transferrable to the UAA radiologic technician, dental hygiene, dental assisting, medical assisting, medical lab technology and pharmacy technician programs. In reality, however, these articulation agreements are often not utilized by students for several reasons. Many of KoC's students are active military personnel, and they are able to access their courses while stationed in other areas because KoC's program is online. However, for the same reason, these students are not able to continue their education by enrolling in the kinds of campus-based programs mentioned above. By the same token, KoC students who are not active military do not necessarily live near the Anchorage, Fairbanks, or Juneau campuses. For example, many students who live on Kodiak Island and attend KoC do not see Anchorage—the nearest four-year university, which is over 250 air miles away—as a feasible option for them. In fact, the online nature of KoC's program is precisely what makes it attractive to rural students and adult students with care responsibilities who cannot easily relocate to attend campus-based classes. During a site visit to KoC, several

students said they wanted to further their education but could not relocate for it. As a result, KoC's articulation agreements with the University of Alaska, while offering theoretical access to a wide range of degree options, does not include offerings that are practically accessible to much of the population served by the college.

While KoC had trouble getting students to use the articulation agreements, OJC struggled to set them up. OJC's MLT program was designed to include many courses that could serve as prerequisites for an MLS bachelor's degree. During the grant period, the institution worked with other colleges in the area to create articulation agreements that would allow students to seamlessly transfer their credits and apply them toward a four-year degree program in a closely aligned field. The process was slow, however, and at the time of the final EERC site visit, none of these articulation agreements had been finalized. Many community colleges nationally struggle to reach these kinds of agreements, as universities often consider community college courses to be less rigorous than their counterparts offered at four-year institutions.

Development of articulation agreements is only one challenge CHEO institutions faced. Some schools created programs that did not resonate well with student or employer needs. RRCC's two stackable program options, the home health and hospice certificate programs, suffered from low enrollment throughout the grant—likely because employer needs did not align with the programs. Neither home health aides nor hospice aides require a certificate; any CNA can potentially be hired for these positions. Thus, the additional stacked certificates did not receive the employer buy-in the school hoped for. The school was considering other options for the programs—including potentially offering them as incumbent-worker training—after the grant period ended.

During 2015, FVCC experimented with adding an entrepreneurial certificate that allied health students could stack after completing their healthcare program. The certificate was meant to fulfill a requirement in the statement of work that colleges integrate entrepreneurial skills into their CHEO programs and courses. The certificate also gave students the option to pursue further education in business if they found they liked the business-oriented side of healthcare operations. The certificate program suffered from low enrollment and was eventually discontinued. The rest of FVCC's programs were extremely successful in creating career pathways for students.

Qualitative data indicates that most of the CHEO institutions were successful in creating programs that aided students in moving through career pathways. Programs were created that filled student and employer needs, allowed multiple entrance and exit points, and led to "laddered" employment or education options. But did students actually utilize the programs as they were intended? Do students actually stack credentials and utilize career pathways? Moreover, do students clearly understand career pathways?

Understanding Career Pathways

Qualitatively, in interviews done by EERC team members, student respondents fell into two categories relative to understanding career pathways and the potential benefits of stacking credentials: 1) Those who did not have a clear plan or goal for their career/education pathways, and 2) those who had a clearly articulated plan for their career pathway and intended to purposely stack credentials to attain it.

Faculty and staff members stated that many students needed to be educated about the pathways available to them in order to fully understand the benefits of stacking or how following a career pathway could help them attain better jobs. Part of the development of career pathways is the integration of intensive advising, which helps students make decisions and helps keep them focused on a career goal so less time is spent taking unnecessary courses. CHEO grant colleges were required to hire a career coach to fill the need for intensive advising; in most cases this coach worked closely with students to help them understand their options. One project lead stated that often students who came to the college interested in an allied healthcare education lacked information about a clear career pathway or how stacking certificates could benefit them. The career coach at this school counseled students on their options:

> So it's one of those things that you don't get them [students] here to earn a pre-health certificate, you get them here to earn a CNA or an EMT, and then what you do is, depending on what they want to do or what their interests are or how successful they are . . . [the career coach] offers, "Look, you already have this [certificate]. If you just do this, this, and this, then you'll have this [additional certificate or associate degree], and this is what the benefits of having that [additional credential] are" kind of, to sort of educate them.

At some schools, educating students about their options also fell to faculty members. A GFC MSU staff member stated that students were successfully stacking, but that instructors had taken an integral role in encouraging students to do so:

> The instructors have been great about talking to them [students] about that [stacking] and how it's a good idea. And I know that a lot of them are getting either the EMT or the phlebotomy and [are] still planning on continuing [on] to medical assistant or paramedic.

Even with intensive counseling by career coaches, faculty, and staff, it was evident in talking to students across the consortium colleges that some were still unsure of their future plans. Many were taking programs with only the vague idea that they would like to continue their education in the future, but without any particular direction or plans. One student said: "I probably will start in the medical coding field, and while I'm doing it, maybe I'll see what interests I can find further—other maybe specific fields that I might . . . get into a different education program."

Other students we spoke with had clearly conceptualized plans for further education or careers and seemed to have purposely chosen their current program with a pathway and career in mind. In fact, many of the consortium career coaches said that most of the students they met with were "set" on their career path and needed very little advising.

One student discussed her path confidently:

> My career path is, I would say, to go into nursing. I was a stay-at-home mom for 16 years, and I just started. . .. And I decided to take the CNA to start with nursing because my mom, she'd been a nurse for—she just retired a few years ago as an RN and she didn't start until I was a kid, so this is kind of the path she went with: CNA, LPN, then RN, and moving up. So I started with that. I wasn't aware of the hospice program until after I started here and I saw the flyers. And I'm really interested in hospice because I was a caregiver for both my grandfather and my dad.

Another student who had already finished two certificates discussed her education and career plans: "I'm gonna do my pre-reqs with Red Rocks. And then at some point in time, I'm going to try and get into an RN program. I want to be a nurse practitioner."

Regardless of whether students had fully committed to a career path, qualitative data indicate that they liked the idea of being able to get multiple certificates—either for the purpose of stacking them together in pursuit of a particular career goal or as a way to experience multiple programs and decide which career best suited them. Among those students who had a clearly articulated career plan, three reasons were frequently cited when asked why they chose to stack credentials: 1) They were accumulating education that would help them qualify for other healthcare programs such as nursing, fire science, or MLS, 2) they were undergoing retraining for a new career, or 3) they were adding credentials to their résumé to increase their competitiveness on the job market. A fourth reason will be discussed later relative to employment: Some students stacked credentials because they were unable to secure desirable employment with their entry-level certificate.

Stacking for Accumulated Education

In many cases, the students who purposely chose to stack certificates took an entry-level certificate program to prepare themselves for additional education. In this way, entry-level programs served as a sort of prerequisite. Many students interested in fire science or paramedic programs, for instance, first completed the EMT program. The PCC career coach noted EMT students often don't even bother to take their certification exam because they took the program only to prepare for other programs:

> With the EMT program, there were seven students who didn't even show up for the exam. And I asked the instructor about it, and he [told me] . . . not every student in the

> EMT basic program needs the certification. Some of them are taking this strictly as a precursor for other programs, and they have no intention of being an EMT, and they don't need the EMT certification. I mean, as far as, like, going on for other healthcare programs, you need to be CPR certified. It's a big plus if you have an EMT—if you've completed EMT coursework—but you don't need the certification. So they just feel like "I'm going to avoid the stress of a major exam." So some of them don't show up for it because it's not what—they just don't need it.

Another coach commented that many students earn additional certificates just to gain more skills for their current job. Pursuing additional certificates was a way to receive further education and increase one's skill set. Some students chose to do this to keep a current job while others focused on preparing themselves in the event they decided to look for a new job in the future.

Stacking for an Alternate Career

Some students added credentials—either by pursuing additional certificates or an associate degree—in an effort to change careers. Some had been laid off, some had quit their jobs to pursue a new one, and others were looking to return to the workforce after time off. One student discussed her choice to pursue a new career that she could stay with until she retired:

> I'm an older student. I'm gonna be 40 years old in a couple of weeks. So I know nursing is a lot of lifting, a lot of moving around, and I know I'm not gonna be able to do that for the next 30, 40 years.

Instead, she chose to return to school to stack additional credentials for a different—but related—job type.

Stacking to Increase Competitiveness

Other CHEO students stacked credentials with the hope of either moving up the career ladder or becoming more competitive on the job market. By continuing to add credentials, students hoped they could increase their earning potential and/or competitiveness. One student said: "I have the CNA . . . certificate, and I figured if I can get home health aide and hospice [certificates], it would probably help me with my CNA and finding a better job." She continued, "It's actually really hard to find a job . . . if you don't have something [on your résumé] above somebody else. It's competitive nowadays, and it's very difficult." This student echoes a national trend—employers are looking for employees with multiple credentials:

> As routine jobs are giving way to work environments necessitating higher-order communication and analytical skills, employers are requiring existing workers to upgrade their skills to stay employed. They are also using educational and occupational credentials in the hiring process to find the most qualified workers and as a screen for adaptability and trainability. (Ganzglass, 2014, p. 1)

Nontraditional Students

Qualitatively, CHEO students appear to be largely successful in stacking credentials for a variety of reasons. But were all students equally successful? Specifically, were nontraditional students as successful as their more traditional counterparts in stacking credentials throughout the CHEO grant period?

The National Center for Education Statistics (Horn & Carroll, 1996) defines nontraditional students as meeting any one of seven characteristics:

1. Delayed enrollment into postsecondary education;
2. Attends college part time;
3. Works full time;
4. Is financially independent for financial aid purposes;
5. Has dependents other than a spouse;
6. Is a single parent; or
7. Does not have a high school diploma.

In most cases, however, community colleges take a simpler view, grouping all (and only) students age 25 or older into the "nontraditional" category; because the data received from the CHEO colleges are categorized in this manner, this age-based formula is the one used to identify nontraditional students in this report.

CHEO colleges served both traditional and nontraditional students during the course of the project. The following section takes a closer look at how nontraditional students navigated career pathways through the CHEO project.

Stacking credentials allowed nontraditional CHEO students to 1) apply knowledge and skills they had previously learned or certificates they had previously earned toward a new certificate or degree, 2) take courses in an online or hybrid format to increase scheduling flexibility, and 3) take time off between credentials. However, data also indicated that many nontraditional students spent a significant amount of time taking courses because they generally enrolled in school part time.

Credit for Prior Learning

Interviews with project staff, faculty, and students revealed that some nontraditional CHEO students were able to apply prior learning experience at some of the consortium institutions to earn credits toward certificate programs. At LATI, LPN students working as CNAs were able to apply their previously learned skills for two credits toward the LPN program. This allowed adult students who had already acquired skills and earned a certificate to apply those skills to further their education. LATI's project lead discussed the way students could apply their prior learning:

> They still enter at the same point, but they get granted credit for some of the fundamentals. We still have them show us they can do them [perform the required skills] because some are CNAs, but they work one weekend every other month or something, so we have them validate their skills, basically. But, yeah, then they get two credits for fundamentals.

Similarly, at LCCC, students who had experience with medical billing and coding (either through previous education or work experience) were able to skip some of the fundamental courses in the college's medical billing and coding certificate program. A CHEO staff member at the college explained:

> What we do sometimes do is if you start in the spring, either we'll start you with the medical terminology or English. If they've had a little bit of the background with billing and coding, we might start them with one of the technically tier-two courses.

In some cases, students were able to use their work experience to enter a program at a higher level and then finish the higher-level certificate to receive a raise or promotion at work:

> [T]he EMTs I know are [finding employment]—well, I know the paramedics [are], for sure, because there's a double major EMT/paramedic. They—most of them have already applied for, and I'd say probably at least half of them already have, jobs. And some of that is [because] they were an EMT and then they did the stair-step [stacked the certificates] to get to the paramedic, so they're applying for the paramedic level at the place that they already work. So that's kind of a cool little perk for them, you know?

Flexibility

Since the majority of the CHEO programs were redesigned to a hybrid or online format, theoretically nontraditional students were able to earn credits while still working or attending to home/care responsibilities. Stacking certificates also allowed these students to take time off between credentialing segments to take care of other responsibilities. One student said: "I am planning to do my bachelor['s] degree. I wanted to take at least one, two years off."

At schools that offered both an in-person and an online or hybrid version of the same program, students who opted to take the program at least partially online tended to be older or have job or care responsibilities. These students also tended to be part-time rather than full-time students. A staff member at one of the consortium schools with both a traditional and online program option compared the demographic make-up of the online students with that of those taking the traditional program courses:

> [Online students are] usually a little bit older, nontraditional. Some of them actually started the full time [program] and found out that it's too fast-paced, and they want to

> slow down a little bit. We get a lot of North Dakota, southern tier of North Dakota, Western Minnesota [students]—for convenience, I suppose, and they have jobs, families. Almost all of them have families as well. So the demographics are a little bit different. [On] campus we're gonna probably average around 22 this year for an age, where online, I think we have two in their 60s this year. So age-wise, a lot different. And responsibilities—jobs and families is the big difference there.

Another CHEO staff member discussed a student she knew that wanted to continue her education after finishing LATI's MLT certificate program but needed flexibility because she had children:

> She'd say, "Okay, I think I want to go on and continue [her education]," and I'd say, "Okay, well, do you know that we have this agreement in place with SDSU [South Dakota State University] and that they're doing an online program?" Because I know she has three kids still in school, and moving down to Brookings [to be near campus] is not going to be the option for her. But if she wants to continue on, the online aspect of it is available to her.

Some nontraditional students are seeking programs that they hope will translate into jobs that they can work remotely. Medical billing and coding, for instance, was a program where, during interviews, students expressed hope to be able to eventually work from home. Because students in two of the CHEO colleges were able to take these courses fully online, this added to the hope that their program certificate would allow them work-from-home opportunities. In reality, it is unknown whether these students were able to secure jobs that allowed them to work remotely. EERC staff talked to faculty members who indicated that finding fully remote billing and coding jobs—especially at the entry level—was often extremely difficult. Students would likely need a couple of years of work experience before they could transition to remote work.

Additional Time to Completion

EERC's qualitative data also revealed that many nontraditional students spend a tremendous amount of time taking courses to fulfill their ultimate education goals, mostly because their home and/or work responsibilities often prevent them from taking classes full time. These students put a huge amount of effort into their education goals. Many times, these students also lack a clearly articulated pathway to their goals:

> I know that I want to complete everything, but to make sure that I can facilitate my child at the same time, it's, I'm hoping, my goal is by the time I'm 30—I'll be 25 this year, in a month—I'm hoping by the time I'm 30, I have my nurse practitioner license and I have everything ready, but . . . My goal used to be, I would be done by the time 2016 came. I don't see it happening. So I gave myself until 30. And I figured if I can get past these little, small bumps here, I think if I can get into the field that I have my certificates for, it

> will be easier because the hours will be different and not all over. It will be a set thing so that I can actually go to school.

Another reason older students may take longer to complete a certificate than younger students is that many older students are just beginning higher education, while many younger students have already acquired some credits (possibly even during high school). A CHEO staff member at LATI discussed this when she described the difference between the program's traditional students and those taking program courses online:

> Probably at least 50 percent [of the traditional students at LATI] . . . have already been somewhere else and taken their Gen Eds [general education credits], and they decide they don't like the big school or whatever so they come to Lake Area for the smaller campus. Where online [students], they're just—they haven't taken any Gen Eds. They're traditionally this mother that's raised her family, she's 35, 41, and wants to now be a nurse. So we see the online students needing the anatomy, the psych, and all that.

Although stacking and the creation of career pathways with multiple entrance and exit points have benefits, they also have drawbacks. As previously stated, taking classes part time leads to a longer time to completion—especially if students are stacking multiple programs. Research has found that students with prolonged time to completion are more likely to burn out and ultimately drop out of school. The president of the Lumina Foundation for Education, Jamie Merisotis, stated that:

> One problem for adults is the constant, competing tension between life obligations and educational obligations. Life obligations often come first. The price that you pay for that is that it takes much longer to get the credential. One thing that we know very well is that the longer it takes, the less likely it is for people to actually achieve that credential. (Merisotis, as qtd in Pelletier, 2010, p. 2)

Although CHEO schools tried to create career pathways to help students maximize their time in school and decrease the likelihood of taking excess credits, some students still ended up taking courses that did not count toward their ultimate goals.

Additionally, having programs packaged into career paths does not necessarily mean that students will choose the correct path—even with intensive advising. Students who completed a program but realized it was not a good fit for them spent additional time, effort, and money taking another certificate or degree program. One student talked about revising her plans after realizing she did not want a career in the field of her certificate. When asked what she wanted to do since she recently graduated from an MLT program, she replied: "I'm looking for an MLT job so I can work with MLT while I go back to school." She continued, saying she wanted to continue her education in nursing: "It was my original plan to be done [with working as a CNA] and go into nursing because I've been a CNA for four years and I think the patient interaction will always be part of me." She had switched gears when she'd joined the MLT

program but had ultimately decided her first inclination to go into nursing was probably the right one:

> I just don't quite get enough here [in the MLT program], you know. I just—I like the science—I like the interest in it, you know, interesting things about it. But I want the patients. I'm so used to going to work and hugging people and helping people, and I don't get that with this [MLT].

Because of that, she was planning to return to school for nursing. In reality, her MLT certificate program may have helped her make up her mind, but it would not count toward her goal of becoming a nurse. Still, this student noted that her additional education in MLT would serve her well as a nurse in the future:

> Because I feel like I have the background where I can—if someone comes in that's sick, I'll know the lab portion of it, because it's only going to help in nursing, because a lot of the nurses that order stuff [lab work to be done] have no idea what's going on.

Thus, even when career pathways are predefined, students may choose to take various programs just to "try them out" or to add skills they may not learn with just one program.

The CHEO project included the addition of career coaches to serve students (especially nontraditional students) by offering intensive advising services as part of its programs, and these coaches improved retention and completion rates throughout the project.[9] Coaches reported helping students juggle responsibilities, mitigate the risk of falling behind, and make reasonable schedules that balanced work and home life (see the section on intensive advising later in this report for more information on this). But most coaches will not be sustained after the grant period has ended. This begs the question: What will happen to nontraditional students—who often invest an immense amount of time in earning their entry-level certificates—after the coaches have gone?

Quantitative Outcomes

The previous sections explored qualitative data relative to stacking. The section below uses quantitative student outcomes data to examine whether—and to what degree—students stacked credentials throughout the CHEO grant period. At some consortium schools, CHEO programs led directly to associate degrees, whereas other institutions offered either multiple certificates or certificates leading to an associate degree. Two schools, OJC and LATI, did not offer stackable credentials at all, though at OJC students could "lattice" a certificate—receive a phlebotomy certificate while they worked on their associate degree—if they desired. Some students even received more than one certificate at OJC—likely because some of OJC's programs—their CHEO phlebotomy certificate as well as other non-CHEO certificates—were

[9] See the Career Coaches report (Edwards & McKay, 2016).

short enough to make it feasible to do so. The tables below examine credential stacking relative to students enrolled in associate degree and certificate programs and reports whether they received any additional credentials.

Table 1 indicates that of the 244 CHEO-redesigned AAS degrees earned, the majority were earned at PCC (120) and FVCC (84), followed by LATI (28) at a distant third. Since PCC and FVCC are the schools with the largest student populations among the CHEO consortium, this is not surprising. Across all eight schools, only about 9 percent of all students earning AAS degrees also completed additional certificates. This indicates that most students who earned an associate degree during the grant period did so without stacking certificates.

TABLE 1. STACKING OF CREDENTIALS BY CHEO AAS DEGREE PROGRAM COMPLETERS

School	Total CHEO AAS degrees granted	Students earning CHEO AAS only	Students earning more than one AAS	Students earning AAS + Additional Certificate(s)
FVCC	84	84	0	0
LATI	28	27	0	1
LCCC	8	1	0	7
PCC	120	108	12	0
OJC	4	2	2	0
Total (N)	244	222	14	8

Table 2 provides data on credential stacking for completers who earned a CHEO certificate. Of the 1,350 certificates earned across the CHEO colleges during the study period, the majority were earned at RRCC (645) and PCC (522); together, these schools accounted for 86 percent of the total certificates earned. PCC had the highest percentage of completers stacking certificates (18 percent), which is likely due to the flexible design of its CHEO programs. PCC's EMS program, for example, includes a sequence of EMS- and paramedic-related certificates with a variety of short-term, median-term, and two-year degree options that stack together. The program is a popular first step for students pursuing fire science and nursing programs.

TABLE 2. STACKING OF CREDENTIALS BY CHEO CERTIFICATE COMPLETERS

11	Total CHEO certificates granted	Single-certificate earners	CHEO students earning two or more certificates	Students earning CHEO certificate + Any AAS
GFC MSU	17	10	1	6
LATI	72	72	0	0
KoC	19	16	0	3
LCCC	42	35	0	7
PCC	522	411	94	17
RRCC	645	620	25	0
OJC	33	26	7	0
Total (N)	1350	1190	127	33

*FVCC did not offer certificate programs through CHEO

Taken together, the tables above indicate that the majority of CHEO students did not choose to stack certificates. Students at LATI and OJC may not have stacked CHEO certificates because those schools did not offer stacked programs. Yet even at OJC, seven CHEO students managed to receive other certificates from both within and outside the CHEO program, which implies that those who were interested in accumulating multiple credentials were able to do so. RRCC's programs were specifically designed with stacking in mind; students had to first complete a CNA certification program before being allowed to pursue either of its two redesigned CHEO programs. However, since the CNA certificates were not required by employers, the vast majority of students ultimately graduated as single-certificate earners, having chosen not to test for the CNA credential before earning a certificate in their CHEO redesigned program.

Employment

Another important question relative to the development of career pathways concerns employment—the ultimate goal of students pursuing these programs. Are students finding employment with their CHEO certificates and degrees? This study examines data related to the employment of all CHEO graduates, regardless of whether the job was within or outside their field of study, and then focuses specifically on the same employment trends with regard to nontraditional students.

Employment in General

Qualitative data reveals that students in CHEO programs were mixed in their ability to find employment. Students in some programs had no trouble finding employment in their field of study. Others had difficulty getting placed in their field. Interestingly, some were able to find jobs as a result of having earned a CHEO credential even though the job was in a different field or was a different type of job within the same field as the one they had studied. One instructor

discussed how students in a medical coding and billing program had been able to find healthcare jobs even though the jobs were not specifically related to billing or coding. She conceptualized their education as a type of professional development—where students learned general skills that could be applied to a range of healthcare jobs:

> Because even if they didn't get a degree in coding, if it led to a job in—say as front office—and then it evolved into billing or something like that, or in coding, you use [these skills] in every job. You just have to. Two of the students that I have in my medical assisting program are actually two of my colleagues there at the [local healthcare] clinic. . .. One works in IT [information technology].

In other cases, students who already had jobs were able remain in their position but earn more pay simply because they now had a higher level of education—even if the program they enrolled in was not related to their job.

Employment for Nontraditional Students

Some students stacked credentials because they could not find jobs that paid well enough with their first-tier certificate (such as CNA). Similarly, some programs lead to jobs that are not ideal for nontraditional students—especially if they can't find full-time work. For example, one student who had been looking for a CNA job spoke about being unable to find full-time work with benefits:

> I've actually been trying to change my employment for two years, but the place I work in feels like I'm just sucked in for life. But hopefully I can—my problem is medical benefits. I have to be able to work as a CNA and have medical benefits, or I can't actually move over. I have asthma, and if I get sick and I can't go see a doctor, I'm not gonna be doing well.

Another student found that the job she had prior to completing the CNA program paid her better and offered better benefits than the job she was offered after receiving her certificate. She was hoping to get into healthcare but was feeling frustrated that doing so could mean taking a cut in pay and benefits:

> That's why I haven't transitioned over. . .. I actually applied for a job, got accepted for the job, and I had to actually deny it because they didn't have medical benefits. And it was less than what I make now, so I couldn't compensate for the medical benefits somewhere.

These quotes illustrate a national trend in allied healthcare education: It often leads to low-wage jobs with few or no medical benefits. Although career pathways in healthcare exist, they require entry at low-wage positions, often with poor hours and limited flexibility. These requirements are untenable for many students, especially nontraditional students.

Continued Education While Working

To alleviate this challenge, allied healthcare programs are envisioned as being stackable; they are designed to get students into an entry-level job quickly so that they can work—and earn wages—while they continue their education. This allows students to move up a career ladder; while they may have to start in an entry-level position, they can advance fairly quickly to positions with better pay and medical benefits. Many of the CHEO programs were designed with this in mind. One instructor commented:

> [I]f someone were so inclined, they could get the entire thing [certificate] during one spring semester. But probably what's likely going to happen is that someone is going to take one of the three certification courses that will make them employment-ready in one semester and then add the rest of the courses probably the next semester... Or it's gonna be students who already have one of those three certifications, and then they're gonna be coming back to add on.

But are students—traditional or nontraditional—able to make this goal a reality?

Many CHEO students had trouble maintaining a job while they stacked an additional program, especially if the program had a clinical component. Hybrid or online programs made stacking easier for many students, but clinicals, which are hands-on and in-person, often required long hours for many days. One career coach noted that many students in her school's CHEO program had to quit their jobs in order to finish their programs because clinicals required full-time involvement. Additionally, some students who worked jobs that had irregular schedules–as many entry-level healthcare jobs do–had trouble committing to a school schedule, even when courses met in the evening or on weekends. Indeed, many CHEO students found it difficult or impossible to work an entry-level healthcare job while continuing their education. In sum, stacking credentials was easier for students who did not work, had a higher-than-entry-level position at work, or, ironically, did not work in a healthcare field.

Conclusion

Although most CHEO programs were designed with stacking in mind, and students liked the idea of being able to climb a career ladder or complete their education in smaller steps by stacking certificates, most CHEO students did not take advantage of the opportunity to stack credentials. Students at PCC who stacked credentials did so in the EMS program, which traditionally requires completion of the basic EMT certificate before enrollment can occur in the intermediate EMS or paramedic programs. Additionally, many students taking the EMS programs at that school do so in preparation for enrolling in the fire science or nursing programs, which leads to further credential stacking.

Therefore, although six of the eight CHEO institutions intended for students to use stackable credentials as an education and career pathway, relatively few students did so. It is possible that

given the short (four-year) window of the study some students will return to stack credentials later. It is also possible that students pursuing certificates simply opted to pursue an associate degree instead; in interviews and focus groups, some students reported having done so. The implication that enrollment in certificate programs may increase students' likelihood to remain enrolled for a full degree—whether due to an increase in student confidence, in the value they place in education, or a variety of factors—is one that warrants further study but is beyond the scope of this report. What this study tells us, however, is that many students are more inclined to leave school having received a single certificate or one full associate degree than to stack multiple credentials.

Section II: Intensive Advising

Intensive Advising

Intensive advising, also called proactive advising or intrusive advising, is a strategy designed to help college faculty and staff identify issues affecting students before they become too difficult for students to overcome. Intensive advisors help students work through barriers and solve problems, work that leads to increased retention and completion rates. Generally, intensive advising focuses on at-risk students, including students with limited resources, working students, students with family responsibilities, and first-generation college students. Intensive advisors approach students "before situations develop"; educate them "on all options" by way of "deliberate intervention to enhance student motivation, using strategies to show interest and involvement"; and create and involve students in activities "designed to increase the probability of student success" (Varney, 2012, p. 1).

Intensive Advising in the CHEO Project

The CHEO project explicitly included intensive advising as an integral part of the grant. Each of the eight consortium colleges was to hire and embed a "career coach" into their CHEO program(s). The coach's duties were broadly defined, but intensive advising was to be integral to the role. In the grant Statement of Work, coaches were to "address student attrition due to poor study and/or time management skills." Approaches were to include "academic and non-academic strategies, such as early warning systems, student success courses, logistical support for enrollment and financial aid, recruitment and screening, career guidance and intrusive [intensive] advising" (p. 13). In general, coaches were to provide "support services for students" throughout their educational process (p. 14–15).

Given the implicit goal of creating career pathways through the CHEO project, it is not surprising the project included a focus on intensive advising, as it is often discussed as an integral part of career pathway models. A CCRC brief by Hughes and Karp (2006) noted that in order for students to receive the information and support they need to help them determine what career pathway they should pursue; students need someone who is able to counsel them throughout the process:

> Students need access to information about career pathways—the types of courses involved and the degrees and careers they might lead to—in order to choose which pathway to enter. Moreover, career pathways should be structured in ways that help students make informed decisions with the assistance of knowledgeable and caring adults. (p. 2)

In fact, the Carl D. Perkins Vocational and Applied Technology Education Amendments of 1998 included language supporting "career guidance and academic counseling" that is integrated within a students' educational career. This is defined as "providing access to information regarding career awareness and planning with respect to an individual's occupational and academic future that shall involve guidance and counseling with respect to career options, financial aid, and postsecondary options" (Hughes and Karp, 2006, p. 2). The authors note: "It seems clear that pathway plans should explicitly require the provision of such services" to students. Other literature strikes a similar tone, with Alssid and colleagues stating that career pathways should include "social supports throughout" the educational process as well as "an introduction to career opportunities in [the] region's high-wage, high-demand employment sectors" if they are to successfully advance students (Alssid et al, 2002 p. 10), and Kemp, Harvey, and Carrie (n.d.) arguing that "sharing information [with students] on careers and pathways" is a primary function of career coaches (p. 45).

Nationally, intensive advising has garnered a lot of attention and has become part of a reform agenda for colleges and high schools alike. Many institutions have integrated intensive advisors—also called coaches, navigators, and counselors, among other things—as part of their students' educational programming from orientation to graduation. For the most part, intensive advising is meant to help students find the resources and help they need to succeed and to stay on track throughout their education. To this end, Kemp, Harvey, and Carrie found that coaches help students "define their career aspirations and recognize postsecondary programs and services that can help students achieve their goals" (p. 45).

Throughout the grant period, career coaches were integral to the success of the CHEO project at their institutions. They maintained a wide range of roles, including those defined above. To fully assess the impact of career coaches at CHEO consortium colleges, the following sections explore the role as it played out at each of the eight CHEO colleges relative to a set of research questions and variables identified in relevant literature on intensive advising.

Research Questions

This section takes into consideration the grant goal of embedding intensive advising into CHEO programs through the integration of career coaches and explores several research questions relative to this goal:

1. Does intensive advising positively impact students relative to:
   a. Retention?
   b. Completion?
   c. Employment?
   d. Continued education?

2. Does intensive advising positively impact student satisfaction relative to:
   a. Their courses/program(s)?
   b. Their overall college experience?

3. Did intensive advising have any additional benefits for CHEO students?

These research questions will be answered through a combination of qualitative and quantitative data. Qualitative data were available for all eight CHEO colleges. Due to missing fields, quantitative data were available for all four years of the grant for only two colleges: KoC and LCCC. These two schools represent a good natural experiment in comparing and exploring intensive advising's impact, however, as both schools are rural, both offer fully online programs, and on most occasions both schools' coaches communicated with students fully remotely. Quantitative data, collected through a series of spreadsheets coaches used to self-report activities they participated in with students, did not directly address all the research questions outlined above, but questions and data were aligned wherever possible.

After examining the role and functions of the career coaches on the two CHEO campuses for which quantitative data were analyzed, we present our analysis in a series of subsections divided by topic relating directly to the above-specified research questions. First, we examine the question of whether embedding intensive advisors in CHEO programs positively impacted students relative to their retention, completion, employment, and continued education rates. Next, we will turn to qualitative data to explore whether intensive advising increased students' satisfaction with their courses/program(s) and with their overall college experience. The inclusion of this more subjective variable is important according to literature, which suggests that students' experiences with intensive advisors seem to "directly affect their perceptions, not just about the effectiveness of advising services but also about the quality of their college in general" (Nodine, Jaeger, Venezia, and Bracco, 2012, p. 11). Finally, we turn to a holistic discussion of the overall benefits of intensive advising to students within the CHEO project.

Career Coaching Interaction and Caseload at KoC and LCCC

At the eight CHEO colleges, career coaches maintained a variety of roles that were tailored to the needs of their own institution. A primary role across the consortium was the work coaches did with students, but that work took many different forms. Depending on the school, intensive advising at the CHEO colleges was accomplished through meetings with students that may have been conducted one-on-one, with entire classrooms, in small groups, or remotely through e-mail, phone, or web-based communication. Coaches also carried different caseloads across the

consortium depending on the size of the institution and the number of students enrolled in its CHEO programs.

The two schools with available quantitative data, KoC and LCCC, provide a snapshot of coaching activity and caseload. The coaches at both schools served a similar number of CHEO students. A key difference, however, was that LCCC's program was closed, meaning only CHEO students were able to take courses in the program, whereas KoC 's program was open to other healthcare students. Thus, KoC's coach served some students that were not CHEO students (of KoC's 237 unique participants, only 68 were CHEO program participants). KoC's coach communicated with each student an average of 52 times, whereas LCCC's coach communicated with her students an average of 20 times. This is likely because KoC's coach was responsible for all of the academic advising and registration duties for the CHEO program, where LCCC's coach split the duties with other staff. KoC's coach also saw 169 "pre-CHEO" students (students who were undecided about program choice but requested information about the program), while LCCC's coach did not see students until they officially became part of the CHEO program.

The fact that KoC's coach was responsible for general advising duties outside the CHEO program and LCCC's coach was not would seem to imply that matters relating to general concerns would occupy a greater proportion of the advising energies at KoC than at LCCC, but that is not what emerges from the data. KoC's coach spent over half of her time meeting with CHEO students for academic reasons related to such issues as program-related paperwork requirements, D2L (learning platform) questions, technical issues, tutoring needs, and general questions regarding program progress. LCCC's coach dedicated about a quarter of her time to those issues, but spent even more time—almost 30 percent—communicating with students for enrollment/retention purposes and to address financial aid questions and concerns. Second to academic issues, KoC's coach communicated with her CHEO students most often about their career-related needs (including résumé writing and interview skills) and certification issues (including when and where to take national certification tests, application submissions, help with studying, and questions about costs).

TABLE 3. CAREER COACHING INTERACTION AND CASELOAD: KOC

	CHEO Students	Pre-CHEO[10]
Unique Participants (N = 237)	68 (28.7%)	169 (71.3%)
Total Coaching Load (# of interactions reported)	3567	235
Advising Intensity (avg. interactions per student)	52.5	1.4
Reason/Focus of Interaction		
Academic	1913 (53.5%)	59 (24.5%)
Career	835 (23.5%)	7 (2.9%)
Program Enrollment/Retention	144 (4.05%)	170 (70.5%)[11]
Certification	328 (9.2%)	4(1.7%)
Survey	68 (1.9%)	0
Financial Aid	127 (5.6%)	1 (0.4%)
Routine Contact	138 (3.9%)	0
Method of Interaction		
Blackboard Announcement	1913 (53.8%)	40 (55.6%)
E-mail	1459 (41.1%)	29 (40.3%)
Facebook	11 (0.3%)	0
Phone	97 (3.0%)	3 (4.2%)
Live Lecture	25 (0.7%)	0
In Person	25 (0.7%)	0
Survey	7 (0.2%)	0
Other	16 (0.5%)	0

Both coaches occasionally met with some students in person on campus. At LCCC, more students in the program were local than at KoC, where many students were military or otherwise located off the rural island. Thus, in-person meetings at KoC were much rarer—accounting for less than 1 percent of total interactions—than they were at LCCC, where they accounted for around 10 percent of coach–student interactions. Instead, KoC's coach communicated with her students most often through the Blackboard learning platform—the portal for all courses in the program—and by direct e-mail; together, these communications made up 95 percent of her total interactions with CHEO students (Blackboard = 54 percent; e-mail = 41 percent). LCCC's coach communicated with her students most often through e-mail and phone calls, which together accounted for about 81 percent of her student–advisor interactions (e-mail = 61 percent; phone = 20 percent). In interviews, both coaches reported that intensive advising through remote channels was beneficial to students and resulted in higher retention and completion rates than if students were to navigate the programs without coaches.

[10] Pre-CHEO students (those interested in a CHEO program but not yet declaring their program of study) did not have as much information recorded by coaches as CHEO students did. Therefore, pre-CHEO student records contained quite a bit of missing information.

[11] Missing data for pre-CHEO students was counted as seeking program enrollment information

TABLE 4. CAREER COACHING INTERACTION AND CASELOAD: LCCC

	N	Percentage
Unique Participants	62	
Total Coaching Load (# interactions reported)	1230	
Advising Intensity (avg. interactions per student)	19.8	
Reason/Focus of Interaction		
Academic	314	25.5%
Career	197	16.0%
Program Enrollment/Retention	341	27.7%
Certification	45	3.7%
Financial Aid	216	17.6%
Routine Contact	117	9.5%
Method of Interaction		
E-mail	751	61.1%
Phone	248	20.2%
In Person	126	10.2%
Web	33	2.7%

Impact on Student Retention

Intensive advising is considered a primary way for colleges to retain students who would otherwise be at risk for dropping out of school. Coaches at all eight colleges were heavily involved in helping students "stay the course" and remain enrolled at the school. For all coaches, the retention process started at enrollment. Coaches provided information about financial aid and other resources, introduced students to other staff who could help them find information, and spent considerable time "getting to know" students in ways that might help them identify any success risks or barriers up front. One coach described her process:

> I wanted to know if they worked in the medical field, where. What their hours were. If they had children. What kind of other stuff they did. And just sort of build a relation—a rapport with them so that they would trust me and would come to me with questions rather than just think I'm somebody on the computer that doesn't care. So I asked them—and I asked for each of them to call me or give me a number and let's make a time to call them so that I could hear their voice and they could hear my voice and that kind of stuff.

Like this coach, most CHEO coaches developed an "intake" process during which they asked students questions, got to know them, and started to develop a "rapport" with them. Coaches discussed this process in terms of "building trust" and "relationships" with students so that if or when the student needed help later they would feel comfortable coming to the coach. Most coaches also integrated information about how to attain necessary resources in this process. One coach described her initial meeting with students:

> I do what we call an intake. . .. Everybody's mandated to come in and visit with me and we do an intake, which gives me a chance to look at what our—some of the risk factors that they have, whether that's daycare, time management, or whatever. And then help them work with that to make sure that it helps—that those barriers are—become lessened. And just start building that rapport. At that time, I refer every single student to Colorado Workforce [the local workforce center] and talk to them about the benefits of going down there and speaking to one of their representatives.

Another coach discussed the time she spent with the many students who wanted to enroll but were unable to traverse the basic registration process:

> I go meet them . . . and walk them through the registration process. Because it's so scary. . .. They don't understand. "How do I register?" So I'm getting a few more students now that will just come and meet with me, and we'll get them registered.

Coaches often started working with students a semester before they entered the CHEO program to help them work through any issues that may arise as well as to help them work out the proper course sequence to take and schedule their classes.

Once students were enrolled in the program, some coaches were instrumental in helping students navigate specific requirements before classes began. At RRCC for example, the CNA program involved prerequisite drug testing, background checks, CPR certification, and immunizations, which immediately put to the test students' attention to detail and their ability to complete requirements by a certain deadline. The coach put together checklists for students and sent out reminders to students who had not yet completed certain requirements at specific points in time prior to a deadline. After several semesters with the coach in place, administration at the college noted that "front-end retention" for the program had increased significantly, and many students who previously would have fallen out of the program due to missed deadlines were able to attend and complete the program.

To get a more detailed understanding of whether and how intensive advising affects various measures of student retention, we entered quantitative data from KoC and LCCC into a series of regression models that controlled for a set of demographic variables including enrollment status, ethnicity (white/nonwhite), sex, military status (veteran/nonveteran), self-reported disability status, and Pell grant eligibility. Our first set of models, presented in appendix table A1, indicated a statistical significance between intensive advising and several measures of student retention at KoC. Career coaching services at the college were associated with a 25 percent increase in the probability of retention in a CHEO program. Additionally, students served by the career coach received 1.8 more CHEO credits than those who did not receive those services. Receiving more credits is likely reflective of the increased rate of retention in the program.

The frequency and method of student–coach interaction as well as the content conveyed during those interactions also mattered relative to retention. Advising intensity—how often, on average, the coaches met with each CHEO student they served—was significantly but only very weakly associated with all of the student-outcome measures, though those associations were all positive; see appendix table A2. Among the types of advising content offered by coaches, information about academics, general requirements for the program, and financial aid were more likely to result in an increase in student retention, as shown in appendix table A3. Regression models examining multiple methods of coach–student interaction, outlined in appendix table A4, reveal that Blackboard posts by the coaches were related to higher student retention, as were Facebook posts. This was likely because coaches posted information pertinent to deadlines and program or certification requirements. Synchronous lectures were not significantly associated with retention but bore significant positive associations with all other measures of student-level outcomes at KoC, including total GPA, number of CHEO credits earned, earning any credential, and earning a CHEO credential. This could be a result of the types of help students needed to stay retained at KoC: Whereas qualitative data indicated that students needed more help with reminders and course assignment clarification, which would have been sent out by the coach through Blackboard, synchronous lectures would have addressed other concerns, such as the need for more detailed information about financial aid and help preparing for upcoming certification exams (where to go, related costs, etc.).

At LCCC, simply interacting with a career coach, no matter how often a student did so, did not matter as much as how those interactions were conducted and what content was conveyed. As shown in appendix table A6, three types of intensive advising content emerged as having statistically significant, positive associations with student retention: advising related to the CHEO program, financial aid, and routine contacts.[12] In terms of interaction methods, both phone and e-mail interactions were positively associated with student retention, and those relationships were also statistically significant. Finally, it is important to note that full-time enrollment status indicated a positive statistical significance relative to retention in all four of our regression models, indicating that students were even more likely to remain in their program if they both received the benefits of career coaching and attended school full time.

Since both KoC and LCCC's CHEO programs were fully online, it is not surprising that online elements such as Blackboard and Facebook postings and e-mail interactions were related to retention, since communication primarily had to occur through methods other than face-to-face meetings. It is interesting, however, that the two fully online programs had different methods of contact that worked for their respective students. Communication using the learning management system was highly effective for students at KoC, while e-mails at LCCC were more impactful than other methods.

[12] Routine contacts were defined by coaches as any routine communication to students that was not focused on a specific event, such as reaching out about an upcoming exam or for a purpose such as certification registration or upcoming deadlines.

Retention through Early Alert Systems

At some point during the course of the grant period most of the CHEO coaches became involved—either formally or informally—in their institution's early alert system. Although there was some variation across the consortium relative to when and how students entered the early alert system, nearly all coaches were involved to some degree. One coach felt the early alert system helped identify students who needed assistance but, for one reason or another, didn't ask for it. She said:

> I think the early alert [system] is helping us identify those students, because lots of times, students—they don't want to come forward. They take some pride. And if it takes a phone call or you see them in the hallway and say, "Hey, I saw where you're struggling a little bit in math," you know, "What are we doing? Have you met with your instructor yet?" Oftentimes it just takes that little interaction to establish that connection to the college and get them pointed in the right direction.

Another coach explained the steps involved in her schools' early alert system process and how the intervention can help struggling students:

> Week 4, week 8, and week 11, we pull all the grades, and anybody who has below a C—for the MLT program, those grades come to me—and at that time, then I reach out to those students and try to get them involved in tutoring or try to get them some time management. First, we're going to explore, "What is the problem? Why is it that you have below a C?" And if it's because they're struggling with the academia, then we'll work on getting them specialized tutoring. If it's that they don't have time to take advantage of the tutoring, then we'll do the tutoring and maybe some time management, so we can work with whatever it is. But that we automatically do every time the early alerts are pulled. And that's the main time that I probably see more students.

Coaches also reported that knowing whether a student is struggling or needs help involves far more than simply reading names off an early alert list. Each coach described a process of truly getting to know their students, including students' attendance habits. One coach said:

> Sometimes a student can be absent five days, and that's perfectly fine because you know that they are in a car accident or whatever and they're in the hospital. Other students, if they miss one or two days it's: "What happened? What's going on here?" We go to people's doors, knock on the door, find out are they all right. Particularly if it's unexpected for them to be absent. So it really goes back to knowing the students and their lives, not just who they are.

Coaches also have to figure out why the student is having trouble in class and what type of help they might need:

> We have students here who I think party too much, and then we have students who have cancer. So it's kind of that wide range of trying to figure out why they're missing [classes] and what we can do to help each individual student.

Aside from monitoring early alerts for their programs, some coaches also talk to staff in other programs to identify students struggling in similar healthcare-related programs. If a student is struggling in a nursing program, for example, but still wants to pursue healthcare, they may be a good fit for one of the CHEO allied healthcare fields. Many coaches took part in this type of recruitment, finding students who were struggling and redirecting them to a new program they may succeed in. This type of cross-program retention kept students enrolled in school who may have otherwise dropped out completely.

CHEO coaches reported that nontraditional students[13]—who tended to have more work or family responsibilities—were often more likely to fall behind and need extra help to stay on track. Some examples of the kinds of assistance coaches would offer are: 1) help increasing computer skills, 2) providing a tutor, or 3) teaching time managements skills. In many cases, coaches felt their work included healthy doses of "cheerleading" and assuring students they could succeed. One coach said "a lot of it's just [that] they need someone to say 'You got this. …Make it through and get a different job, because this is your future.'"

Retention through Resource Assistance

For all CHEO coaches, helping students to remain in their program—or to remain at the school—also involved identifying students' basic resource needs. Coaches often found themselves helping students overcome barriers outside of academic issues. In most cases, this involved finding resources the student may not know how to find. When asked what her primary role was relative to helping students succeed, one coach said:

> It's anything: whatever they need. I had a person that needed groceries, and so I contacted the local Catholic Charities, and they donated enough food to last until the end of the month. …Because they were saying, "I'm going to have to drop out of the program, because it's either work more hours so I can buy food, or starve to death and go through the program." So we worked on finding ways that they could get groceries. …It's just meeting them where they need to be met, so that they're able to remain in the program and stay successful.

Other coaches spoke of finding resources for students such as childcare and transportation. One coach discovered a student was perpetually late to class because he had no transportation and was not allowing himself enough time to walk. The coach posted a note on Facebook asking for

[13] CHEO college staff define nontraditional students as those over the age of 25.

a used bike. A local couple delivered a brand new bike to her house that night, and the student was no longer late to class. Another student was falling behind in classes because he was sleeping on a friend's couch and was not getting enough rest. The coach found someone willing to donate a bed for the student. One coach said being able to provide these types of resources to students is incredibly rewarding because these are "barriers that really could have kept somebody from being successful." And while all were "easy to resolve" for the coaches, they were nearly insurmountable to the students.

Many coaches found students often lacked the ability to purchase textbooks. Especially in healthcare courses, textbooks tend to be expensive, making them tremendously difficult for some students to afford. One coach discovered the campus library could obtain a set of textbooks for students to use in the library. On another occasion, the coach purchased a textbook with grant funds that a student was able to use for her courses and certification exam.

All eight of the coaches found that a lack of resources was a common barrier to their students. Although all of the colleges offer resources and help to their students, coaches found that some students either lacked the know-how to find them or were afraid to ask. One coach said "Even though there are a lot of resources [available on campus], it's really different when somebody's knocking on your door going, 'Hey, I'm here to help you,' versus 'You might have to ask to find assistance,' because some students don't."

Another coach expanded on this, saying: "If they [students] don't have enough daycare or if they don't have a ride to school, then they're at high risk of failure or withdrawing quickly. If they're having an issue with a faculty member, there's just a personality conflict, then they're at risk for failure." Because of this, coaches across the consortium reported having to be a "jack of all trades" when it came to helping students overcome barriers. One coach echoed a sentiment all coaches shared when she said: "I help with scholarship applications, letters of recommendation, finding transportation, furniture, daycare, keeping utilities turned on, etc. Whatever it takes to keep the student in school."

Retention Through Clinicals

A particularly difficult time for students relative to retention was the time spent in clinicals, which generally happens toward the end of their program. While students can often work during the time they are attending classes, clinicals usually require full-time attendance. Although not all CHEO programs required clinicals, coaches in programs that did often had to work hard to find ways to help students finish their clinicals without dropping out. Students tended to drop out during clinicals because they couldn't afford to quit their job during that time or they lacked childcare or transportation or other resources. One coach said since students had to quit their jobs during the clinical portion of the program, many simply could not afford to stay in school. She helped students receive temporary funding through grants, scholarships, and community or state assistance to help them to finish the program. Many coaches partnered

with local workforce centers that were able to help some students cover costs, such as by providing money for fuel to drive to their clinical sites and to purchase uniforms.

Retention can be a particularly challenging issue for community colleges to tackle, especially since many of their students tend to have families and/or work responsibilities. There is not one "magic bullet" that helps retain students in programs, but intensive advising has been proven to increase retention at some schools (Doubleday, 2013). Our data, both quantitative and qualitative, adds to this body of research by indicating that intensive advising had a positive impact on student retention at the eight CHEO colleges throughout the grant period.

Impact on Student Completion

Closely linked to retention, student completion of their academic program is another area of primary concern for community colleges. Intensive advising at the eight CHEO colleges was heavily focused on student completion. Coaches reported their help generally fell into three categories relative to student completion: 1) career pathway guidance, 2) academic help/help with study skills, and 3) help with students' preparation for certification.

Career Pathways Guidance

Across the consortium, many coaches found that helping students identify their career pathway was one of the most rewarding parts of their job. Likewise, many felt it was the most important element of their role as an intensive advisor. One coach said that coaching is really just "sitting down with a student and helping them figure out their career path." This coach asked each student: "What is your goal? Do you have an idea of what you want as a final outcome? Where do you want to land? And then we'll figure out how to get there." Although some students come in with a plan, they are often unaware of the full range of career possibilities and, without coaching, may overlook desirable alternatives. Several coaches reported seeing students who were planning to look for work in hospitals but had never considered nursing homes, medical clinics, or research facilities, for instance. Without this awareness, students may apply for jobs in only one area, such as hospitals, and never even look for jobs elsewhere. This can lead to frustration and discouragement, which may cause the student to stop trying and leave the field. Other students come in with a career plan but are unaware of what that career encompasses. Some are set on nursing, for example, but when coaches meet with them, students may find they are not a good fit for nursing. In these cases, intensive advising not only helps students identify these issues up front but also helps them plan an alternative.

One coach, paired with a faculty member, gave a PowerPoint presentation to all new students in certain healthcare courses. The presentation described different healthcare career paths, their corresponding education programs, and the differences between each. The coach discussed job types, what can be expected of each job, and differences in pay. After the presentation, students could meet with the coach to discuss their options and get more information about each

program and job type. Coaches reported program fit is extremely important because students were more self-motivated to complete their program if they were excited about the work.

Study Skills/Academic Help

Many students also relied on intensive advisors for help with academics. Some coaches, trained in the healthcare industry, were able help students directly. Others set students up to see tutors or made arrangements for faculty to meet with them after class. All the coaches spoke of teaching study skills and time management as part of the coaching role. Many coaches also took on basic technical duties, such as making sure course homework assignments were posted—especially those coaches with students in hybrid or online courses. In some cases, students contacted the coach if there were issues in a class instead of contacting the instructor directly. One student said:

> I had to contact her [the coach] a few times because I felt it easier to contact her [rather than the instructor] if there was a problem with a task or if something wasn't there [if an assignment was not posted]. For some reason, it was easier for me to tell this to her than to the instructor.

Coaches felt performing these types of tasks made it easier for students to reach out to them when they needed help. If students were already in the habit of reaching out to the coach for basic items, they would not hesitate to do so for something important. This destigmatized the action of seeking help from the intensive advisor; since it was something everybody did routinely, there was no stigma associated with it.

Preparation for Certification Tests

Helping students prepare for certification exams was another activity CHEO coaches took on during the four-year project. At many of the colleges, the rate of students passing their national certification exams prior to CHEO was lower than school administrators would have liked. During the course of our qualitative data collection, administrators, staff, and coaches reported increased passing rates after the CHEO project began, and all of them pointed to intensive advising as being the key to the change. Some coaches recruited former students to come back and talk to current students about the exam process and what they did to study for it, and to answer questions. Other coaches set up study groups for students. Still others arranged online forums where students could post messages, links, or videos they found helpful in studying. Many coaches also taught sessions on topics such as test anxiety and how to deal with stress in healthy ways. During interviews, coaches stressed how important this was to students because "they're getting ready to take a test that's gonna determine if they have a career or not." Sometimes students do not pass their certification exam not because they don't know the material but because they can't successfully deal with test anxiety. One coach said: "A lot of times we see the students that do not pass the first time—they know the content; they just have test anxiety. And they really get in there, and they just—they can't do it." With help from

intensive advising on study skills and test anxiety, CHEO college staff qualitatively reported they began to see pass rates for national certifications increase.

Overall, both staff and students reported feeling that intensive advising increased student completion rates. One student said that without the coach she likely would not have finished her certificate program. When asked to consider what difference it would have made to her going through the same program without a coach, another student replied: "I probably wouldn't have my certificate, honestly. I probably would have never done anything because no one would have responded to me, and I wouldn't have actually known what I was getting myself into."

Turning now to the quantitative data, meeting with the career coaches at KoC and LCCC had a positive impact on student completion rates at those schools. As shown in appendix tables A1 (KoC) and A3 (LCCC), these positive effects were statistically significant regardless of whether the credential completed by the student was within or outside the CHEO program. With specific regard to the completion of CHEO credentials, the more coaching sessions a student had, the more likely they were to complete their program. Advising intensity was positively associated with CHEO completion rates at both schools (see appendix tables A2 and A4), and those effects are statistically significant. At KoC, that significant positive association also emerged relative to earning credentials outside the CHEO program.

Impact on Student Employment

Once students complete their program and pass the related national certification test (if one is required for their program), the next step is to find employment. Administrators at all of the consortium colleges said coaches were directly responsible for increasing student preparedness for employment. One administrator said that getting students into jobs is "ultimately . . . why we do all this." She also said that as a result of grant efforts, students now understand "what services are available to them better; the career coach has done an excellent job of that." All of the coaches spent considerable time helping students learn how to search for jobs, write résumés, and prepare for interviews. Coaches prepared information packets that they handed out to students, gave presentations in classrooms, and met with students one-on-one to help them gain these skills. Many of the coaches noted that students were lacking basic career-readiness skills and without help would likely fail to successfully land a job. The four main skill sets CHEO coaches spent time helping students develop relative to career preparation were: soft skills, professionalism skills (including interview skills and résumé and cover letter writing), how to conduct job searches, and how to connect with employers.

Soft Skills

A big problem facing many students on the job market—according to employers—is a lack of soft skills. Soft skills are skills such as communication, the ability to make decisions, flexibility, time management, leadership skills, and the ability to work under pressure. Employers

nationally feel students are largely underqualified to work because they are lacking soft skills. Likewise, local employers at most of the consortium schools had reported feeling students were underprepared for the workforce in the area of soft skills. Intensive advising helped in this area because coaches were able to teach students many of these skills before exiting their programs. CHEO coaches spent considerable time stressing these skills to students and helping them prepare for the workplace. Across the consortium schools, coaches taught soft skills during regular class hours (with permission from faculty), during office hours, and during special sessions that students could volunteer to attend. Many coaches, working in conjunction with faculty members, integrated soft skills into students' regular coursework.

Professionalism Training

Professionalism training was a big part of the coaches' role at all of the CHEO colleges. Coaches spent considerable time teaching students how to write résumés; to successfully navigate interviews; and to dress, act, and communicate professionally. Several coaches mentioned in interviews with EERC staff that students are often unprepared for this step in their career path and are intimidated by it. One coach said:

> [Because these are] career/technical programs, most of these students aren't from academic backgrounds, so . . . that level of professionalism is pretty foreign to most of them. So résumé and cover letter writing, interviews, all of those skills are scary, intimidating.

Some faculty used the opportunity to assign homework or extra credit to students; students were required to see the coach for a résumé writing session or a mock interview if they wanted the credit. Other coaches and faculty members integrated technology training with professionalism training: Students were tasked with navigating résumé-building software to create a résumé and build a basic e-portfolio, and the exercise was then graded as part of the students' required coursework. Some coaches also stressed how to dress professionally, occasionally visiting classrooms dressed unprofessionally and asking students to identify what was unprofessional about the attire. Visiting students in the classroom was one of the best places to have the most impact, according to coaches. One coach who spent an entire day in the classroom once every semester said:

> I can reach those students who may be struggling. I've had a couple foreign students that are really struggling with résumés and job search[es], so that really helps me get face-to-face with them. And a lot of times then I'll have separate appointments with them.

Another coach spoke about how she used her time in the classroom:

> I sit with each student individually and work with their résumé and their job search and their career goals. We talk about where they're going, what they want to do. And then any resources they need from that, they will contact me or I contact them.

Aside from classroom work, most of the coaches offered one-on-one interview preparedness coaching, a service that was popular among students. One coach spoke of working with a faculty member to collect lists of questions local employers used for interviews. They compiled the questions, divided them into categories based on what type of employers might ask certain types of questions, and the coach would work through the questions with students based on the type of job they were applying for. Another coach had students tell her what questions they were asked during job interviews. She used their answers to prepare other students for the type of questions they may get asked by local employers:

> I'm really curious on [about] interview questions because it helps me, so I always tell them: "After you have an interview, call me and tell me what the questions were, so we can share that with future students." And so yeah, there's some good back-and-forth conversation.

Qualitatively, consortium administrators, staff, and coaches reported that students were more employable upon completion of CHEO programs largely because of the integration of soft skills and professionalism training in their courses. One coach said she worked with a student "on her résumé and her mock interview" and felt the student was "a huge success" even though she did not end up employed in the healthcare field. The coach reported the student "went from 10 hours per week at 9 dollars an hour to 40 hours per week at . . . 12 dollars per hour," further saying that she would "directly relate the work we [the coach and faculty] did with her [to] her being able to get the job."

Job Searches

Coaches reported that students often did not have a good grasp on how to perform job searches. Thus, although students seemed to be better prepared for employment after soft skills and professionalism training, these elements alone would not help them if they did not know where to look for job postings. One coach told EERC that students came into her office with "no idea where jobs are for this type of job," so she spent significant time helping students do job searches and "also pointing them to how they can do their own research, because what they want to do may change as they're in school." Additionally, students were often stumped when it came to searching for jobs outside of their immediate geographical area. Because some students were looking to leave the community after school, they needed to know how to perform regional—or national—job searches.

Some CHEO coaches also did regular job searches for their students that they would sort into categories by job type and send out via e-mail to students who were enrolled in the programs that best matched those careers categories. Coaches often made direct contact with employers

and agencies in order to make connections for students. Most consortium institutions had job boards available, so coaches directed employers to post job openings to those boards and encouraged students to check the boards regularly. A big part of job searching, one coach pointed out, is to identify all the arenas where the job type you are interested in might be located. For instance, many students get "stuck in a box," she said, thinking, for example, that nursing assistants have to work in nursing homes when in reality job openings may also exist in hospitals, physical therapy offices, and other arenas they may have never thought about. One coach said she thinks it's very important for students to be pursuing jobs and getting help if they need it, so she regularly asked: "What jobs are you pursuing? What are you looking for? Do you need help with that?"

All of the coaches stressed the importance of offering students a variety of ways to find additional information about career readiness and job searching skills. Coaches liked to offer students many "tools" they could use to learn how to hone those skills. Some of the tools they mentioned were classroom presentations, videos, online tools, mock interviews, one-on-one meetings with the coach or faculty, and résumé and cover letter review. Several coaches felt helping students go through the job-search process was important even if they were not yet ready to look for a job in the healthcare field. Regardless of the career field, they argued, simply finding and keeping a job could help the student get "familiar with the process" and allow them to "earn a little income while they're in school."

Employer Connections

Coaches across the consortium were also very involved in building and maintaining relationships with local employers. One of the primary ways most coaches did this was through their school's career fair. Other ways included visits to the employer's workplace, phone calls, e-mails, and involvement on the department's advisory board. Employers were able to give input on program and course content, advise faculty and coaches on the type of soft skills to incorporate into programs, and meet students for potential hire. Career fairs were reportedly very successful in helping connect students and employers. One coach said:

> Employers are really receptive to it because they can get top students who are nearly graduated and talk to them about what kinds of job opportunities they have and encourage them to apply with their businesses and that kind of thing.

Students also like career fairs because they can meet a variety of employers in one place and "practice" talking to them in a low-pressure environment.

Impact on Student Continued Education

Besides having a positive impact on retention, completion, and employment, intensive advising during the CHEO project also yielded a positive impact on continued education. Coaches found that throughout the course of the grant some students were choosing to pursue further

education instead of simply exiting with a certificate. Many students told coaches they were planning to stay in school to either pursue an additional certificate or an associate degree. Some were also planning to pursue a bachelor's degree at a four-year university by transferring. Many coaches felt their role was instrumental in helping students achieve the confidence needed to pursue further education, and some also felt they were opening doors for students to continue their education by helping them eliminate barriers. Student voices supported these claims; in interviews and focus groups, many students said they felt they had more confidence in their ability to successfully take and complete courses than they had prior to enrolling in their CHEO program.

Impact on Student Satisfaction

Beyond the tangible elements of retention, completion, employment, and continued education, student satisfaction has recently been studied relative to student success in higher education (Nodine, Jaeger, Venezia, and Bracco, 2012). The happier students are with their advising experience, the happier they tend to be with both their programs and their overall college experience. Staff at CHEO colleges reported that students who went through their program with a career coach tended be more satisfied with their courses, program, and the college than those who went through prior to the integration of a coach.

CHEO students reported that having a coach available to them made their courses and programs easier to traverse because the coach was there if they needed her. Coaches were instrumental in sending reminders, finding textbooks, locating resources, and helping students navigate online platforms such as Blackboard. Students felt these elements helped them focus on their courses. One student said the coach helped her and her classmates because: "We could go to her and [she would] be like, 'Okay, we've got this,' and she even would come into the labs to kind of see how it's going," which reinforced to them that help was available should they need it.

Students also mentioned that it was often hard to get help or feedback from faculty because their instructors were so busy. But they could reach the coach, who either helped them directly or found someone who could. A student said: "It was nice that she would send out e-mails when things were coming up, things were due, and then if we had questions also for an instructor—something specific—she would get back to us, and it was quick." This type of help seemed to influence students' level of satisfaction with their courses and programs.

Students also felt that the coach not only helped them with their courses and programs but also helped them have a better experience with college overall. In many cases, students had personal issues that presented barriers to their ability to participate in school. When asked who they went to if they needed help with a personal issue, students often responded they went to the coach. One student said:

> [Our coach] is connected to all sorts of resources, and if she can't help us, she knows who can. She does our intake at the beginning, and we get to know her then. She helps us whenever we need it. She comes in our classes sometimes too. It's great just knowing she is there; we have her there if we need her. She posts stuff on Facebook—students that are in need—it's amazing how much response she gets. She is great.

Even students who had gone the entire length of their program without reaching out to a career coach still responded that having one available made their experience a better one. One student said "She even e-mailed me on [about] a survey that I just was too busy and never got to for my CNA class, and I [had] never even met her before." This reminder helped the student complete and turn in something that likely would have been forgotten. Another student said the coach had "been responding to me at least once a month if I don't call her back, and she's like, "Well, are you gonna keep going [finish your program]? Is there anything I can help you with?" And it's very helpful.

Many students said they planned to get help from the coach with their résumé or with interview skills. This student quote exemplifies what many students had to say about the coaching help available to them: "I haven't used it yet, but it is something I am planning to do in the next few weeks as I will be preparing for my internship interview." Some students reported feeling extremely overwhelmed with the end of their program approaching—finals, preparation for their national exam, etc.—and were happy the coach was available when they needed her. Intensive advising seemed to provide a type of "security blanket" for students because even if they hadn't yet used the resource, they felt comfort knowing it was available.

Conclusion

Overall, intensive advising proved to be extremely successful throughout the CHEO project. Most administrators and staff members felt the biggest drawback to the project ending was going to be the loss of their career coach—a position most colleges were unable to fund past the end of the grant. A project lead at one of the colleges wrote in a final survey that losing the college's coach was going to negatively impact the program:

> [The coach] has been instrumental in [helping students with] résumé writing, professionalism and interviewing. She has networked with many employers and industry partners to provide students a path for employment. She has provided a weekly list of job openings in our surrounding area for all program students. Losing her will be a loss to our program.

Coaches also noted that their role not only helped students but also helped faculty members. In many cases they took on activities faculty did not have time for. One coach said: "I'm just like an additional boosting support [for students], and partly for the faculty because they don't always have time to do things like look at résumés and do mock interviews and that kind of stuff." Another said: "I kind of view my job as just giving the students that extra boost behind

the scenes. But if they need help getting a job shadow or something like that, then I'm definitely able to help with that." One other coach said she saw her job as "social work for higher education . . . helping people with career decisions, career moves, that kind of thing." In many cases, intensive advising is too broad of a role for faculty members to fully adopt, leaving students without the extra support they may need. CHEO coaches were able to fill this role, thus assisting both faculty and students.

Most administrators and staff felt that the primary reason coaches were successful throughout the project was because of the connections they made with students. One administrator said: "Our career coach reached out to students that were struggling and helped them to manage their lives, to get through their obstacles." Many also felt the coach had been significantly involved in helping students find their appropriate career pathway—something literature has identified as a main function of intensive advising. This "helped us to be sure the students were aware of their 'fit' in the chosen career and allowed the students a broad perspective of their end goal." The coach was "instrumental in helping the students select the correct career for them." Aside from helping guide students into the correct career path, project staff felt that coaches were pivotal in keeping students retained in their program. One staff member said "student retention was critical to the success of the CHEO program. The career coach led the recruitment and retention efforts by being the point of contact for students."

One college, LCCC, had employed intensive advisors prior to the CHEO project. These advisors were much more general, however, helping students campus-wide. The CHEO intensive advisor had the benefit of working with students in one program exclusively. Throughout the four-year project, this gave administration at the college the ability to see the difference between more "general" intensive advising and intensive advising that was conducted in a small-scale, truly *intensive*, manner. Administrators saw the benefit of the smaller caseload for both coaches and students. Although scaling this practice up was going to take some time, administrators felt it would be possible in the future:

> There's so much that's been going on campus around intrusive [intensive] advising, and it's one of those best practices that we just have to continue to provide our students. And we have the center and the coaches that we had before, and we continue to think about how to best provide the service. So I think coaching though, from CHEO, goes beyond what we have in place here, and it is an excellent model. . .. Right now we have a case management approach to advising for our more needy populations, so the student has someone with them no matter if they change their major, but other students, if they haven't picked a program or do not fit with a special population, then they don't get that. And I think that's a next step for us, but it will take a lot to scale that up.

Our qualitative study indicates that intensive advising was fully successful throughout the CHEO project. It had a positive impact on student retention, completion, employment, and continued education, and it increased student satisfaction toward their courses and programs and their overall college experience.

Section III: Technology and Teaching in Allied Health

Introduction

A principal goal of the CHEO grant was to assist colleges in redesigning courses and programs from allied health curriculum for rural and remote students. The questions around the effective delivery of allied health curriculum-incorporating technology to reach a wider range of students is of particular importance not just in the regions served by CHEO consortium schools but on a national scale. As of May 2015, healthcare occupations represented approximately nine percent of total national employment (Bureau of Labor Statistics, 2016, 1). According to the Bureau of Labor Statistics, jobs in healthcare services are projected to grow faster than the national average at least until 2024, with 12 of the top 20 fastest growing jobs in 2015 related to the healthcare field (2015). In rural states like Montana and Wyoming, the healthcare services industry is a primary sector for job growth.

The nature of the changes required to incorporate online and hybrid learning as required by the CHEO grant significantly impacted the teaching practices and pedagogy of faculty in CHEO healthcare courses and required extensive cooperation and collaboration from them as they engaged in course development and redesign. Faculty in allied health and the related science prerequisites were often reticent out of concerns that online education would not work for their *particular subject,* not necessarily that it was unsuitable for *all education*. Several faculty members expressed having initial reservations, saying things such as "before my CHEO experience I believed that online teaching [wouldn't] work for lab-based classes" or that online teaching "would be difficult to do in science courses and that labs should be [done] in class." One instructional designer described the concerns expressed by faculty in the nursing field:

> I think you have the conception, in the industry, that you can't do it [online] because it is a tactile industry. . .. [T]he nursing staff will say, "Oh, no, you can't put this online!" And I challenge them all the time and say, "Yeah, you can." Yeah, you can. You can have them come here [to campus] and do their clinical piece and think outside the box. I think, because we are so rural, that our industry in this particular region won't even question it. Because we're so short of employees in the healthcare realm. . .. If they can pass the board and they can do the work, and the programs can stay accredited, they'd fully accept it.

Teaching online presents a unique set of challenges for faculty in technical programs, like the ones offered under CHEO, in which faculty members, teaching part-time, are experts in their field but have limited teaching experience. As one grant participant pointed out: "We have faculty that have never used a learning management system, that don't even know how to teach, let alone teach online." Online teaching tools can overwhelm faculty, even when presented with training. Some colleges have found that their existing training is not sufficiently

introductory for all new instructors. One faculty member concluded that "not everybody likes to teach online . . . even if they are comfortable with technology."

CHEO Students Taking Online/Hybrid Courses

In this section, we present a quantitative analysis that compares a group of CHEO students who took their courses online with a comparison group who took the same courses in the traditional classroom format. We will use data from PCC, OJC, RRCC, and FVCC for this purpose because they are the four CHEO colleges where both online/hybrid and traditional courses coexist. Table 5 provides an overview of the composition of the two groups of students that will be the subjects of this analysis at each college.

The percentage of students taking online/hybrid courses varied from school to school. OJC, for example, had a large proportion of students taking online courses—roughly 81 percent—whereas less than a third of students at PCC and FVCC took courses online. In terms of demographic characteristics, online/hybrid students in the four colleges were different from students who only took traditional courses. Students taking online/hybrid courses were generally older than students taking traditional courses. This is not surprising, since students choosing online/hybrid courses were more likely to be working or have care responsibilities at home. Online/hybrid courses are generally more flexible relative to scheduling and can be taken during evenings and weekends. Students taking online/hybrid courses were also more likely than their counterparts taking traditional courses to be enrolled as part-time students and, with the exception of the population at OJC were more likely to be female than male. This is also likely an indication that students choosing online/hybrid options are attracted to the ability to take courses that allow more flexibility in scheduling and thus more opportunities to attend to home care responsibilities.

In general, students who took online/hybrid classes during the course of the CHEO grant took more credits in CHEO-related fields. This is an interesting finding and may indicate that the intended target population was reached—nontraditional and rural students with home or work responsibilities who want to re-enter the job market or increase their wages. These students, who may have limited access to campus, could be seeking retraining and are therefore more likely to pursue higher credit loads in order to find employment quickly.

TABLE 5. KEY CHARACTERISTICS OF ONLINE VERSUS TRADITIONAL-ONLY STUDENT POPULATIONS AT CHEO COLLEGES OFFERING BOTH COURSE OPTIONS

		PCC		OJC		RRCC		FVCC	
		Online	Traditional Only	Online	Traditional Only	Online	Traditional Only	Online	Traditional Only
% CHEO Population		29.5	70.5	81.6	18.4	56.0	44.0	29.1	71.0
Total Credits Earned (Mean)		12.3	6.0	5.8	3.1	4.6	4.3	14.1	6.8
Online Credits Earned (Mean)		3.4		3.3		4.6		5.5	
Avg. % of Total Credits Earned Online		52.9		63.4		96.9		45.2	
Gender	Female	79.2	71.2	55.6	88.9	83.0	27.8	73.9	56.5
(Percent)	Male	20.9	28.8	44.4	11.1	17.0	72.2	25.7	43.3
Enrollment	Full Time	48.0	52.0	50.0	44.4	26.3	42.2	47.7	52.6
Status (Percent)	Part Time	52.0	48.0	50.0	55.6	73.7	57.8	53.0	47.5
Age (Years)		33	28	26	32	30	26	29	27
Incumbent Worker (Percent)		54.4	58.3	65.0	55.6	56.4	63.5	54.8	48.5
Pell Eligibility (Percent)		72.0	60.5	87.5	66.7	31.9	29.1	43.7	38.2
Total (N)		1292	3083	40	9	904	712	1134	2769

Research Questions

In this section, we take into consideration the explicit grant goal of extending rural students' access to allied health education and explores three specific research questions relative to this goal:

1. How do faculty adapt their teaching practices to accommodate online delivery modalities in allied health?
2. To what extent did the CHEO grant facilitate the adoption of new technologies and delivery approaches in allied health?
3. What were the most effective content-delivery strategies developed over the course of the CHEO grant?

We will answer these research questions using a combination of qualitative and quantitative data. First, we discussed the process by which faculty adapted their teaching practice and pedagogy to deliver course content in online and hybrid formats. Then, we will present the most promising practices that were developed over the course of the CHEO grant.

Faculty Adaptation

Existing literature identifies instructor attitudes as a major factor in faculty adoption of technology in teaching. Teachers' adoption of online learning strategies is rooted in their existing pedagogical beliefs. Changing those beliefs requires more than just training instructors in what tools are available how to use them; it also requires inspiring a shift in their beliefs regarding whether the new tools are valuable (Ertmer, 2005; Mitchell and Geva-May, 2009). Overall, faculty generally reported a change both in perception toward online teaching and in their teaching practice over the course of the CHEO grant.[14] However, there were significant sources of resistance to the development and implementation of technology, specifically around teaching fully online courses.

Faculty are keenly aware of the value of interaction amongst students and between students and instructors in the face-to-face classroom environment. Students' *perception* of the amount they interact in the online learning environment does correlate to their outcomes for certain categories of assessments (Picciano, 2002). Faculty consistently cited concerns around incorporating sufficient student interaction into online courses and the asynchronous nature of the way most online courses are formatted; for example, one faculty member was concerned that "the thing that's lacking is the interaction, which is the hardest thing to do on an online class." CHEO faculty are not alone in this concern; the literature suggests that faculty nationally are concerned with the perceived lack of direct faculty-to-student contact that is available in an online learning environment (Anderson, Maier, and Shepard, 2010). Relatedly, the hands-on-learning aspect required in many allied health courses was considered by faculty to be a significant impediment to fully online science courses.

Despite resistance, many CHEO faculty indicated they had increased their incorporation of technological tools into their online courses since the beginning of the grant period. The ability to create or share videos with students was particularly important to many faculty; for example, "the quality and ease of use for recording information for student viewing was greatly enhanced [by the CHEO grant]. I acquired the ability to edit my own lecture recordings and the ability to present them to students in a timely fashion."

The literature suggests that quality instructional design can have a significant impact on both student outcomes and changes in faculty pedagogy in allied health programs. Conscious inclusion of instructional design elements can significantly increase students' academic achievement (Williams, 2006). Online teaching requires a shift from the traditional methods that many faculty members have spent their entire careers being trained in and practicing; collaboration creates an environment where faculty members can help one another "think outside the box." Furthermore, instructional designers provide valuable pedagogical expertise to assist faculty members who may be unfamiliar with new technological delivery modalities.

[14] For more information on the extent of pedagogical development amongst faculty during the CHEO grant, see Mattoon, Edwards, and McKay (2016).

Interaction with instructional designers, or at least training in online instructional design, has been shown in other studies to be a major facilitator of pedagogical change (Lackey, 2011). Across consortium colleges, instructional designers assisted allied health faculty with the incorporation of technology in a variety of ways. One instructional designer described their role with faculty as "show[ing] them what's possible, what they can do. And then also they come to me with ideas, and I've been the one to say, 'Well, I'll see what I can do to make this happen.'" For example, PCC's instructional designer helped to develop and deliver a fully online course to prepare instructors across all four PCC campuses to teach online. The training course "focuse[d] on the pedagogy of teaching online—how it's different from face-to-face, how to manage groups, how to build community online, and how to build student success online—and retention."

Many colleges have instituted defined instructional design metrics to guide course development and redesign. To this end, four of the eight CHEO colleges instituted the use of the Quality Matters(QM) standards.[15] QM provides a rubric that outlines general standards for online courses including an overall course design and the clear definition of learning objectives, assessment strategies, and instructional materials and activities.

Consortium colleges that adopted the QM rubric had varying level of success with its implementation. RRCC subscribed to QM as an institution, and their instructional designer was a certified QM reviewer prior to the grant period. However, RRCC did not have a policy for enforcing QM standards and had not defined a process to review online course designs for adherence to those standards. At PCC, QM standards were introduced to faculty, but due to faculty turn-over, the ability to transmit best practices from previous faculty experience with the course was impaired, and the process of improving course quality was slowed as a result. Faculty who used the QM rubric, however, felt that its introduction as part of the CHEO grant was "very helpful" in providing a metric for "quality control." Faculty have used the rubric to ensure that they are have "everything in place and balanced."

New Technology and Approaches

To meet CHEO goals, colleges implemented a package of technological and complimentary pedagogical developments, including:

1. *The development of remote forms of course delivery, including fully online and hybrid classes that took advantage of OER materials, NANSLO labs or lab kits, and both synchronous and asynchronous content-delivery mechanisms*. This was undertaken at most schools by faculty with the assistance of instructional designers.

[15] Additional information on Quality Matters(QM) standards is available at https://www.qualitymatters.org/.

2. *The enhancement of a simulation blood bank lab at LATI and a simulation hospital with CHEO grant dollars*. These facilities provide students with hands-on opportunities to engage in realistic exercises that mimic the work environments they are preparing to enter. These facilities can take the place of internships or clinicals where the rural nature of the learning environment or where local economic forces make clinical sites limited. Students at LATI reported that their experience in the simulation blood bank better prepared them for their clinicals—a sentiment that local employers echoed after working with LATI students.

3. *The addition of cameras and software that allow students to review their hands-on performance to improve the effectiveness of skills instruction*. For example, in EMS courses students engaged in exercises using manikins with the ability to mimic a variety of symptoms. The instructor filmed the students as they worked through the exercise and then reviewed the results with the students after the fact.

Most faculty we surveyed reported incorporating online tools such as YouTube and WebEx into their teaching. A majority also reported using some form of lecture-capture technology for their class. The use of electronic reminders and announcements along with open-ended discussion questions or forums were also popular amongst faculty.

For CHEO institutions already delivering online classes prior to the grant period, the grant allowed them to swap existing tools that might have been more cumbersome for newer, more effective tools. At FVCC, they developed facilities to record videos using a light board that enhanced instructors' ability to face the camera while also writing on a board or adding interactive graphics to video.[16] At LATI, they switched out software that limited access to lecture recording and instead bought a more user-friendly software package that allowed instructors to edit their own videos with less effort.

Extent of Change

Feasibility limited the extent to which colleges transformed their courses. On one end of the spectrum, FVCC's CHEM 105 was entirely online with the exception of one weekend of labs that students were required to attend on campus—for that reason they labelled the course "hybrid" rather than "online." PCC's EMT and paramedic courses were designed as more traditionally hybrid offerings, with about 30 percent of content being offered online and the rest requiring students to meet on campus once or twice a week.

On the other end of the spectrum, GFC's EMT and phlebotomy programs included a very limited online component that largely consisted of access to grades and homework assignments. These programs required extensive hands-on training and proprietary course materials,

[16] For more on FVCC's experience with the light board, refer to the Flathead Valley Community College Case Study Report (Edward, Mattoon, and McKay, 2015).

elements that initially raised concerns among faculty with regard to the ability to "ever truly reach hybrid or online status" in these types of courses. However, some CHEO colleges found success delivering courses with these challenges in a blended or hybrid format; RRCC's hybrid CNA program, for example, was so popular that they were able to add an additional session over the Summer 2015 term.

Faculty who experienced a shift in pedagogy embraced the enhanced delivery options that online teaching provided them when presenting material to students. The nature of online delivery allowed students to review course material or activities repeatedly, so that if students "need to go back and review something, it's always there, they can get into it [and] [t]he activities . . . [students] can do over and over and over again until they get it."

The very nature of online learning—the fact that students are already on computers connected to the Internet as they complete their lessons—also opened up additional resources for a more varied presentation of lesson content. Faculty teaching online were more likely to make use of videos and games online because:

> They're already on the Internet . . . it's easy to click. [The online students say] "Oh, hey, that tutorial was really useful" versus [the in-classroom students who say] "Yeah, I'll look at it," [but they really mean] "No, never mind." [And] I would suggest other YouTube channels or other websites that would have additional content if they wanted to explore this a little bit more, and if they needed perhaps another person explaining this in a different context.

In terms of enrollment in courses that transitioned to hybrid or online formats, there was extensive variance across the consortium. Appendix tables A5–A8 display course-level data for the four CHEO colleges that offered comparable courses in both hybrid/online and traditional formats: PCC, OJC, RCCC, and FVCC. Each school is represented by a table indicating the numbers of sections of each course that was offered in each format along with the total enrollment for both formats over the grant period. In most cases, schools offered more course sections in the traditional format than in hybrid or online formats. Enrollment, likewise, tended to be higher overall across traditional course options than in the hybrid/online options.

Table 6 displays the total enrollment in both traditional and hybrid/online courses at each of the four comparison colleges across terms.

TABLE 6. COMPARISON OF ENROLLMENT IN HYBRID/ONLINE VERSUS

	PCC		OJC		RCCC		FVCC	
Term*	Online or Hybrid	Traditional	Online or Hybrid	Traditional	Online or Hybrid	Traditional	Online or Hybrid	Traditional
Spring '13	192	1427	0	9	179	127	318	1,454
Summer '13	71	276	13	0	101	36	93	157
Fall '13	233	1511	16	7	156	149	260	1,478
Spring '14	199	1516	1	15	188	130	269	1,359
Summer '14	118	258	6	6	116	55	0	97
Fall '14	278	1301	29	1	111	141	177	632
Spring '15	407	1182	0	9	198	120	158	901
Summer '15	108	248	/	/	143	0	0	360
Fall '15	514	1181			190	0	654	1,986
Spring '16	378	1193			164	0	714	1,776
Summer '16	/*	/			152	0	/	/
Total (N)	2,498	10093	65	38	1698	758	10200	2643

Effective Allied Health Delivery Strategies

Fully online course delivery presents a unique set of challenges in allied health fields. Over the course of the CHEO grant, colleges developed multiple solutions to these challenges to meet their students' needs. This report highlights the following primary practices that emerged out of those experiences: the development of hybrid courses; the use of synchronized online delivery technology for course delivery as well as to hold virtual office hours and tutoring sessions; and a focus on students' development of computer literacy skills.

Hybrid Courses

Hybrid courses and programs overcome many of the sources of both faculty and student resistance to fully online learning. Many allied health careers require that students develop a set of specialized, hands-on skills—for example, the ability to draw blood, operate a microscope, or perform resuscitation—prior to joining the workforce. Faculty perceive a natural barrier in the online environment to being able to teach and practice these skills effectively, and this perception may make them resistant to adopting fully online course models. CHEO students also expressed reservations about fully online courses, citing concerns about a lack of interaction with faculty and other students as well as concerns about individual time management skills.

The definition of a "hybrid" course varied across CHEO colleges. For example, FVCC considered their Chemistry 105 course a hybrid course even though students were only required to be on campus once a semester. Though there was no solid consensus amongst consortium schools, the most common definition for hybrid courses is that at least 30 percent of the course material is delivered online. This diversity of meaning is shared by the national discourse on hybrid and "blended" learning (Helms, 2014; McGee and Reis, 2012). Experts and colleges define hybrid courses in one of two ways: by setting a numerical threshold for the amount of course content that must be delivered in different modalities, or by focusing on the pedagogical process of blending diverse teaching modalities.

Hybrid courses are particularly well suited to meeting the needs of adult and rural distance learners in the allied health environment. They allow students to limit the amount of time they need to travel to and be on campus while also facilitating the hands-on learning required to fully master the skills necessary for allied health careers. At PCC, for example, traditional EMT classes require students to be on campus from 10 to 12 hours a week. The hybrid version requires students to be on campus one day a week for a four-hour lab; the rest of the course material is delivered asynchronously online. The hybrid version eliminates approximately eight hours that students would be required to be on campus every week.

Community colleges, which are already accommodating the schedules of adult learners through evening and weekend classes, can also be flexible about the days and times that students are required to be on campus. Flexibility is a primary concern when students select hybrid courses over traditional alternatives; qualitative data indicate that school personnel have noticed that students taking hybrid courses are often not taking online courses exclusively. Students whose workload also includes traditional courses often select hybrid options to fit around their job and family schedules—not simply because of prohibitive travel distances to campus. At RRCC, the response to hybrid CNA courses has been positive due to the additional flexibility; "the students loved [the hybrid course], and they kept saying, 'Okay, it fits into my life.'" FVCC scheduled the on-campus labs for one of its hybrid science courses to occur on two weekends so that students could attend them without taking time off and could schedule their presence ahead of time to assist with childcare arrangements. The on-campus lab time included community-building activities to provide students with the contact that many reported they were disappointed to miss out on in completely online courses.

Students in hybrid courses also had face-to-face access to their instructors during their on-campus time. Students struggling with computer skills could take advantage of computer assistance directly from their instructor. Students also reported a desire to "feel part of the class." According to existing research on the topic, this concern is widespread—students surveyed about online learning routinely report that interaction in the classroom with peers and professors is vital to their learning satisfaction (Abdullah, 2012). Face-to-face, in-classroom time helps students create a sense of community that may make them feel more confident in their skills and more comfortable working in teams in their careers. Hybrid course options give students the opportunity to see one another and the instructor in person, which may increase

the quality of their online interactions while limiting the time commitment required of busy students. Courses offered through this modality were popular with CHEO students; evidence of this could be seen at RRCC, where during the Summer 2015 term, both their hybrid CNA courses filled, and they added a third. These hybrid courses quickly became so popular and were so successful that RRCC no longer offers traditional sections of their CNA courses.

One EMS instructor who taught paramedics and emergency management classes both in traditional and hybrid formats identified a "huge benefit to hybridizing traditional courses:" online content is available for students to review on their own schedule and, importantly, is available for them to review multiple times, which means that students come to class more prepared—making face-to-face time more effective.

Course-level Outcomes

We analyzed individual student grades in CHEO courses at each of the four comparison colleges to determine the pass rates for those classes according to their delivery format: hybrid, online, and traditional. (See table 7) PCC offered courses in all three formats, whereas OJC, RRCC, and FVCC offered courses in hybrid or traditional formats only. For three of the four colleges, the nontraditional course offerings had a higher pass rate than traditional courses; OJC was the only college of the four where the hybrid format courses had a lower pass rate than the traditional classroom option. At PCC, where all three format types were available, fully online courses had an even higher pass rate than hybrid courses.

TABLE 7. COMPARISONS OF AGGREGATE COURSE-LEVEL OUTCOMES IN CHEO COURSES OFFERED IN HYBRID, ONLINE, AND TRADITIONAL FORMAT AT FOUR CHEO COLLEGES

	PCC			OJC		RRCC		FVCC	
Grade (in percent)	Hybrid	Online	Traditional	Hybrid	Traditional	Hybrid	Traditional	Hybrid	Traditional
A	40.6	73.7	34.6	52.3	68.4	80.6	43.7	42.6	39.4
B	24.1	10.5	24.4	21.5	18.4	7.4	26.0	26.5	28.7
C	13.9	0.0	15.4	9.2	5.3	1.5	12.8	13.6	11.5
D	4.3	10.5	3.3	1.5	0.0	0.1	4.1	3.3	3.2
Withdrawn	10.6	0	13.1	7.7	0.0	8.6	8.6	6.7	7.2
Pass Rate*	78.6%	84.2%	74.4%	83.0%	92.1%	89.5%	82.5%	82.7%	79.6%

NOTE: PASS RATE IS DEFINED AS LETTER GRADE "C" OR ABOVE.

Program-level Outcomes

In this section we examine the impact of taking online/hybrid courses on four program-level outcomes: The number of credits earned by each student, the likelihood the student would be retained in a CHEO program and in any program at the school, and the student's likelihood to earn a credential. We examine these outcomes using two different measures of online course exposure: First, we analyze the data using a binary variable indicating whether a CHEO participant ever completed an online or hybrid course. Then, we look at the same set of outcomes using a continuous variable indicating what percentage of each student's total CHEO credits was earned in online or hybrid courses. This dual approach allows us to explore whether taking any online/hybrid courses affected outcomes as well as how the percentage of online/hybrid courses a student took might have affected their outcomes.

At three of the four comparison colleges—PCC, FVCC, and RRCC—having taken an online course is associated with a positive effect on most of the program-level outcomes we tested: retention in a CHEO program, retention in education, and earning a credential. At PCC and FVCC, experience with online coursework was also positively associated with the total number of CHEO credits obtained (See table 8). All of these results are statistically significant. At PCC, controlling for all other observed characteristics, students who took at least one online course earned 5.1 additional CHEO credits and had a 4.1 percent increase in the likelihood of remaining in school, a 3.6 percent increase in the likelihood of being retained in a CHEO program, and a 2.9 percent increase in the likelihood of earning a credential. While the increases in credentialing and general education retention rates were similar for FVCC students (credential earning: 2.9 percent; general retention: 3.1 percent), online course experience at that school contributed to a 21 percent increase in the likelihood that students would be retained in a CHEO program and as well as the earning of nearly 8 additional credits.

TABLE 8. REGRESSION COEFFICIENTS AND STANDARD DEVIATIONS FOR MODELS PREDICTING THE EFFECT OF TAKING AN ONLINE COURSE ON FOUR PROGRAM-LEVEL OUTCOMES: PCC & FVCC

	PCC				FVCC			
	(1) Total Credit	(2) Retention in CHEO Program	(3) Retention in Any Program	(4) Credential Earned	(1) Total Credit	(2) Retention in CHEO Program	(3) Retention in Any Program	(4) Credential Earned
Any Online Course	5.111***	0.0369*	0.0414***	0.0291**	7.948***	0.213***	0.0310***	0.0290*
	(15.42)	(2.44)	(5.57)	(2.70)	(19.76)	(12.32)	(7.22)	(2.52)
Incumbent Worker	0.290	0.00224	-0.00164	-0.00268	-0.710	0.00541	0.00381	0.0252*
	(0.95)	(0.16)	(-0.24)	(-0.28)	(-1.95)	(0.35)	(0.98)	(2.42)
Part-Time Status	0.0660	0.0156	-0.00258	-0.0241*	0.154	-0.148***	-0.0141	0.123
	(0.21)	(1.10)	(-0.37)	(-2.39)	(1.27)	(-2.23)	(-0.38)	(1.13)
Female	-1.323***	0.0890***	-0.0324***	-0.109***	-3.121	-0.167***	-0.211	-0.0680
	(-3.99)	(5.92)	(-4.37)	(-10.14)	(-1.13)	(-3.54)	(-0.54)	(-0.19)
Age 25+	1.587***	0.0421**	0.0139*	0.0218*	0.817*	-0.0193	0.0146***	0.0453***
	(5.22)	(3.03)	(2.03)	(2.21)	(2.22)	(-1.22)	(3.72)	(4.31)
Constant	5.878***	0.129***	0.0506***	0.170***	6.749***	0.269***	-0.00433	0.0633***
	(14.99)	(7.40)	(5.89)	(13.68)	(21.40)	(19.89)	(-1.28)	(7.01)
Total (N)	4375	3880	3880	3880	3475	3475	3475	3475

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Both PCC and FVCC implemented a mixture of hybrid, online, and traditional options that provided students with greater flexibility in enrollment. Greater flexibility created more educational opportunities for nontraditional students with work and care responsibilities and thus making completing a credential easier for them.

At RRCC, experience with online education had significant positive impacts on education retention (14 percent increase in probability) and credential earning (67 percent increase in probability). This is likely a result of RRCC's largely nontraditional student population—many of whom were juggling coursework alongside their work or home responsibilities and appreciated the flexibility the online format allowed. It may be for this very reason that online coursework was negatively associated with CHEO retention (3 percent decrease in probability) at RRCC; students with heavy scheduling burdens outside of school may have found it hard to adjust to the demands—for example, clinical requirements—of some allied health fields and have chosen to migrate to fields outside the sphere of CHEO programming.

At OJC, online education had no significant impact on the four program-level outcomes of interest here. This may be because students there were likely to be local to the campus and because OJC's CHEO program led to an associate degree. Both these factors contributed to this school attracting a larger proportion of traditional students who were less likely to have work or care responsibilities than we found at most other schools.

TABLE 9. REGRESSION COEFFICIENTS AND STANDARD DEVIATIONS FOR MODELS PREDICTING THE EFFECT OF TAKING AN ONLINE COURSE ON FOUR PROGRAM-LEVEL OUTCOMES: RRCC & OJC

	RRCC				OJC			
	(1) Total Credit	(2) Retention in CHEO Program	(3) Retention in Any Program	(4) Credential Earned	(1) Total Credit	(2) Retention in CHEO Program	(3) Retention in Any Program	(4) Credential Earned
Any Online Course	0.262	-0.0316***	0.149***	0.647***	3.347	0.00146	0.00281	-0.321
	(1.82)	(-3.96)	(7.97)	(29.23)	(1.13)	(0.01)	(0.01)	(-1.72)
Incumbent Worker	0.0705	-0.0168**	0.0156	0.0886***	-4.167	0.375***	0.0948	-0.233
	(0.59)	(-2.58)	(1.02)	(4.91)	(-1.51)	(3.87)	(0.41)	(-1.15)
Part-Time Status	0.0477	-0.00909	-0.0193	0.0441*	3.691	-0.412***	-0.0280	0.223
	(0.40)	(-1.38)	(-1.24)	(2.41)	(1.42)	(-4.49)	(-0.12)	(1.12)
Female	0.156	-0.00771	0.0450*	0.126***	-1.622	-0.318***	-0.0964	-0.123
	(1.09)	(-0.97)	(2.40)	(5.68)	(-0.70)	(-3.89)	(-0.49)	(-0.72)
Age 25+	-0.107	0.00356	-0.00897	-0.0386*	-0.879	0.245**	-0.184	-0.203
	(-0.90)	(0.54)	(-0.58)	(-2.11)	(-0.36)	(2.82)	(-0.94)	(-1.20)
Constant	4.238***	0.0488***	-0.0103	-0.0866***	5.305	0.167	0.707*	1.116***
	(29.59)	(6.32)	(-0.57)	(-4.03)	(1.48)	(1.32)	(2.66)	(4.84)
Total (N)	1617	1391	1391	1391	49	49	36	36

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

When we examine the percentage of online courses taken by students, or *online intensity*, we again found mixed impacts on outcomes. A student's online intensity represents the percentage of his or her total credits that were received from online or hybrid courses throughout the course of his or her enrollment. At FVCC, a higher proportion of online course credits was associated with positive program outcomes, including an increase of 5.7 in the number of overall credits earned by students (see table 10). Taking online courses also increased students' probability of remaining in their CHEO programs by 7 percent, the probability of remaining in any program by about 1.5 percent, and the probability of earning a certificate by 4 percent. All these results are statistically significant.

TABLE 10. REGRESSION COEFFICIENTS AND STANDARD DEVIATIONS FOR MODELS PREDICTING THE EFFECT OF ONLINE INTENSITY ON FOUR

	(1) Total Credit	(2) Retention in CHEO Program	(3) Retention in Any Program	(4) Credential Earned
Percent Online	5.669***	0.0728*	0.0149*	0.0414*
Courses	(8.37)	(2.56)	(2.13)	(2.23)
Incumbent	-0.401	0.0145	0.00510	0.0261*
Worker	(-1.06)	(0.91)	(1.30)	(2.51)
Part-Time	0.085	-0.108***	-0.0141	0.321
Status	(1.23)	(-2.63)	(-0.26)	(1.29)
Female	-2.145	-0.125***	-0.211	-0.0680
	(-1.60)	(-2.54)	(-0.12)	(-0.19)
Age 25+	1.424***	0.00212	0.0175***	0.0462***
	(3.72)	(0.13)	(4.42)	(4.40)
	7.938***	0.308***	0.000968	0.0658***
Constant	(24.60)	(22.77)	(0.29)	(7.44)
Total (N)	3475	3475	3475	3475

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Nevertheless, for other schools, taking a higher percentage of online courses had negative impacts on some of the retention and credential-earning outcomes. At both PCC and RRCC, increased online intensity was associated with a decrease in the probability of being retained in a CHEO program, and at OJC, it was associated with a decreased probability of earning a credential. These results are statistically significant, though the differences, shown in Table 11, are relatively small. Similarly, though the positive associations between online intensity and the three remaining program-level measures are statistically significant, the differences are so small that we can interpret them to have no practical significance.

TABLE 11. REGRESSION COEFFICIENTS AND STANDARD DEVIATIONS FOR MODELS PREDICTING THE EFFECT OF ONLINE COURSEWORK ITENSITY ON FOUR PROGRAM-LEVEL OUTCOMES: PCC, OJC, AND RRCC†

	PCC	OJC	RRCC			
	Retention in CHEO Program	Credential Earned	Total Credit	Retention in CHEO Program	Retention in Any Program	Credential Earned
Percent Online Courses	-0.0587** (-2.80)	-0.0000543** (-3.01)	0.0000662*** (4.72)	-0.000303*** (-3.87)	0.0000154*** (8.40)	0.00672*** (32.06)
Incumbent Worker	0.00303 (0.22)	-0.298 (-1.63)	0.108 (0.91)	-0.0172** (-2.65)	0.0187 (1.23)	0.102*** (5.88)
Part-Time Status	0.0166 (1.17)	0.232 (1.29)	0.0216 (0.18)	-0.00925 (-1.40)	-0.0193 (-1.25)	0.0441* (2.50)
Female	0.0973*** (6.49)	-0.0886 (-0.59)	-0.0520 (-0.37)	-0.00895 (-1.14)	0.0450* (2.44)	0.124*** (5.89)
Age 25+	0.0530*** (3.83)	-0.101 (-0.65)	-0.146 (-1.23)	0.00340 (0.52)	-0.00929 (-0.60)	-0.0403* (-2.29)
Constant	0.137*** (7.85)	1.090*** (6.76)	4.157*** (29.15)	0.0488*** (6.31)	-0.0124 (-0.69)	-0.0963*** (-4.65)
Total (N)	3880	36	1617	1391	1391	1391

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

† Only measures with statistically significant coefficients on the dependent variable are included in this table.

Comparing the two sets of regression results indicates that having the opportunity to take online courses benefits students by providing flexibility for them to accommodate their schedules. However, as the intensity of the online portion of their education increases, so do some potential threats to program-level outcomes such as retention and completion. Fully online students may be less likely than students taking traditional classes to complete a program.

Student feedback on hybrid course design was relatively favorable across all eight consortium schools. Faculty noted that many students were initially "scared, but once they get into it and see how simple it is and user-friendly, they are fine with it." The flexibility of hybrid courses appeals to students, even those who do not want to take fully online courses.

Synchronous Delivery

Synchronized online delivery practices have gained in popularity at some CHEO schools. They are also increasingly being adopted nationwide; as online learning has achieved wider acceptance, colleges have sought a way to overcome common problems like student disengagement, communication barriers, and a decreased sense of community. Synchronous delivery methods allow instructors and students to "establish presence," which helps "foster

points of connection" and ultimately results in higher rates of student satisfaction (Olson and McCracken, 2015, p. 2). In previous studies, students have reported significant anxiety with online courses, which requires significant instructor interaction to overcome (Abdullah, 2012).

Synchronous online interactions "get them [students] connected to you . . . like in the face-to-face class, you see them and they feel ownership, and they also feel that you're watching them, so they're more likely to perform." Another faculty member emphasized the ways in which synchronous interaction helps students feel connected:

> So, they can see each other on webcam . . . on their screen, they can see these other people's faces popped up. One of them would ask a question. I hadn't gotten to answering yet because another student would pop in so quickly and be like, "well, you know, in this video she did this."

Adoption of synchronous online methods at CHEO consortium schools was largely driven by exposure to the technology through faculty training and through the acquisition of new software and tools. When faculty were aware that synchronous delivery methods were available, and when those methods were user friendly, adoption was more likely. At PCC, CHEO funds were used to send instructors to an online teaching symposium. Faculty were impressed with what they learned and began introducing synchronous sessions in all of their online classes starting in Fall 2014. Student response was so positive that they have continued the use of synchronous methods through the time of this writing.

Faculty have even found that, in some situations, synchronous delivery and tutoring methods are less time-consuming than asynchronous methods, particularly when delivering complex scientific information that may not lend itself to being transmitted through e-mails or written communication. Faculty have previously cited the time-intensive nature of online teaching as an impediment to adoption[17]—paradoxically, synchronous delivery methods can streamline the online teaching experience by allowing multiple students to interact with each other and the faculty member simultaneously. The long and delayed nature of complex e-mail communication can also be circumvented by setting up synchronous "office hours" or tutoring sessions.

The presence of new, user-friendly technology that allows for the synchronous online re-creation of the traditional classroom environment has significantly driven faculty adoption of online courses. For example, one college began using Zoom, a synchronous-lecture-capture and video-conferencing tool that allows people in multiple locations to interact face-to-face and share their computer screens. This technology "[began] to allow us to replicate face-to-face teaching and those important personal interactions in an online environment." Speaking with students directly while using a document camera saves faculty from having to type out long

[17] For further information, see the Faculty Development Brief (Mattoon, Edwards, and McKay, 2016).

explanations for concepts that are difficult to transmit purely through the written word. This has been considered a significant benefit, especially in allied health-adjacent science classes.

The use of synchronous office hours or tutoring is even more widespread across the consortium; faculty at RRCC required students to check in during online office hours, while faculty at FVCC provided real-time chemistry tutoring using a document camera. Students responded well to these types of initiatives, and faculty found that when given the opportunity, students actually were more interactive with each other—answering each other's questions during office hours or offering topics for discussion.

At PCC, live tutorial sessions were offered for the medical coding class both face-to-face on campus and synchronously online. There, as at many CHEO colleges, "80 percent of students are still local even though they take classes online, so if they want to come in and sit in the room they can . . . [o]r online, it's really all the same . . . [s]o they have the option, and the model has worked really well."

Computer Training

CHEO colleges are primarily located in and serving rural students. Consequently, colleges were concerned about whether remote students would be able to find reliable computer and internet access. There were also concerns about how online coursework would be received by the people it was intended to target; the grant's focus on TAA and TAA-like workers, as well as many of the colleges' nontraditional student bodies, meant targeting populations that may be more likely to lack computer literacy skills. Faculty had concerns that students would have to overcome the technology itself as a barrier to entry for learning; said one faculty member, "I don't want to set [students] up for something that [they]'re not going to [succeed at]."

At the college level, these concerns were addressed both formally and informally. Formally, GFC's E-learning division performs an assessment for all students who are registering for an online course. The assessment is available to students online; they can "go on and . . . take this thing, and it says 'Well yeah, you can—you're ready.' or 'No, you're not.'" Based on their assessment results, student can be referred back to E-learning for remediation.

Faculty members confronted computer literacy in online classes through the development of orientation material. One faculty member involved in developing such material reported, "we're going to try to put together something that will walk them through, '[H]ow do [I] get to where my grade's at[?].'" To successfully support students, faculty were required to adjust the breadth of communication styles they deployed to assist students. One faculty member described their approach:

> [Students] have my cell phone. They have my e-mail. They have everything they need. If they have question—and they do, especially at the start of the class, '" How do I get to where I need to go? To do what I need to do?" . . . Computer skills and actually finding out how to navigate within a program is something that we've talked about . . .

The effective use of computers is an essential requirement in many medical settings. Therefore, it is "paramount" that allied health students develop their computer literacy skills early in their programs to ensure mastery for later career success (Abdulla, 2012, p. 1216). Hybrid courses allow students to further develop these skills as they apply to a medical setting as part of their learning process while effectively mitigating some of the intimidation that students report around fully online courses by also providing regular access to face-to-face time with faculty and other students as well as to hands-on learning experiences.

Faculty members explicitly acknowledged the importance of computer literacy to successful allied health careers by folding computer skills into their learning goals. For example, OJC included the demonstration of "basic computer skills" among its list of program core competencies on the syllabus for its MLT program.

Summary

Faculty acceptance of new technologies and delivery modalities was increased by CHEO funding through: (1) the training and exposure to new technology, (2) collaboration with instructional designers and other CHEO staff, and (3) the availability of technologies to reproduce key classroom interactions. The CHEO grant also created a community amongst consortium schools that was focused on innovating in allied health course delivery, which expanded the realm of collaboration for faculty and instructional designers.

Overall, CHEO colleges significantly advanced their abilities to incorporate new technologies into traditional courses as well as to utilize technology to develop new and innovative ways to deliver allied health curriculum online. Colleges built or enhanced existing simulation laboratories and hospitals with the addition of manikins, cameras, and software to allow students and faculty to review performance. They also transitioned courses previously taught in traditional classrooms to online and hybrid modalities to accommodate more students, accelerate delivery, and provide nontraditional students with more flexible course options.

Significant experience transitioning allied health courses to online and hybrid delivery modalities or incorporating major technological enhancements led to the development of several promising practices. Hybrid courses helped students and faculty overcome initial reservations about the appropriateness of purely online courses in allied health fields while still allowing the increased access and scheduling flexibility that can be offered when time spent on campus is limited. While synchronous delivery methods only began to gain in popularity later during the grant period, faculty embraced its ability to overcome the interaction barrier inherent to online course delivery. Schools adopted synchronous content delivery as well as synchronous

tutoring and office hours. CHEO colleges also recognized the potential difficulty that a lack of access and computer skills could pose for nontraditional and largely rural student populations. They addressed this concern at the institutional level through assessments and at the faculty level by making changes to their own communication styles and expectations.

PART III: OUTCOMES

Section I: Introduction and Definitions

This section examines quantitative outcomes from the CHEO project using data collected from the spring 2013 term to summer 2016 at all of the consortium colleges. For this analysis, we use data received from each of the non-Colorado schools as well as from the Colorado Community College System. Data was pulled based on course lists collected from each school detailing classes that were influenced by CHEO dollars. These course lists were compiled by the CHEO project teams at each college and the grant management team and were checked for accuracy by each college prior to the data pull. Once the data were received, EERC ensured that all courses were in the data sets and that all students appeared in each data set. SAS was then used to run the analysis.[18]

A few data points require brief definitions. A "unique enrollment" is an enrollment in any CHEO-redesigned (or "CHEO-touched") course—that is, a course in a CHEO-redesigned program of study or in a program or course that has been modified in some way with CHEO funds during the study period—a period that is different for each school. A "unique participant" is a student who has taken any CHEO-touched course. Thus, one *unique participant* would be linked to three *unique enrollments* if he or she took three CHEO-touched courses.

Unique participants (UP) and program participants (PP) are also defined differently. While a "unique participant" is defined as any student sitting in a CHEO-touched course (regardless of the program in which he or she was enrolled), a "program participant" is a student who took *more than two* CHEO-redesigned courses during their enrollment of his or her enrollment in the colleges. This was done because CHEO dollars were used for general sciences courses *and* CHEO healthcare courses; by selecting two courses we are more likely to be looking at students involved in CHEO healthcare programs rather than those just taking a general science course and moving on to a non-CHEO program.

[18] Grant management at PCC also collected data from the consortium for reporting purposes. It is important to note that while grant management calculated the total number of cases submitted to EERC, those totals will not match the number of cases included in the analysis that follows. There are several explanations for this discrepancy. First, the consortium may have included different semesters and/or courses in their data than we have; second, the consortium may have made different decisions regarding grade variables or other assumptions; and finally, the consortium may have used different registration statuses than we do in this analysis. For example, only students registered in courses after the add/drop periods ended are included in our data set.

In this section we examine both unique and program participants and their relation to the following program-level outcomes: earning credentials, education and employment retention, and wage increases.

This section of the report also includes comparative analyses of two schools—PCC and FVCC. These schools were chosen for comparative analysis because they had programs in place prior to the CHEO grant that were similar enough to the CHEO-redesigned courses to be used as the bases of historic comparison groups. The other colleges in the grant did not have concurrent or historic programs or populations that would serve as adequate comparisons. It should also be noted that, due to limiting factors including time and the relatively small number of students in our samples, many of the findings reported below warrant further inquiry and investigation and should be read with that in mind.

CHEO Program Enrollment Overview

We begin by exploring the influence of CHEO dollars on the student experience at each of the consortium colleges. To do this, we first examine course enrollment counts and then consider the proportions of unique participants and program participants in those courses. As discussed above, the influence of CHEO dollars on a course can include the use of CHEO-purchased equipment or technology; the incorporation of redesigns or new programming created with CHEO dollars; or the migration of a course to an online or hybrid format.

Table 12 summarizes unique CHEO enrollments across the consortium colleges over the four years of the grant. Grant years follow the academic calendar and encompass three terms: Fall, Spring, and Summer. Because we start our analysis from Spring 2013—the semester that grant dollars began influencing programs and courses at the colleges—Year 1 consists of only two semesters (Spring 2013 and Summer 2013). LATI, KoC, and LCCC have no enrollments reported in the first year because they did not launch their redesigned program until Fall 2014; therefore, their redesign activities had not yet influenced any classes in the first year of the grant. Years 2, 3, and 4, however, include three semesters of data for all eight colleges. It should be noted that low numbers in year one at other colleges may reflect delayed starts.

TABLE 12. UNIQUE CHEO ENROLLMENTS ACROSS COLLEGES BY GRANT YEAR

Grant Year	FVCC	GFC MSU	LATI	KoC	LCCC	PCC	RRCC	OJC*
Year 1	1979	18	/	/	/	1966	443	9
Year 2	3398	144	855	210	525	3835	794	52
Year 3	1998	787	324	317	592	3524	713	42
Year 4	2488	606	100	270	437	3266	506	/
Total (N)	9863	1555	1279	797	1554	12591	2456	103

*NOTE: OJC did not report CHEO program enrollment data for Year 4.

Enrollments are often a product of the size of the school. The CHEO consortium contains fairly large urban and suburban schools like PCC, FVCC, and RRCC as well as very small rural schools like OJC, LCCC, KoC, and GFC MSU. CHEO enrollment numbers at each college align with the size of each program's respective institution.

FVCC had large enrollment numbers throughout the grant. Beginning in Year 2, PCC had an annual average CHEO enrollment of about 3,500 students, whereas midsized institutions like GFC MSU, and LCCC attracted closer to 500 annual enrollments. The smaller institutions experienced greater enrollment fluctuation over the course of the grant period than the larger schools. The large fluctuation of enrollments at LATI from Year 2 to Year 4 are a product of a change in the number of programs included in the grant redesign: After Year 2, LATI dropped Practical Nursing (PN) from their CHEO program. OJC, on the other hand, began a new program under the grant, which accounts for the low enrollments in Year 1 and the growth seen in Years 2 and 3 (OJC did not report CHEO program enrollment data for Year 4.)

Next we examine the proportion of unique participants (UPs) who were enrolled in CHEO programs across colleges. This comparison, shown in Table 13, provides a picture of all students touched by the CHEO grant (UPs) and those students who were more focused in a CHEO program (program participants/PPs). The ratios of PPs to UPs varied largely across colleges and over the grant period. These categories (UP and PP) were created by the research team in an attempt to understand the impact of CHEO on students. This was necessary because very few students declared concentrations or majors in the grant-focused programs of study as is common at community colleges.

We define the year of entry as the year in which participants took their first CHEO-redesigned course. It should be noted that while CHEO was a health-related program, the grant served students beyond the health fields due to equipment purchases and online and hybrid redesigns of its courses. Thus, CHEO programs served a vast array of students; most notably those in science prerequisite courses. Since students from a variety of majors and programs enrolled in CHEO-touched courses, there are far higher enrollment figures when looking at unique students than at CHEO program participants. On average, the program-to-unique participant ratio is less than 50 percent. FVCC, PCC, and LATI had the highest program-to-unique participant ratios, ranging from 55 percent at PCC to nearly 97 percent at LATI, while GFC MSU, KoC, LCCC, RRCC, and OJC have lower ratios—only around one-third or fewer of students in their CHEO-touched courses were enrolled in CHEO programs.

There are many reasons for the differences in the ratio of program participants to total unique participants. First, this ratio depends largely on the courses counted as CHEO-redesigned courses (as noted above) and their relative capacity. More CHEO-touched general education and science courses led to lower UP: PP ratios. LATI has the highest program-to-unique participant ratio of nearly 97 percent; this is because their CHEO programs—leading to the MLT associate degree or Practical Nursing certificate—were closed programs; only students pursuing those credentials could enroll in those courses. FVCC, on the other hand, offered 82 CHEO-

redesigned courses, including 13 general education courses, 2 chemistry courses, 4 computer applications courses, 2 biology courses, 1 math course, and 1 college writing course, which explains its slightly lower PP: UP ratios. Only four of PCC's 73 CHEO-touched courses were general education or science courses.

TABLE 13. PROPORTION OF UNIQUE PARTICIPANTS IN CHEO COURSES WHO ARE ALSO CHEO PROGRAM PARTICIPANTS BY COLLEGE AND YEAR OF ENTRY

Year	Item	FVCC	GFC MSU	LATI*	KoC*	LCCC*	PCC	RRCC	OJC**
Y1	UP	1173	18	/	/	/	1111	337	9
	PP	698	3	/	/	/	658	93	1
	% PP	59.5	16.7	/	/	/	59.2	27.6	11.1
Y2	UP	1139	133	153	137	375	1285	569	22
	PP	646	65	148	62	98	761	169	16
	% PP	56.7	48.9	96.7	45.3	26.1	59.2	29.7	72.7
Y3	UP	814	549	28	179	313	1046	469	18
	PP	360	202	27	55	59	591	167	0
	% PP	44.2	36.8	96.4	30.7	18.8	56.5	35.6	0.0
Y4	UP	777	379	19	174	186	933	242	/
	PP	317	98	18	35	30	409	177	/
	% PP	40.8	25.9	94.7	20.1	16.1	43.8	73.1	/
Total	UP	3903	1079	200	490	874	4375	1617	49
	PP	2021	368	193	152	187	2419	606	17
	% PP	51.8	34.1	96.5	31.0	21.4	55.3	37.5	34.7

*NOTE: LATI, LCCC and KoC did not implement CHEO redesigns in their classes and programs until Year 2.

**NOTE: OJC did not report CHEO program enrollment data for Year 4.

Overview of Student Composition of CHEO Programs

This section looks at the demographic composition of unique and program participants in CHEO programs.

Gender

Table 14 presents the gender distribution across colleges for both the unique and program participant populations. Across all colleges, CHEO students were predominantly female, likely due to the healthcare jobs of focus, though there is substantial variation in gender distribution between schools. Among unique participants, LATI had the smallest percentage of male enrollees—less than 10 percent. At RRCC, on the other hand, male students accounted for over 40 percent of unique CHEO participants. The larger gender disparity at LATI likely results from the closed nature of its programs; since the vast majority of UPs at LATI are also CHEO program enrollees, these numbers more directly reflect the gender disparity of the healthcare

field than those of other schools with lower PP: UP ratios. Conversely, the more moderate PP: UP ratios found at larger colleges such as RRCC and FVCC likely were responsible for the greater proportion of males found among the UP populations at those schools.

TABLE 14. GENDER DISTRIBUTION OF UNIQUE AND PROGRAM

		FVCC	GFC MSU	LATI	KoC	LCCC	PCC	RRCC	OJC
UP	% Male	38.1	22.7	8.2	15.3	25.5	28.1	40.9	32.7
	% Female	61.6	77.2	91.8	84.7	74.5	71.8	58.7	67.4
	N	3351	1078	182	490	874	4369	1610	49
PP	% Male	33.1	17.4	7.9	18.4	16.2	28.2	11.7	52.9
	% Female	66.8	82.6	92.1	81.6	83.8	71.7	88.3	47.1
	N	1903	367	175	152	187	2416	599	17

Age

Table 15 presents the age distribution across colleges for unique and program participants. Across all colleges, the mean age of unique participants was around 28, while the mean age of program participants was just slightly older at 29. In addition to looking at the mean age of each population, we categorized students into two age groups to look at traditional-age students (under 25) and nontraditional students (over 25) and found that, while both the UP and PP populations had relatively high proportions of nontraditional students, such students generally, though not always, made up a larger percentage of the CHEO-enrolled population.

TABLE 15. AGE DISTRIBUTION OF UNIQUE AND PROGRAM PARTICIPANTS BY COLLEGE

	Age	FVCC	GFC MSU	LATI	KoC	LCCC	PCC	RRCC	OJC
UP	% Under 25	46.5	46.5	10.3	30.8	55.5	48.9	51.2	41.2
	% 25 and over	53.5	53.5	89.7	69.2	44.5	51.2	48.8	58.8
	Mean	27	28	29	29	27	28	28	26
	N	3802	695	193	490	874	4375	1617	49
PP	% Under 25	51.3	30.6	19.0	21.7	40.9	41.2	49.5	76.5
	% 25 and over	48.7	69.4	81.0	78.3	59.1	58.8	50.5	23.5
	Mean	28	27	29	31	31	30	28	25
	N	2021	245	186	152	187	2419	606	17

Ethnicity

Table 16 looks at ethnicity and race in both CHEO populations. Unsurprisingly, due to the locations of the colleges, the majority of CHEO students identified as white. This was true everywhere except at OJC, where over 50 percent of students identified as Hispanic.

TABLE 16. ETHNICITY DISTRIBUTION OF UNIQUE AND PROGRAM PARTICIPANTS BY COLLEGE

	FVCC	GFC MSU	LATI	KoC	LCCC	PCC	RRCC	OJC
Unique Participants								
Hispanic/Latino	2.9%	6.8%	1.2%	7.5%	11.7%	28.7%	9.5%	62.5%
American Indian or Alaskan Native	1.5%	1.2%	0.6%	10.1%	1.3%	3.4%	1.4%	0.0%
Asian	0.4%	1.3%	1.7%	4.1%	3.6%	1.8%	7.0%	2.1%
Black or African American	1.6%	3.3%	1.7%	2.1%	0.2%	2.8%	2.8%	4.2%
Native Hawaiian of Other Pacific Islander	0.4%	0.1%	0.0%	0.4%	0.9%	0.0%	0.0%	0.0%
White	93.2%	83.6%	94.2%	68.7%	80.3%	63.2%	78.8%	31.3%
More than One Race	0.0%	0.1%	0.0%	7.3%	0.5%	0.0%	0.0%	0.0%
Total (N)	3475	1028	188	461	854	4194	1602	49
Program Participants								
Hispanic/Latino	2.8%	7.1%	1.3%	3.7%	8.0%	31.0%	13.2%	65.7%
American Indian or Alaskan Native	1.7%	1.9%	0.6%	16.9%	0.7%	2.9%	1.5%	0.0%
Asian	0.3%	2.4%	1.9%	5.9%	1.5%	1.9%	6.7%	0.0%
Black or African American	1.8%	4.2%	1.9%	2.2%	4.4%	2.8%	3.1%	0.0%
Native Hawaiian of Other Pacific Islander	0.5%	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%	0.0%
White	92.8%	89.1%	98.5%	74.2%	92.9%	68.9%	85.9%	46.0%
More than One Race	0.0%	1.9%	0.0%	5.9%	0.0%	0.0%	0.0%	0.0%
Total (N)	1802	357	181	148	183	2329	599	17

Enrollment Status: Part-time Versus Full-time

In Table 17, we look at the enrollment status of unique and program participants across CHEO colleges and find that the composition was relatively diverse. Among both the unique and program participant populations, the student body was heavily skewed toward full-time enrollees at only one school—LATI—where over two thirds of students were full time. At KoC, PCC, and RRCC, on the other hand, around three quarters of both populations were part-time students. Finally, though both populations were dominated by part-time students at OJC, program participants were the most heavily skewed, with over three quarters of students attending CHEO programs at OJC part-time.

TABLE 17. ENROLLMENT STATUS OF UNIQUE AND PROGRAM PARTICIPANTS BY COLLEGE

	Degree Status	FVCC	GFC MSU	LATI	KoC	LCCC	PCC	RRCC	OJC
UP	Full time	1996	542	20	148	440	734	413	12
	%	51.1	49.6	71.4	25.5	50.3	24.6	24.7	33.3
	Part time	1907	550	8	432	434	2244	1257	24
	%	48.9	50.4	28.6	74.5	49.7	75.4	75.3	66.7
	Total (N)	3903	1079	200	490	874	4375	1617	49
PP	Full time	1212	119	13	40	85	378	121	4
	%	60.0	50.2	68.4	28.2	55.2	23.9	23.8	23.5
	Part time	809	118	6	102	69	1206	387	13
	%	40.0	49.8	31.6	71.8	44.8	76.1	76.2	76.5
	Total (N)	2021	368	193	152	187	2419	606	17

Economic Status: Pell Eligibility and Incumbent Workers

The final set of demographic characteristics we examine in this section relate to students' economic status. We explore the economic status of unique versus program participants by considering their Pell grant eligibility—used here as an indicator of economic disadvantage—and their status as incumbent workers when entering the program (see table 18c.) Across all colleges, a sizable portion of students were eligible for Pell grants. OJC had the highest percentage of Pell-eligible students—about 84 percent—followed by PCC at 64 percent. In contrast, KoC had a very limited number of students who were Pell eligible; only about 5 percent. This may be because more students at KoC were associated with the military, whether currently enlisted or as veterans, and those students may be receiving financial assistance through other programs. If this is the case, financial hardship may be underreported at KoC. This disparity may also be a result of Alaska's Permanent Fund Dividend program, which awards Alaska residents a dividend for each family member based on the state's oil revenue for the year. Especially for nontraditional students who may have a family, this additional income could push them over Pell eligibility.[19]

In terms of employment status, on average, more than 50 percent of students in CHEO-touched courses (57.3% for unique participant and 56.7 percent for program participant) were incumbent workers when entering the program. This finding is potentially related to the age profile and high proportion of part-time students we have previously found to be associated with CHEO programming.

[19] In 2013, a family of four would have earned an additional income of $3,600 from the dividend; in 2014 $7,536; in 2015 $8,288; and in 2016 $4,088. See the following website for more information about the Permanent Fund Dividend and amounts paid to residents of the state of Alaska: http://www.apfc.org/home/Content/dividend/dividendamounts.cfm

TABLE 18. PELL ELIGIBILITY AND INCUMBENT WORKER STATUS OF UNIQUE AND PROGRAM PARTICIPANTS BY COLLEGE

	Status	FVCC	GFC MSU	LATI	KoC	LCCC	PCC	RRCC	OJC
UP	% Pell Eligible	39.8	57.2	51.4	4.8	36.3	63.9	30.3	83.7
	% Incumbent Worker	50.4	59.2	/	/	/	62.2	59.5	51.0
	Total (N)	3903	1079	200	490	874	4375	1617	49
PP	% Pell Eligible	46.0	63.3	52.0	9.9	34.4	66.4	37.5	82.4
	% Incumbent Worker	49.8	58.9	0.0	0.0	0.0	61.3	60.4	52.9
	Total (N)	2021	368	193	152	187	2419	606	17

Overview of Course-level and Program-level Outcomes

Course-level Outcomes for CHEO Students

To examine course-level outcomes for CHEO students, we look at course grades along with pass (success) and withdrawal rates. As shown in table 19, CHEO courses have a relatively high success rate, with the proportion of students receiving grades of C or above hovering around 80 percent at all eight consortium colleges. Although the success rates are similar across colleges, the grade distributions differ considerably. At LCCC, RRCC, and OJC, more than 50 percent of the course grades assigned are A grades. In contrast, GFC MSU, LATI, KoC, and PCC are more restrictive in assigning A grades. At schools with more restrictive grade distributions, the course withdrawal rates tend to be higher, ranging from 11 to close to 15 percent versus as low as 4 to 6 percent at the schools that were more prone to giving higher marks.

On average, 3 percent of CHEO students received a failing grade in courses, while around 9 percent withdrew before the end of course.

TABLE 19. CHEO COURSE GRADES, SUCCESS RATES, AND WITHDRAWAL RATES BY COLLEGE

Grade Outcome (%)	FVCC	GFC MSU	LATI	KoC	LCCC	PCC	RRCC	OJC
A	43.6	27.5	22.9	35.3	51.6	38.0	65.1	57.3
B	27.0	29.0	43.5	25.9	23.1	23.3	15.0	18.8
C	13.3	15.0	13.4	13.8	10.5	14.4	6.2	8.6
Success Rate	83.9	71.5	81.7*	74.9	85.2	75.7	86.3	84.6
D	2.8	5.6	0.7	6.1	2.4	3.5	1.9	0.9
F	7.3	11.4	5.1	6.1	8.8	6.4	3.1	8.6
Withdrawn	6.0	11.4	12.6	13.0	3.9	14.5	8.7	6.0
Total	100	100	100	100	100	100	100	100

Note: For LATI, 1.85 percent of course enrollments received a "pass" grade without a specific letter grade.

Program-level outcomes

In this section we examine three program-level outcomes: CHEO completion rates, the number of credentials earned by CHEO students, and the stacking of credentials.

The analysis to follow relies on the distinction, described above, between unique participants (UPs) and CHEO program participants (PPs). Further, a *completer* is defined as a student who has earned at least one CHEO credential. As most students did not declare majors, the UP and PP designations were defined by the research team as a way to identify CHEO program-affiliated students (and, in the historic cohort, students associated with CHEO-equivalent programs) in the data set. We acknowledge, however, that it was not possible to draw a distinct boundary between the two populations, as there were some certificates that could be earned by taking a single course.[20] Because of this, our characterization of a program participant as someone enrolled in two or more CHEO courses likely underestimates the true number of program participants. We have no way of knowing the intent of CHEO course enrollees, therefore there is no way to determine exactly how many students in our data set enrolled in school expressly seeking a CHEO credential.

CHEO Program Completion Rates

Table 20 presents the total number and percentage of program participants who completed a CHEO-redesigned program over the four-year grant period. Across all colleges, approximately 20 percent of program participants completed a CHEO-redesigned program during the period of observation. We consider this to be a conservative estimate, both for the reasons outlined above and due to the time constraints imposed by the grant period. Because our period of study was limited, it's likely that more credentials will be earned by many of the CHEO students included in our data set in the semesters and years following this report.

LATI, RRCC, and OJC had the highest completion rates across the CHEO consortium. At RRCC, nearly 95 percent of program participants finished at least one CHEO-redesigned program. This high completion rate is likely due to the fact that RRCC provides a variety of short-term certificate programs that require as few as 2.5 credits to complete, including the home health aide, RN refresher, hospice aide, and nurse's aide certificates. Similarly, OJC, despite its small size, has a high completion rate of about 88 percent that is mainly driven by the number of participants enrolled in its relatively short-term MLT certificate program. Colleges with more general education and science courses included in their CHEO-redesigned course lists and those offering longer-term credentials tended to have lower completion rates.

[20] Some students who are counted as non-program unique participants in this study—i.e., students who took at least one CHEO-redesigned course but were not enrolled in a CHEO program—may have earned a CHEO credential if the earned certificate required only one CHEO course or if the participant completed the rest of the courses required for the credential after the grant period ended.

TABLE 20. TOTAL NUMBER OF CHEO PROGRAM COMPLETERS ACROSS COLLEGES

College	Number of Program Participants	Number of CHEO Completers	% of Participants Completing a CHEO program
FVCC	2021	83	4.1
GFC MSU	368	6	1.6
LATI	193	100	51.8
KoC	152	18	11.8
LCCC	187	35	18.7
PCC	2419	505	20.9
RRCC	606	575	94.9
OJC	17	15	88.2
Total (N/Mean)	6487	1337	20.6

Credentials Earned by CHEO Students

Table 21 shows the number and type (short-term, medium-term, and AAS) of credentials earned by CHEO program participants at each consortium college. Note that any and all credentials earned by CHEO participants during the grant period are counted in this table, not just credentials earned in CHEO programs. Examining the average number of credentials per student allows us to develop more nuanced insights into each program. The highest ratios of credentials to students were found at GFC MSU (1.26:1), LCCC (1.24:1), and OJC (1.21:1), which may indicate that those schools were the most successful at creating opportunities for achieving multiple credentials and/or at designing more diversified programs—or simply that they were more popular with high achieving students and thus may be producing a particularly strong field of talent for employers in the fields their CHEO programs were designed to connect with.

TABLE 21. TOTAL CREDENTIALS EARNED BY CHEO PROGRAM PARTICIPANTS

College	Short certificate (≤1 year)	Medium certificate (>1 year but ≤2 years)	AAS degree	Total	Number of students earning credentials	Avg. credentials per student
FVCC	24	32	202	258	251	1.03
GFC MSU	22	10	51	83	66	1.26
LATI	44	39	32	115	103	1.12
KoC	0	25	9	34	32	1.06
LCCC	35	10	33	78	63	1.24
PCC	546	153	268	967	852	1.13
RRCC	554	0	51	605	556	1.09
OJC	17	0	6	23	19	1.21
Total (N)	1242	269	652	2163	1942	1.11

Stacking of Credentials by CHEO Students

Next we take a closer look at the phenomenon of credential stacking in CHEO programs. In table 22, we break down the number of AAS completers at each school according to the number of additional credentials those students earned. Once again, all credentials, both CHEO and non-CHEO, are considered here. Of the 244 students who earned CHEO-redesigned AAS degrees during the grant period, only 22—around 9 percent—completed additional credentials.

TABLE 22. STACKING OF CREDENTIALS BY CHEO AAS DEGREE COMPLETERS BY COLLEGE

School	Total CHEO AAS degrees granted	Students earning CHEO AAS only	Students earning more than one AAS	Students earning AAS + Additional Certificate(s)
FVCC	84	84	0	0
LATI	28	27	0	1
LCCC	8	1	0	7
PCC	120	108	12	0
OJC	4	2	2	0
Total (N)	244	222	14	8

Credential stacking was slightly more common among students who earned CHEO certificates, as shown in table 23. More than 10 percent of credential earners obtained certificates or an AAS degree in addition to their CHEO credential. PCC had a high proportion of completers who stacked credentials. To achieve a Paramedic degree at PCC, students must first complete the EMT basic and intermediate programs. The schools' EMT programs are also quite popular among students wishing to continue into fire science or nursing programs. Overall, the majority of students did not stack credentials unless their program path required it. For more information on credential stacking through the CHEO grant period, see Part II, section I of this report.

TABLE 23. STACKING OF CREDENTIALS BY CHEO PROGRAM CERTIFICATE COMPLETERS BY COLLEGE

School*	Total CHEO certificates granted	Single-certificate earners	CHEO students earning two or more certificates	Students earning CHEO certificate + Any AAS
GFC MSU	17	10	1	6
LATI	72	72	0	0
KoC	19	16	0	3
LCCC	42	35	0	7
PCC	522	411	94	17
RRCC	645	620	25	0
OJC	33	26	7	0
Total (N)	1350	1190	127	33

*FVCC did not offer certificate programs through CHEO

Section II: Employment and Wage Outcomes

Employment data for incumbent and non-incumbent workers at LATI, FVCC, OJC, PCC, and RRCC is presented below. Unemployment Insurance (UI) data from three states —South Dakota, Montana and Colorado —was used for this analysis. As mentioned above, UI data was not available for all schools, and the number of available quarters varied by school. As a result, wage analyses could not be completed for all graduates.

All reported wages are quarterly earnings. PCC, RRCC, and OJC provided UI data from 2012 to the second quarter of 2016; these data cover the full grant period. The UI data available for FVCC and LATI cover less than the length of the grant period. FVCC provided UI data from 2012 through the first quarter of 2015, which is midway through Y3. For LATI, UI data extend through the fourth quarter of 2015.

Incumbent Worker Wages

For this analysis we define incumbent workers as students who had reported wages greater than 0 in the quarter prior to their first semester of enrollment. Note that "employment" does not imply that students were working in the same field as their field of study but simply that they were working for wages at the time that they enrolled in their first CHEO-redesigned course. Further employment at the end of a program of study also does not imply that students were working in their field of study. Data on industry was not available at the time of analysis.

Table 24 reports the employment status and mean wage for student completers. For each school, employment status and wage data are separately reported for both unique participant-incumbent workers (UP) and program participant-incumbent workers (PP). For unique

participants, a completer is defined as a student who has completed any credential. The credential does not have to be a CHEO-program credential. For program participants, completion is achieved only if the student received a credential from a CHEO-redesigned program.

There are several caveats for interpreting the data reported below. First, note that earning a credential does not mean that the student is no longer enrolled in other programs in the college. It is possible that after earning a short-term credential, a program completer may be working part-time and pursuing further education. Therefore, the outcomes do not precisely measure the effect of CHEO programs on employment after participants finish their education. Second, due to the availability of data, wage and employment outcomes are evaluated under a limited time span after these students earned their certificates. Because of this, effects will be underestimated. Third, FVCC and LATI only provided wage data covering a partial period of time during the grant project. Employment outcomes of later cohorts entering the program are not counted in the table. Lastly, under TAA guidelines, pre-enrollment and post-enrollment employment status is measured by whether a participant earns a positive wage in the specified time period. Under this guideline, any positive wage amount could be considered an indicator of employment. In the data set, however, some participants earned a quarterly wage as low as $2, which is in fact different than the traditional definition of employment. As a result, for this analysis we impose a $500/quarter minimum amount for a wage earner to be considered employed. The analysis following the grant guidelines is reported in the grant's annual report to the USDOL.

Turning now to table 24, we see that, on average, about half of program completers were employed at the time that they entered the program. LATI had the highest proportion of incumbent workers: About three quarters of both their UPs and PPs were employed at the time of enrollment. The proportions of incumbent workers were about the same across both the unique and program participant populations at almost all of the schools considered in this portion of the analysis. The only exception to this rule was FVCC, where only about 23 percent of unique participants were incumbent workers versus just over 60 percent of the school's program participant population. Interestingly, however, the schools that started out with more or less equal proportions of incumbent workers among both populations ended up having larger proportions of employed completers among their program participants, whereas the imbalance first observed at FVCC was reversed. Though program participants had a larger share of incumbent workers upon enrollment, a larger proportion of FVCC's unique-participant completers were retained in employment upon graduation.

We use two measures to examine employment outcomes after program completion: 1) the percentage of incumbent workers retained in the labor force, and 2) change in wage. Not all incumbent workers were retained in employment after they earned a credential. As mentioned above, program participants were more likely than non-program unique participants to be retained in employment after they earned a credential. In terms of post-completion wages, all colleges showed positive wage gains for both program and unique participants. At LATI, UPs

and PPs earned, on average, $819 and $1,118 more, respectively, in quarterly wages after completion. At OJC, UPs and PPs earned more than their incumbent worker counterparts by $435 and $326, respectively. At PCC, the wage gain was positive for PPs ($553/quarter) and for UPs ($640). At RRCC, wage differences for both groups were smaller but positive. At FVCC, UPs saw a small wage gain of about $312 upon completing their programs, while PPs experienced a modest increase of $288 on average. For schools with smaller wage gain, it may be because many students do not enter the labor market after earning a credential, choosing instead to remain in school to further their education. In addition, for FVCC, since wage data were only available for three quarters of the grant period, wage results for this school are not a precise measure of employment outcomes and are only reported for reference.

TABLE 24. MEAN QUARTERLY WAGES OF INCUMBENT WORKERS

	PCC		RRCC		OJC		FVCC		LATI	
	UP	PP	UP	PP	UP	PP	UP	PP	UP	PP
Incumbent Workers (N)	2722	1483	962	366	25	9	1751	1007	147	143
Completers (N)	1437	505	957	575	45	15	896	83	133	100
Incumbent Worker Completers (N)	803	265	522	309	19	8	210	50	99	74
% Incumbent Worker Completers	55.9	52.5	54.5	53.7	42.2	53.3	23.4	60.2	74.4	74.0
Incumbent Worker Completers Employed After Completion (N)	151	151**	196	182	11	6	132	18	55	48
% of Incumbent Worker Completers Employed After Completion	18.8	61.1	41.4	58.9	57.9	75.0	62.8	36.0	55.6	64.9
Mean Wages*										
Mean Q Wage: Incumbent Worker Completers at Enrollment	$3940	$4027	$3992	$3884	$3112	$3893	$3093	$3672	$4096	$4094
Mean Q Wage: Incumbent Worker Completers Employed After Completion	$4580	$4580	$4361	$4108	$3547	$4219	$3405	$3960	$4915	$5212
Change in Mean Q Wage from Enrollment to Completion	$640	$553	$369	$224	$435	$326	$312	$288	$819	$1118

*Source: Unemployment Insurance data

**These numbers are the same. This happened when we placed the $500 earning limit per quarter on the analyses

Non-incumbent Worker Wages

Table 25 summarizes post-completion employment outcomes for non-incumbent workers. Across all colleges, the percentage of non-incumbent workers who found a job after completion was relatively low. On average, around 30 percent of non-incumbent workers were employed in the quarter immediately following program completion. RRCC had the highest rates of post-completion employment—about 27 percent of UPs and 40 percent of PPs from RRCC were employed after completing their first credentials. In general, non-incumbent workers from the PP population were more likely to be employed after earning a certificate than from among the UP population. In terms of wages, differences between unique and program participants were generally small. The greatest difference was observed among students at PCC, where non-incumbent workers from the PP population enjoyed, on average, a $568 quarterly wage advantage over non-incumbent worker UPs employed after completion.

TABLE 25. MEAN QUARTERLY WAGES OF NON-INCUMBENT WORKERS

	PCC		RRCC		OJC		FVCC		LATI	
	UP	PP	UP	PP	UP	PP	UP	PP	UP	PP
Completers (N)	1437	505	957	575	45	15	896	83	133	100
Non-incumbent Worker Completers (N)	634	240	435	266	26	7	686	33	34	26
% Non-incumbent Worker Completers	44.1	47.5	45.5	46.3	57.8	46.7	76.6	39.8	25.6	26.0
Non-incumbent Worker Completers Employed After Completion (N)	103	86	116	106	5	2	31	21	7	7
% Non-incumbent Worker Completers Employed After Completion	16.2	35.8	26.6	39.8	19.2	28.6	4.5	63.3	20.6	26.9
Mean Wages*										
Mean Q Wage: Non-incumbent Worker Completers Employed After Completion	$3550	$4118	$3757	$3588	$2561	$2116	$2386	$2349	$4743	$4651

*Source: Unemployment Insurance data

Section III: NANSLO Outcomes Comparison

Methodology

The quantitative analysis below looks at the impact NANSLO labs on student learning. For this analysis, we use data from the Colorado Community College Online System (CCCOnline). CCCOnline is part of CCCS and used NANSLO labs in science classes prior to and during the CHEO grant.[21] CCCOnline accepts students whose home institution is one of the 13 CCCS schools all courses are delivered online. CCCOnline was chosen for this analysis because of the number of students served. Additionally, the classes at CCCOnline use the same general syllabus each semester which was helpful to the comparison. We examined four introductory science courses for which NANSLO labs were used, e.g. Biology 111 (BIO 111), Chemistry 111 (CHEM 111), Physics 111 (PHYS 111) and Physics 211 (PHYS 211). It was confirmed by CCCS that these courses used NANSLO labs during the treatment period. Once the program participants were identified, EERC obtained "grade book" information from CCCOnline, which includes the grade as a point and as a percentage of the total points available for the course assignments.

Analysis

The main question, when considering the incorporation of NANSLO relative to other available remote-lab options (such as science kit labs), is whether or not, and how, student learning outcomes are affected by the use of NANSLO. In other words, does the use of NANSLO, as a replacement of or supplement to other fully remote options increase, decrease, or have no effect on student outcomes? CCCOnline's use of NANSLO in the early years of the grant presented a good opportunity for a comparative analysis. Each course used two NANSLO lab activities, replacing two of the eight to ten lab activities provided in each course.

To determine whether student learning outcomes were affected by the use of NANSLO labs in courses, we elected to study student outcomes in four introductory CCCOnline science courses. These courses were selected because they presented a sufficiently experimental situation for meaningful comparison. The courses used were: Biology 111 (BIO 111), Chemistry 111 (CHEM 111), Physics 111 (PHYS 111), and Physics 211 (PHYS 211). These courses were followed through CCCOnline for two semesters: the fall 2013 semester, when NANSLO was not being used because the lab was being moved to a new location and the spring 2014 semester, when the CCCS node became operational again. This allowed for analysis of one group of students who had no access to NANSLO labs (because the node was not operational) compared to another group of students who used NANSLO labs through CCCOnline. Aside from the incorporation of NANSLO labs in the spring semester versions of each course, there were no substantial differences in the course material, schedule, or evaluation methods between the

[21] NANSLO labs are no longer being used in CCCOnline classes since the closure of the NANSLO lab in Colorado.

two semesters.[22]

The labs were all followed by a quiz or test that would have covered the material learned from the lab. Grades for these assignments and final course grades were used as tests for the impact of NANSLO on student learning outcomes (Corter, et al., 2007; Ogot, et al., 2003). In order to determine whether the use of NANSLO was the potential cause of any changes in grades (Ogot, et al., 2003) we also looked at the impact of several control variables on student grades, e.g. age, gender, GPA, credit hours earned, and student major (Corter, et al., 2007). No differences were found with any of the control variables between the two cohorts

Our analysis of the average grades achieved by CCCOnline students in related coursework showed little difference between those students in courses with NANSLO lab activities and those in courses without. Table 26 displays average grades for lab-related assignments for students who did not have a NANSLO lab activity (the Comparison, Fall 2013 group) and those students who did use a NANSLO lab activity (the Treatment, Spring 2014) group. The final grade percentages for the chemistry and physics students were statistically similar. However, students in the Biology 111 treatment group had a significant increase in their grades as compared to the fall semester comparison group, indicating that the difference in average grades could potentially be linked to the use of NANSLO (Table 26). It should be noted that the BIO 111 course did not use NANSLO as a replacement for its kit labs in microscopy and meiosis/mitosis. Instead, the NANSLO versions of these labs were presented in addition to the kit versions, requiring students to take each lab topic twice, once with each modality. As such, this repetition of learning may be the reason why the 10-point increase in course grade percentages is seen in the treatment group.

Due to low sample sizes, we cannot say definitively that the following results are representative of the population as a whole, but they do provide an interesting first look at grade stability following the integration of NANSLO lab activities into the CCCOnline curriculum.

[22] See appendix 10.

TABLE 26. NANSLO OUTCOME COMPARISON

CCCOnline Course	Kit Lab (Fall 2013)	NANSLO Lab (Spring 2014)
BIO 111	Student Average Grade	
Unit 1 Test	57	56
Unit 3 Test	49	51
Final Grade Percentage **	43	53
CHEM 111		
Chap 9 Quiz	58	53
Chap 11 Quiz	57	56
Final Grade Percentage	57	66
Lab 6 Assignment	55	43
PHYS 111		
Unit 2 Test	58	52
Final Grade Percentage	47	50
Acceleration/Motion Lab Assignment	48	54
PHYS 111		
Unit 2 Test	51	48
Final Grade Percentage	48	48
Acceleration/Motion Lab Assignment	57	44

*$p < 0.05$ **$p < 0.01$ ***$p < 0.001$

To further control for other possible factors, the difference in final course grade outcomes for Biology 111 was modeled to isolate the impact NANSLO had on this change. Only age and GPA were determined to be potentially significant control variables.

Participation in NANSLO lab activities increased the final grade percentages by 10 points, holding all other variables constant. However, this was a weak to moderate relationship. All students, regardless of their ages, benefited from this 10-point increase in scores by being in the treatment group. While a student's incoming GPA increased average scores 17 points for each full point of GPA, e.g., raising a 2.0 to a 3.0, students at every success level received the same benefit from participating in NANSLO. These results show that even while controlling for age and previous academic success, NANSLO appears to be of benefit, regardless of starting position, when looking at BIO 111 final course grade percentages. Overall, this model explains 28 percent of the total variance in final grade percentages (Table 27).

TABLE 27. RESULTS OF AN OLS REGRESSION OF NANSLO USAGE BY AGE AND GPA

		Statistical Significance Information					
	Coefficient	Standard Error	t-statistic	p-value	Symbol	Lower 95% CL	Upper 95% CL
Treatment	9.9924	2.8347	3.5300	0.0000	***	4.4229	15.5618
Age	-0.2251	0.1929	-1.1700	0.2440		-0.6041	0.1538
GPA	17.2908	1.2656	13.6600	0.0000	***	14.8041	19.7774
Constant	5.0621	6.2200	0.8100	0.4160		-7.1587	17.2830
Notes: N=499; F-statistic is 66.44 with 3 *df*; adjusted R^2 is 0.2828.							

These results indicate that NANSLO would be appropriate for all students in producing the same expected results as kit labs. However, each course used only two NANSLO lab activities out of eight to 12 total lab activities provided in the class. Future research should focus on instances in which NANSLO lab activities make up the entirety, or at least a majority, of the lab activities offered in the course to test whether the impact becomes stronger. As was noted previously, low sample sizes prevent these conclusions from being representative. On campus, this planning does not generally occur. EERC team members have found that this issue remains the primary barrier to successful NANSLO usage.

Initial results with the limited population of students available suggest that students using NANSLO lab activities received grades similar to those of students using traditional distance lab options, such as lab kits. This indicates that students taking NANSLO lab activities learned the material just as well as students using kit labs.

Section IV: Multivariate Regression Evaluations of Student Outcomes by College

We will now turn to the analysis of outcome indicators by looking at two comparison cohorts. In the following comparison analysis, participants enrolled in CHEO-redesigned courses are referred to as the "CHEO cohort," while students enrolled in comparable courses before the CHEO grant period are called the "historic cohort." The treatment group (CHEO) time period includes academic terms from Spring 2013 through Spring 2016 (a total of 10 terms). The control group (historic) time period includes the 13 academic terms spanning Fall 2008 through Fall 2012, which is the period just before the colleges received the grant funds that allowed them to redesign their courses.

To make the cohort comparisons as accurate as possible, we paired each CHEO-redesigned program with the program that was most similar to it prior to the redesign period. In addition, to make sure that the two cohorts consist of students with the same demographic profiles, we control for a wide range of demographic characteristics in the regression analysis including: gender, age, ethnicity, Pell grant eligibility, and employment status.

In our analysis, we examine the impact of CHEO cohort membership (the independent variable) on students' academic performance, program completion, employment, and continuing

education rates. For academic performance, we examine three variables: the number of credits students earned in their CHEO-redesigned courses (measured by counting the number of courses in which the student received a grade of C or better), their success rates in those courses, and their cumulative GPA. One continuous and two categorical variables relate to program completion. The continuous variable reports the number of credentials earned by each student, regardless of whether the credential was earned in a CHEO program. Both categorical variables are binary: The first, *CHEO credential*, reports whether students completed a CHEO program, and the second, related variable, *credential type*, reports, for those who completed a program, which form of credential—certificate and/or AAS degree—was earned.

We also included multiple measures of employment in the model. The first is *incumbent worker*. We define an incumbent worker as a student who had documented wages in the UI data system greater than zero in the quarter prior to enrollment in at the college. The second is *employed post-completion.* We define employed post-completion as a student who had documented wages in the UI data system greater than $500 for at least two consecutive quarters after completing a credential. For students who were employed both pre-enrollment and post-completion, a continuous measure reflects the difference in their wages between those two periods in dollars. For students who were not employed prior to enrollment, a continuous measure of wage is under examination. Lastly, *continuing education* is examined by looking at a dichotomous variable that reports whether a student re-enrolled in *ANY* course in the same college in the term immediately following the completion of his or her first credential. Note that continuing education only captures the enrollment in the institution where the student completed a CHEO program.

Two colleges are under evaluation in this section: FVCC and PCC. We chose these schools for our comparison cohort analysis based on two main criteria. First, the size and enrollment scale at the colleges. In order to conduct a proper multivariate analysis that controls for a wide range of observed factors, the enrollment number should be large to allow enough variation to be observed. Many of the colleges in CHEO were small rural schools and thus had small enrollments. Additionally, the two schools chosen for the analysis designed CHEO programs based on preexisting academic programs to ensure a comparable historic cohort. The evaluation of each college is discussed separately.

FVCC

Summary Statistics

We begin our comparative analysis by looking at the demographics of unique participants in each cohort. As the focus was on comparing the two cohorts, we were concerned only with variables that were associated with cohort membership in a way that was statistically significant; therefore, additional statistics are not reported for variables that lacked such a relationship. Table 28 identifies the demographic differences between the two cohorts. The CHEO-redesigned program had a greater proportion of male enrollees compared to the historic

cohort. Additionally, CHEO-cohort students were more likely to enroll as part-time students, were younger, and were less likely to be eligible for Pell grants.

We should also note that the cohort samples are not equal in size; the historic cohort sample contains a comparatively smaller number of participants than the CHEO cohort does. There were 3,903 unique participants in the CHEO cohort and 2,235 unique participants in the historic cohort. While this imbalance does not itself pose a threat to the analysis that follows, the uneven distribution of different demographic characteristics may bias some results. For example, if we find that males were more likely than females to complete their programs, and the CHEO cohort contained a higher proportion of male students than the historic cohort did, than any results regarding program completion will be biased toward the CHEO cohort. Therefore, it is necessary in the multivariate regression analysis to control for these demographic characteristics.

TABLE 28. DEMOGRAPHIC CHARACTERISTICS OF CHEO PARTICIPANTS[23] BY COHORT

Characteristic		CHEO cohort (N=3903)	Percentage	Historic cohort (N=2235)	Percentage
Gender	Male	1319	38.1	728	32.6
	Female	2131	61.6	1507	67.4
Race	Hispanic/Latino	100	2.6	44	2.0
	American Indian or Alaskan Native	52	1.3	9	0.4
	Asian	13	0.3	1	0.04
	Black or African American	56	1.4	15	0.7
	Native Hawaiian or Other Pacific Islander	14	0.4	0	0
	White	3240	83.0	1839	82.3
	More than one race	0	0	0	0
Enrollment	Full-time status	1996	51.1	1468	65.7
	Part-time status	1907	48.9	767	34.3
Other	Incumbent worker	1967	50.4	1135	50.6
	Eligible veterans	218	5.6	98	4.4
	Participant age (Mean)	27		29	
	Persons with a disability	235	6.0	171	7.7
	Pell grant eligible	1602	39.8	1088	48.7
	TAA eligible	10	0.3	60	2.7

Data on course grades shown in table 29 reveal that the CHEO cohort had a slightly higher success rate than the historic cohort; 83 percent of CHEO cohort enrollments culminated in

[23] Student-level data was missing for many cases; therefore, the individual Ns for each variable will not add up to the total N for the populations they represent.

passing grades compared with 82 percent of historic cohort enrollments. CHEO students were also less likely to withdraw from their courses—only about 7 percent of course enrollments in the CHEO cohort were withdrawn versus about 10 percent of historic cohort enrollments. This is notable given that the CHEO program included more online and hybrid classes—delivery methods that are often associated with higher course withdrawal rates. One possible explanation for this counterintuitive finding is the influence of career coaching and intensive advising in the CHEO program.

TABLE 29. COMPARISON OF GRADES EARNED BY STUDENTS IN ALL CHEO-REDESIGNED COURSES VERSUS COMPARABLE HISTORIC COURSES BY COHORT: FVCC

College-level course grade	CHEO	Percent	Historic	Percent
A	4300	43.6	2171	44.6
B	2663	27.0	1223	25.1
C	1312	13.3	593	12.2
Success Rate	83.9		81.8	
D	276	2.8	175	3.6
F	720	7.3	248	5.1
Withdrawn	592	6.0	461	9.5
Total (N)	9863	100	4871	100

Table 30 lists the number of general credentials and CHEO-program credentials earned by both cohorts. Note that for the historic cohort, "CHEO courses" refer to the courses in the related historic programs judged to be the most comparable to the courses that were redesigned and offered under the CHEO program. The percentage of short-term-certificate earners in the CHEO cohort (1.3 percent) was slightly lower than that of the historic cohort (2.6 percent). While this difference was not substantial, the gap was much wider with regard to medium-term certificates, where the historic cohort had a larger number of completers (16 percent/N = 359). However, this group primarily earned a certificate of "general study" rather than a health credential. Only five students in the CHEO cohort earned this certificate.

TABLE 30. CREDENTIALS EARNED BY TIME TO CREDENTIAL BY COHORT: FVCC

	CHEO Cohort: Earned Credential			Historic Cohort: Earned Credential		
	Short-term (<1 year)	Medium-term (>1 year to <2 years)	Long-term/ 2-year degree	Short-term (<1 year)	Medium-term (>1 year to <2 years)	Long-term/ 2-year degree
Healthcare office management	/	/	1	/	/	8
Medical assistant			45			49
Paramedicine			15			26
Radiologic technology			13			20
CHEO Credentials[24]			74			103
Non-CHEO Credentials	32	45	233	58	359	336
All Credentials	32	45	307	58	359	439

Table 31 and 32 provide summary information on the wage outcomes for the CHEO and Historic Cohorts upon program completion. Note that for program participants, completion is defined as obtaining the first CHEO credential (certificate or degree). This means that the credential had to be earned in a CHEO-redesigned program. For non-program participant students, completion is measured as attaining any credential. For the CHEO cohort, there is a higher percentage (76) of non-incumbent worker completers compared to Historic cohort (47). For incumbent worker completers, CHEO students and Historic students are comparable in the probability of being retained in employment for two quarters after completion. However, CHEO students received a lower wage ($312/quarter) than historic cohort students ($1839). Lastly, for mon-incumbent worker completers, a higher proportion was employed after completion with higher average quarterly wages in the historic cohort. Again, due to limited time span of wage data for CHEO cohort in FVCC, the wage outcomes are likely underestimated for CHEO cohort and should be read with caution.

[24] In FVCC, CHEO credentials consist of only two-year AAS degrees.

TABLE 31. MEAN QUARTERLY WAGES OF INCUMBENT WORKERS BY COHORT: FVCC

	CHEO Cohort	Historic Cohort
Completers (N)	896	400
Incumbent Worker Completers (N)	210	210
% of Incumbent Worker Completers	23.4	52.5
Mean wages*		
Mean Q Wages: All Incumbent Workers at Enrollment	$3008	$3451
Mean Q Wages: Incumbent Worker Completers at Enrollment	$3093	$3362
Mean Q Wages of Incumbent Worker Completers Employed Post-Completion	$3405	$5201
Difference in Mean Q Wages for Incumbent Worker Completer	$312	$1839
Number of Incumbent Worker Completers Employed Post-completion	132	141

*Source: Unemployment Insurance data

TABLE 32. MEAN QUARTERLY WAGES OF NON-INCUMBENT WORKERS

	CHEO Cohort	Historic Cohort
Completers (N)	896	400
Non-incumbent Worker Completers (N)	686	190
% of Non-incumbent Worker Completers	76.6	47.5
Non-incumbent Worker Completers Employed Post-Completion	31	94
Mean Wages*		
Mean Q Wages: Non-incumbent Worker Completers Employed Post- Completion	$2386	$5874

*Source: Unemployment Insurance data

Regression Analysis

In the regression analysis to follow, we examine cohort differences in academic performance then discuss outcomes related to program completion. Finally, we present our findings relative to trends in employment and continuing education. Across all outcome measures, for individual i, we adopt the following linear regression specification in our analysis:

$$Y_i = \beta_0 + \beta_1 CHEO_i + \beta_2 CHEO_i * ProgramParticipant_i + \beta_3 X_i + \varepsilon_i$$

Where Y_i is a measure of academic/program/employment outcomes, $CHEO_i$ is a binary indicator of whether an individual is in the CHEO cohort. $ProgramParticipant_i$ is also a binary variable indicating whether an individual enter the college as a program participant. X_i is a set

of control variables of individual demographic characteristics, including gender, age, enrollment status, ethnicity group, disability, veteran and employment status etc.

The main variables of interest in the above specification are the CHEO cohort indicator and the interaction term between the CHEO cohort and the status of program participant. Two corresponding regression parameters ($\beta_1 \; and \; \beta_1 + \beta_2$) capture the main effects of CHEO cohort. The former (β_1) captures the difference in outcome between CHEO cohort non-program participant students and historic cohort students. The latter ($\beta_1 + \beta_2$) captures the difference in outcomes between CHEO cohort program participants and historic cohort students. As discussed above, the CHEO grant funded a wide range of areas in the college including facilities, course equipment and personnel etc. As a result, a large group of students were "touched" by the grant. This analysis was designed to try to focus on those students affected most by the grant. We identify program participants as students who were more intensively exposed to CHEO and as a result more likely to be involved in health care specific education programs. Hence, the impact of CHEO is expected to be different for general student (non-program) and program participants.[25] Our specification distinguishes between the effects for the two different groups directly. Notice that β_2 in the model measures the extra impact of CHEO intervention on program participants in addition to the general impact on unique participants. One could interpret β_1 as the baseline impact of CHEO intervention compared to the historic cohort, and β_2 as the incremental influence from the baseline impact of CHEO on program participants.

Course-level Academic Outcomes

The regression analysis measures four course-level outcomes: total CHEO credits earned, success (pass rate, measured as a grade of C or better) in CHEO courses, and cumulative GPA. Note that for the historic cohort, the term "CHEO courses" refers to program courses *similar to* those that would later be included in the redesigned CHEO program. Each regression includes a set of control variables that account for observed differences between the historic and CHEO cohorts, including gender (female), ethnicity (minority), disability status (disability reported), Pell grant eligibility (eligible), enrollment status (full time), veteran status (veteran).

Table 33 summarizes the regression results. The variables of interest are an indicator of whether the student is in the CHEO cohort and the interaction term between CHEO cohort indicator and program participant indicator. Estimated parameters (Beta coefficients) and standard deviations for all variables are reported.

The results are mixed about the impact of CHEO intervention, depending on the specific outcome measures. Looking at the baseline impact of CHEO intervention (β_1), it is positive on cumulative GPA while it is negative on number of Credits earned and pass rate. To be specific, compared to members of the historic cohort, non-program participant CHEO students earned a

[25] See definitions for program and non-program participants above.

0.2-point advantage in their overall GPA but were about 7.8 percent less likely to pass their CHEO course. Both of these findings are statistically significant.

Turning to the incremental effect from baseline on program participants, the results indicate that CHEO interventions have a more positive influence on program participants than on general grant-touched students on all three outcome measures. By summing up the baseline effect and incremental effect ($\beta_1 + \beta_2$), we estimate the impact of CHEO intervention on program participants compared to historic cohort. CHEO program participants earned 0.1 (-6.9+7.29) program course credits and have a 0.39 (0.21+0.18) higher cumulative GPA than historic cohort students. The CHEO course pass rate for program participants is lower than the historic cohort (3% lower) with statistical significance.

Female students were a little over 4 percent more likely than their male counterparts to pass their CHEO courses, and their GPAs were 0.20 points higher on average. Full-time students not only took more CHEO credits (1.58 points more) but also were a little over 2 percent more likely to pass their CHEO course. On the other hand, Pell eligibility was a negative predictor of performance, associated with both lower course success rates and lower GPAs.

TABLE 33. REGRESSION COEFFICIENTS AND STANDARD DEVIATIONS FOR MODELS PREDICTING THE EFFECTS OF THE CHEO GRANT ON THREE COURSE-LEVEL OUTCOMES: FVCC

	Total CHEO Credits Earned	CHEO Pass Rate	Cumulative GPA
CHEO Cohort ***(β_1)***	***-6.993**** ***(-22.39)***	***-0.0783**** ***(-5.33)***	***0.210**** ***(5.92)***
CHEO Cohort* Program Participant ***(β_2)***	***7.029**** ***(29.00)***	***0.0485**** ***(4.25)***	***0.189**** ***(-5.24)***
Demographic Control Variable			
Female	1.993*** (8.76)	0.0433*** (4.04)	0.202*** (6.83)
Minority	-0.145 (-0.51)	0.00385 (0.29)	-0.0315 (-0.87)
Disability	0.455 (1.03)	-0.0447* (-2.14)	-0.102 (-1.84)
Pell Eligible	-0.0951 (-0.42)	-0.0410*** (-3.85)	-0.0622* (-2.16)
Full time	1.587*** (7.15)	0.0235* (2.25)	0.0554 (1.89)
Veteran	1.516* (2.09)	0.0247 (0.72)	0.0968 (0.95)
Incumbent Worker	1.076*** (4.88)	-0.00999 (-0.96)	0.106*** (3.82)
Constant	7.415*** (21.29)	0.823*** (50.20)	2.480*** (61.37)
N	4831	4831	4831

t statistics appear in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Program-Completion Outcomes

Table 34 summarizes the results of our regression analysis of program-completion outcomes. We find that in terms of program completion, the CHEO cohort did not outperform the historic cohort. In fact, across all three measures of program completion—CHEO credential[26], number of

[26] CHEO credential includes both certificates and degrees

credentials, and degree type (AAS vs. certificate)—the baseline effect (β_1)of being in the CHEO cohort is negative. However, as discussed in the comparative analysis section above these results should be read with caution. The shorter timespan available to study the CHEO cohort severely limited the length of time in which CHEO participants could finish their programs. If, for example, the majority of students in CHEO-redesigned programs were seeking 2-year credentials, the study period would not have been long enough to capture their completion data. Therefore, CHEO program-completion outcomes are likely underestimated due to data limitations.

However, compared to the baseline effect, for CHEO program participants, the completion outcomes are improved (β_2). The probability of earning a credential is about the same for CHEO program participants and the historic cohort, with a difference in probability of less than 0.5 percent. Nevertheless, considering the data limitations, it is still too early to make conclusions about the impact of CHEO cohort performance in terms of program completion.

TABLE 34. REGRESSION COEFFICIENTS AND STANDARD DEVIATIONS FOR MODELS PREDICTING THE EFFECTS OF THE CHEO GRANT ON THREE PROGRAM-COMPLETION OUTCOMES: FVCC

	All Participants		CHEO Program Completers
	Any CHEO Credential Earned	Number of Credentials	CHEO AAS (vs. CHEO Certificate)
CHEO Cohort (β_1)	-0.0372***	-0.903***	-0.140***
	(-6.53)	(-105.02)	(-5.04)
CHEO Cohort * Program Participant (β_2)	0.0326***	0.0309***	-0.0426
	(5.86)	(3.68)	(-1.42)
Demographic Control Variables			
Female	0.0187***	0.00544	0.108***
	(4.06)	(0.78)	(5.30)
Minority	-0.00165	0.00315	-0.0195
	(-0.29)	(0.36)	(-0.80)
Disability	0.0160	0.0141	0.0293
	(1.81)	(1.06)	(0.81)
Pell Eligible	0.00103	0.0136	0.0291
	(0.22)	(1.96)	(1.51)
Full Time	0.0193***	0.0655***	0.00109
	(4.24)	(9.52)	(0.05)
Veteran	0.00302	0.00600	-0.0195
	(0.18)	(0.24)	(-0.24)
Incumbent Worker	0.00743	0.0196**	0.0564**
	(1.66)	(2.91)	(2.90)
Constant	0.0151*	0.936***	0.876***
	(2.46)	(101.07)	(28.63)
N	6129	6129	850

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Employment and Continuing Education Outcomes

Looking at employment outcomes, we estimate the effect for incumbent and non-incumbent workers separately. For incumbent workers, we examine two variables: whether students were retained in employment for at least two consecutive quarters after receiving their credential (*employed post-completion*), and the change in their quarterly wage after receiving that credential (difference in wage). For non-incumbent workers, employment status at completion is also

studied. However, instead of examining wage differences, we look at the wage earned post-completion. Note that all post-completion wages are calculated as the average of wages earned in the two consecutive quarters after program completion.

In addition to employment outcomes, we are also interested in whether students pursued further education after receiving their first credential. We therefore look at whether program completers were retained in other educational programs at the same college after receiving a certificate. Note that continuing education in other schools was not captured in this data set. Therefore, our measure of continuing education likely underestimates the true number of students who pursued further education.

For incumbent workers, the CHEO-redesigned program at FVCC was positively associated with post-completion employment rates. (See columns (1)-(2) of table 35.) CHEO cohort members were 67 percent more likely than their counterparts in the historic cohort to be retained in employment after they received a CHEO credential, and that difference was statistically significant. The incremental impact of being a program participant is not significantly different from non-program participants. In terms of post-completion wages, both non-program and program CHEO students did not have earning that were significantly different from their historic counterpart.

For non-incumbent workers, being in a CHEO cohort is not associated with higher post-completion employment rate. However, for those non-incumbent workers who were employed after completion, their wage upon completion was significantly lower than their historic cohort counterparts ($3,434/quarter). There is a very important caveat in interpreting this result. Note that FVCC only provided data on wage up to the beginning of Year 3 in CHEO grant period, therefore, the employment outcomes were largely underestimated given the limited data.

Lastly, examining the probability of continuing education, the CHEO program significantly increases the probability of pursuing further study. Being in the CHEO cohort, a non-program CHEO student is a little over 2 percent more likely to continue education within the same school, whereas CHEO program participant is a little over 11 percent more likely to retain in education. It is important to note this post-completion education status when thinking about the employment results noted above. These findings suggest that it is too early to examine employment outcomes for this group.

TABLE 35. REGRESSION COEFFICIENTS AND STANDARD DEVIATIONS FOR MODELS PREDICTING THE EFFECTS OF THE CHEO GRANT ON EMPLOYMENT AND CONTINUING EDUCATION OUTCOMES: FVCC

	Incumbent Worker Completer		Non-Incumbent Worker Completer		All Completers
	Employed Post-Completion	Difference in Wage	Employed Post-Completion	Wage at Completion	Continued Education
CHEO Cohort (β_1)	0.672***	-232.9	0.0421	-3434.2**	0.0217**
	(15.89)	(-1.22)	(1.70)	(-2.93)	(2.78)
CHEO Cohort* Program participant (β_2)	-0.0702	119.3	0.0131	-236.8	0.0887***
	(-1.41)	(0.54)	(0.53)	(-0.18)	(10.18)
Demographic Control Variables					
Female	0.0119	-89.65	0.103***	-653.8	0.0307***
	(0.63)	(-1.12)	(5.87)	(-0.88)	(6.61)
Minority	-0.0140	24.89	-0.0265	-312.5	-0.000456
	(-0.62)	(0.26)	(-1.33)	(-0.33)	(-0.08)
Disability	-0.0643	154.3	-0.0523*	76.24	0.00600
	(-1.64)	(0.93)	(-2.02)	(0.06)	(0.73)
Pell Eligibility	-0.0514**	-52.31	-0.0138	-1198.6	-0.00325
	(-2.92)	(-0.70)	(-0.85)	(-1.79)	(-0.73)
Full Time	0.0774***	46.13	0.109***	-1430.7	0.0277***
	(4.21)	(0.60)	(6.41)	(-1.79)	(6.10)
Veteran	-0.102	313.7	0.0341	-3840.1	-0.0841*
	(-0.73)	(0.50)	(0.29)	(-0.94)	(-2.46)
Constant	0.0911***	207.5*	-0.00479	7579.3***	-0.0368***
	(4.20)	(2.27)	(-0.26)	(7.91)	(-7.27)
N	1539	1445	1492	147	3031

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

PCC

Summary Statistics

At PCC, a total of 4,375 unique participants make up the CHEO cohort and 5,099 unique participants make up historic cohort, making the two groups comparable in size. Again, we begin with a look at the demographic composition of each cohort; these details are displayed in

table 36. The two cohorts are similar in terms of gender, ethnicity, enrollment status, and age. The CHEO cohort contains a slightly lower proportion of full-time students (24.7 percent attended full time vs. 27.6 percent of the historic cohort), and its members were both more likely to be eligible to receive Pell grants (65.2 percent vs. 57.2 percent) and more likely to be incumbent workers (63.5 percent vs. 53.1 percent) In general, both the historic and CHEO cohorts contain large groups of nontraditional students—i.e., those who are over 25 years old.

TABLE 36. DEMOGRAPHIC CHARACTERISTICS OF CHEO PARTICIPANT BY COHORT: PCC[27]

Characteristic		CHEO Cohort (N=4375)	Percentage	Historic Cohort (N=5099)	Percentage
Gender	Male	1228	28.1	1347	26.4
	Female	3141	71.8	3752	73.6
Race	Hispanic/Latino	1203	27.5	1426	28.0
	American Indian or Alaskan Native	144	3.3	123	2.4
	Asian	74	1.7	72	1.4
	Black or African American	118	2.7	122	2.4
	Native Hawaiian or Other Pacific Islander	0	0.0	0	0.0
	White	2651	60.6	3093	60.7
	More Than One Race	0	0.0	1	0.0
Enrollment[28]	Full-time Status	734	24.7	1405	27.6
	Part-time Status	2242	75.3	3694	72.4
Other	Incumbent Workers	2722	63.5	2709	53.1
	Eligible Veterans	260	5.9	194	3.8
	Participant Age (Mean)	28		29	
	Persons with a Disability	105	2.4	156	3.1
	Pell Grant Eligible	2854	65.2	2917	57.2
	TAA Eligible	0	0.0	0	0.0

A comparative analysis of course grades is presented in table 37. The CHEO cohort tended to earn slightly higher letter grades in general, boasting a higher percentage of students who earned A grades (38.0 percent vs. 33.5 percent) and B grades (23.3 percent vs. 19.4 percent) than the historic cohort. In terms of overall success and withdrawal rates, however, the two cohorts were not substantially different.

[27] There are missing observations on demographic characteristics and therefore the total number in each category will not always add up to the total number of participants.

[28] PCC enrollment information contains 1457 observations

TABLE 37. COMPARISON OF GRADES EARNED BY STUDENTS IN ALL CHEO-REDESIGNED COURSES VERSUS COMPARABLE HISTORIC COURSES BY COHORT: PCC

GRADE	CHEO	Percent	Historic	Percent
A	4771	38.0	4473	33.5
B	2934	23.3	2597	19.4
C	1813	14.4	1677	12.5
Pass (P)			1436	10.7
Success Rate	75.7%		76.1%	
D	441	3.5	382	2.9
F	806	6.4	1029	7.7
Withdrawn	1826	14.5	1775	13.3
Total (N)	12591	100	13369	100

Table 38 lists the number of overall credentials and CHEO-program credentials earned by both cohorts. For the historic cohort, the term "CHEO credentials" refers to credentials granted by programs that were similar to ones that were redesigned under the CHEO grant.

In terms of the overall number of credentials earned by participants, the historic cohort outperformed the CHEO cohort. Larger proportions of the historic cohort population became credential earners in all three credential categories. However, when focusing specifically on CHEO program credentials, the results are reversed; the CHEO cohort out-earned their historic-cohort counterparts in all three categories. For example, 9 percent of the CHEO cohort participants earned short-term CHEO credentials versus only a little over 6 percent of the historic cohort.

TABLE 38. CREDENTIALS EARNED BY STUDENTS BY TIME TO CREDENTIAL BY COHORT: PCC

	CHEO Cohort: Earned Credential			Historic Cohort: Earned Credential		
	Less Than One Year	Greater Than One Year	2-Year Degree	Less Than One Year	Greater Than One Year	2-Year Degree
Any Credential	462	122	268	723	257	685
% of Total Participants	10.6	2.8	6.1	14.2	5.0	13.4
CHEO Credential	395	110	137	317	87	108
% of Total Participants	9.0	2.5	3.1	6.2	1.7	2.1

We close this section with an examination of employment outcomes. Focusing on incumbent workers, there was a slightly higher percentage of incumbent workers among the cohort of CHEO completers (55.9 percent) than among the historic cohort (50.4 percent). However, the percentage of incumbent workers who were retained in employment at the time of program

completion was relatively low for graduates of both programs—only slightly under 19 percent of CHEO completers and 29 percent of historic cohort graduates were employed at that time.

Looking at mean wages, both cohorts experienced a wage decrease after program completion. As mentioned above, one main reason for the wage decrease is simply data availability. First, wage at completion is calculated as the average wage of the two consecutive quarters after a participant completes a certificate. However, there is usually a time lag between when a student graduates and when he or she finds a job. Therefore, the data likely underestimates employment outcomes. Moreover, using the UI data, specific employment status, full-time or part-time, as well as type of job, is unknown to the researcher. Lastly, we do not know whether students took jobs in health-related fields.

TABLE 39. COMPARISON OF MEAN QUARTERLY WAGES OF INCUMBENT WORKERS BY COHORT: PCC

	CHEO Participants	Historic Participants
Completers (N)	1437	1374
Incumbent Worker Completers (N)	803	693
% of Incumbent Worker Completers	55.9	50.4
Mean Wage		
Mean Q Wages: All Incumbent Workers at Enrollment	$3938	$ 4137
Mean Q Wages: Incumbent Worker Completers at Enrollment	$3940	$4210
Mean Q Wages of Incumbent Worker Completers Employed Post-completion	$4580	$ 3136
Difference in Mean Q Wages for Incumbent Workers	$640	-$1074
Incumbent Worker Completers Employed Post-Completion (N)	151	220
% Incumbent Worker Employed Post-completion	18.8%	29.1%

Among non-incumbent workers, the CHEO cohort slightly outperformed the historic cohort in terms of their post-completion employment rate as well as their average wage: 16.4 percent of non-incumbent workers in the CHEO cohort managed to find a job at completion compared to 14.7 percent of historic cohort graduates, and the mean quarterly wage among CHEO completers was $1,095 higher than that of the historic cohort.

TABLE 40. COMPARISON OF MEAN QUARTERLY WAGES OF

	CHEO Participants	Historic Participants
Completers (N)	1437	1374
Non-Incumbent Worker Completers (N)	634	681
% of Non-Incumbent Worker Completers	44.1%	49.6%
Mean Wage		
Mean Q Wages: Non-Incumbent Worker Completers Employed Post-completion	$3550	$2455
Non-Incumbent Worker Completers Employed Post-completion (N)	103	100
% Non-incumbent Workers Employed Post-completion	16.4%	14.7%

Regression Analysis

Similar to FVCC, we will begin our cohort comparisons by examining differences in students' academic performance and program completion rates, then we will discuss outcomes related to employment and continuing education. For each outcome measure, we estimate the same regression model specified in FVCC section. Similarly, the main variables of interest are both the binary indicator of CHEO cohort status, and the interaction term of CHEO cohort and program participant status. The former (captures the baseline impact of CHEO intervention and the later represents the additional effect of being a program participant in CHEO.

In the regression analysis presented in this section, we examine two course-level outcomes: the total number of CHEO credits earned and students' success (pass) rates in CHEO courses. As described above, for the historic cohort, the term "CHEO course" refers to a course in a related historic program judged to be comparable to one that was redesigned and offered under the CHEO program. We also examine two program-level outcomes—binary variables that indicate whether a participant earned a CHEO credential and whether a participant earned any (including CHEO and non-CHEO) credential.

Table 41 summarizes the regression results. First, the baseline effects (β_1) of CHEO intervention are either insignificant or slightly negative, which indicates that compared to historic cohort, non-program participant CHEO students did not outperform historic cohort students in terms of academic and program completion outcomes.

Further looking at effect of CHEO intervention on program participants (β_1+β_2), results are significant and positive across all outcome measures. Being a CHEO program participant is associated with 5 more credits earned in CHEO courses and a 19 percent higher probability of passing a CHEO course. For completion, program participants are 11 percent more likely to receive a CHEO credential and nearly 6 percent more likely to earn any credentials.

Looking at other predictors of academic performance, veterans were associated with positive academic outcomes. On the other hand, being female, nonwhite or an incumbent worker was associated with various negative course and program outcomes, although not always with statistical significance.

TABLE 41. REGRESSION COEFFICIENTS AND STANDARD DEVIATIONS FOR MODELS PREDICTING THE EFFECTS OF THE CHEO GRANT ON COURSE-LEVEL AND PROGRAM-COMPLETION OUTCOMES: PCC

	(1) Total CHEO credit	(2) CHEO pass rate	(3) CHEO Credential	(4) Any Credential
CHEO Cohort (β_1)	***-4.332****	***-0.00737***	***-0.0896****	***-0.000423***
	(-16.48)	***(-0.66)***	***(-11.21)***	***(-0.04)***
CHEO Cohort*	***9.334****	***0.191****	***0.194****	***0.0679****
Program participant (β_2)	***(32.85)***	***(15.69)***	***(22.40)***	***(5.21)***
Demographic Control Variables				
Female	-0.960***	0.0657***	-0.115***	0.0176
	(-4.37)	(6.99)	(-17.25)	(1.69)
Minority	-1.617***	-0.115***	-0.0279***	-0.0103
	(-8.18)	(-13.64)	(-4.65)	(-1.14)
Disability	-1.113	-0.0682**	-0.0248	0.0735**
	(-1.90)	(-2.72)	(-1.39)	(2.77)
Pell Eligibility	-0.220	-0.102***	-0.0220***	0.0323***
	(-1.09)	(-11.76)	(-3.59)	(3.48)
Full Time	-0.0363	-0.0460***	-0.0108	0.0274*
	(-0.12)	(-3.66)	(-1.21)	(2.05)
Veteran	1.402**	0.0564**	-0.0127	0.0280
	(3.07)	(2.88)	(-0.92)	(1.32)
Incumbent Worker	0.148	0.00580	-0.0154**	-0.0241**
	(0.76)	(0.70)	(-2.61)	(-2.70)
_cons	7.723***	0.645***	0.209***	0.173***
	(28.92)	(56.39)	(25.72)	(13.58)
N	9474	9474	9474	9474

Our final regression analysis is presented in table 42. In this table, we examine employment-related variables and continuing education. Similar to results for academic and completion outcomes, compared to historic cohort data, the CHEO-redesigned program at PCC had a positive impact on only program participants' employment status after completion (β_1+β_2). For

incumbent workers, CHEO program participants were 1 percent more likely to be retained in employment right after they received a CHEO credential with statistical significance. Non-incumbent workers program participants are nearly 9 percent more likely to gain employment after earning a CHEO credential. Moreover, examining the probability of continuing education, the CHEO program significantly increased the probability of pursuing further study. Program participants in the CHEO cohort were 19 percent more likely to return to their schools to pursue further education. On the other hand, for non-program participants, the effect captured by baseline impact (β_1) are either negative or insignificant, indicating that non-program participants did not outperform historic cohorts. Like the analysis for FVCC, these findings should be read with caution as there are data and time limitations.

TABLE 42. REGRESSION COEFFICIENTS AND STANDARD DEVIATIONS FOR

	Incumbent Worker Completers		Non-Incumbent Worker Completers		All Completers
	(1) Employed at Completion	(2) Difference in Wage	(3) Employed at Completion	(4) Wage at Completion	(5) Continued Education
CHEO Cohort (β_1)	***-0.252****	***-170.5***	***-0.160****	***4475.2***	***0.0115***
	(-8.01)	***(-1.68)***	***(-4.68)***	***(1.55)***	***(0.50)***
CHEO Cohort*	***0.262****	***-60.06***	***0.247****	***-3705.0***	***0.188****
Program participant (β_2)	***(8.52)***	***(-0.61)***	***(7.09)***	***(-1.28)***	***(10.08)***
Demographic Control Variables					
Female	-0.142***	134.2	-0.159***	-155.2	-0.0149
	(-6.23)	(1.76)	(-7.39)	(-0.37)	(-0.99)
Minority	-0.0501*	-53.30	-0.0104	899.5*	-0.0381*
	(-2.37)	(-0.76)	(-0.49)	(2.00)	(-2.53)
Disability	-0.0707	105.0	0.0270	752.8	0.0926
	(-1.30)	(0.60)	(0.45)	(0.57)	(1.91)
Pell Eligibility	-0.0645**	-80.71	-0.0894***	-87.82	-0.00501
	(-3.01)	(-1.13)	(-4.24)	(-0.21)	(-0.34)
Full Time	-0.0922**	-206.1	-0.0459	-1148.7	0.00400
	(-2.77)	(-1.84)	(-1.56)	(-1.61)	(0.13)
Veteran	-0.0226	104.4	0.0224	1249.5	0.00934
	(-0.49)	(0.68)	(0.51)	(1.58)	(0.31)
_cons	0.423***	137.2	0.322***	2445.1***	0.0172
	(16.09)	(1.51)	(13.23)	(6.14)	(0.94)
N	1484	1359	1240	203	1687

CONCLUSION AND RESEARCH NEXT STEPS

Under the CHEO grant, consortium colleges developed or redesigned identified allied health programs to expand or create hybrid and online delivery options. Schools incorporated NANSLO lab activities into coursework to enable science and allied health students to complete science labs remotely. Consortium colleges also hired career coaches—to assist students from

registration through graduation. The project further required schools to expand and/or develop relationships with employers and workforce representatives in their communities and to create stackable credentialing programs with viable career pathways for students.

This report provided an examination of the implementation and outcomes of CHEO and provided some insight into the sustainability of grant funded activities, polices and practice. However, more research should be conducted. The outcomes analysis presented in this report should be examined again after the passage of more time to provide more accurate results. Additionally, it would be helpful to examine how the colleges were able to sustain and scale grant activities.

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APPENDIX

TABLE A1. REGRESSION COEFFICIENTS AND STANDARD DEVIATIONS FOR MODELS PREDICTING THE EFFECT OF CAREER COACHING ON FIVE STUDENT-LEVEL OUTCOMES: KOC

	(1) Cumulative GPA	(2) Total CHEO Credits	(3) CHEO Retention	(4) Any Credential	(5) CHEO Credential
Any Career Coaching Intervention	0.944 (0.61)	1.778*** (3.92)	0.235*** (5.05)	0.107** (2.64)	0.0695* (2.45)
Age	0.0735 (0.83)	-0.0143 (-0.55)	0.000121 (0.05)	-0.00235 (-1.02)	-0.00180 (-1.11)
Full Time	-0.0524 (-0.03)	0.256 (0.55)	0.00169 (0.04)	0.0752 (1.81)	-0.00853 (-0.29)
Minority	0.778 (0.53)	-0.305 (-0.72)	-0.0618 (-1.41)	0.00125 (0.03)	0.00198 (0.07)
Male	0.679 (0.37)	0.0999 (0.19)	0.176** (3.17)	-0.0895 (-1.86)	-0.0477 (-1.41)
Veteran	-2.700 (-0.78)	5.302*** (5.27)	0.118 (1.14)	0.257** (2.86)	0.303*** (4.82)
Disability	-16.67 (-1.30)	0.627 (0.17)	-0.232 (-0.61)	-0.213 (-0.64)	-0.0853 (-0.37)
Pell Eligible	16.58*** (5.92)	0.691 (0.85)	-0.0102 (-0.12)	-0.0118 (-0.16)	0.00932 (0.18)
Constant	0.455 (0.15)	3.005*** (3.35)	0.00211 (0.02)	0.101 (1.27)	0.0600 (1.07)
N	323	323	323	323	323

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE A2. REGRESSION COEFFICIENTS AND STANDARD DEVIATIONS FOR MODELS PREDICTING THE EFFECT OF ADVISING INTENSITY ON FIVE STUDENT-LEVEL OUTCOMES: KOC

	(1) Cumulative GPA	(2) Total CHEO Credits	(3) CHEO Retention	(4) Any Credential	(5) CHEO Cred
Number of Career Advising Interactions	0.00479*	0.0931***	0.00192*	0.00565***	0.00635***
	(2.23)	(14.03)	(2.19)	(8.38)	(16.70)
Age	0.0165*	-0.0252	0.000730	-0.00302	-0.00276*
	(2.46)	(-1.22)	(0.27)	(-1.43)	(-2.33)
Full Time	0.106	0.535	0.0142	0.0921*	0.00872
	(0.88)	(1.43)	(0.29)	(2.43)	(0.41)
Minority	-0.226*	-0.150	-0.0543	0.0107	0.0115
	(-2.04)	(-0.44)	(-1.20)	(0.31)	(0.58)
Male	0.0118	0.347	0.173**	-0.0745	-0.0288
	(0.08)	(0.80)	(3.02)	(-1.69)	(-1.16)
Veteran	-0.457	-0.368	0.0446	-0.0871	-0.0948
	(-1.55)	(-0.40)	(0.37)	(-0.94)	(-1.81)
Disability	0.665	4.408	-0.151	0.0163	0.172
	(0.69)	(1.47)	(-0.38)	(0.05)	(1.00)
Pell Eligible	-0.505*	-2.282**	-0.0108	-0.192**	-0.209***
	(-2.25)	(-3.29)	(-0.12)	(-2.74)	(-5.27)
Constant	2.412***	3.782***	0.126	0.148*	0.0850*
	(10.77)	(5.46)	(1.37)	(2.10)	(2.14)
N	323	323	323	323	323

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE A3. REGRESSION COEFFICIENTS AND STANDARD DEVIATIONS FOR MODELS PREDICTING THE EFFECT OF CAREER COACHING ON FIVE STUDENT-LEVEL OUTCOMES: LCCC

	(1) Cumulative GPA	(2) Total CHEO Credits	(3) CHEO Retention	(4) Any Credential	(5) CHEO Credential
Any Career Coaching Intervention	0.762 (1.61)	19.85*** (15.37)	0.000340 (0.00)	0.460* (2.36)	0.545*** (10.98)
Age	0.0154 (1.13)	0.00676 (0.33)	-0.00344 (-1.53)	-0.00369 (-1.20)	0.000949 (1.21)
Full Time	-1.093** (-2.89)	3.733*** (3.64)	0.310** (2.74)	-0.0698 (-0.45)	0.111** (2.82)
Minority	0.223 (0.52)	0.512 (1.09)	0.0255 (0.49)	-0.103 (-1.45)	0.00978 (0.54)
Male	0.356 (0.99)	-0.462 (-1.02)	-0.0843 (-1.68)	0.00446 (0.06)	-0.00413 (-0.24)
Pell	-0.398 (-1.36)	0.208 (0.54)	-0.0182 (-0.43)	0.0234 (0.40)	0.0286 (1.92)
Constant	2.521*** (4.96)	1.617* (2.44)	0.207** (2.84)	0.317** (3.16)	-0.0383 (-1.50)
N	50	199	199	199	199

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE A4. REGRESSION COEFFICIENTS AND STANDARD DEVIATIONS FOR MODELS PREDICTING THE EFFECT OF ADVISING INTENSITY ON FIVE STUDENT-LEVEL OUTCOMES: LCCC

	(1) Cumulative GPA	(2) Total CHEO Credits	(3) CHEO Retention	(4) Any Credential	(5) CHEO Credential
Number of Career Advising Interactions	0.0295	0.703***	-0.00271	0.0149	0.0177***
	(1.56)	(12.11)	(-0.48)	(1.90)	(8.11)
Age	0.0143	0.00236	-0.00328	-0.00370	0.000927
	(1.04)	(0.10)	(-1.45)	(-1.19)	(1.07)
Full Time	-1.086**	4.306***	0.325**	-0.0488	0.135**
	(-2.87)	(3.74)	(2.88)	(-0.31)	(3.13)
Minority	0.262	0.665	0.0258	-0.0996	0.0142
	(0.61)	(1.26)	(0.50)	(-1.39)	(0.71)
Male	0.357	-0.565	-0.0861	0.00117	-0.00800
	(0.99)	(-1.10)	(-1.72)	(0.02)	(-0.42)
Pell Eligible	-0.384	0.317	-0.0187	0.0256	0.0312
	(-1.31)	(0.73)	(-0.44)	(0.44)	(1.91)
Constant	2.551***	1.744*	0.204**	0.319**	-0.0366
	(4.99)	(2.33)	(2.79)	(3.16)	(-1.30)
N	50	199	199	199	199

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE A5. COMPARISON OF ENROLLMENT IN HYBRID/ONLINE VERSUS TRADITIONAL CLASSES ACROSS SUBJECTS: PCC

Subject	Hybrid/Online	Traditional
Biology, # of Sections	55	267
Total Enrollment, Biology	277	4378
BTE, # of Sections	3	7
Total Enrollment, BTE	18	49
Chemistry, # of Sections	0	3
Total Enrollment, Chemistry	0	36
EMS, # of Sections	19	232
Total Enrollment, EMS	253	2775
HIT, # of Sections	34	5
Total Enrollment, HIT	762	61
HPR, # of Sections	36	54
Total Enrollment, HPR	802	727
PHY, # of Sections	0	14
Total Enrollment, PHY	0	302
PSG, # of Sections	3	3
Total Enrollment, PSG	9	42
RCA, # of Sections	3	13
Total Enrollment, RCA	22	96
RTE, # of Sections	1	2
Total Enrollment, RTE	22	25
Total CHEO Enrollment (N)	2498	10093

TABLE A6. COMPARISON OF ENROLLMENT IN HYBRID/ONLINE VERSUS TRADITIONAL CLASSES ACROSS SUBJECTS: RRCC

Subject	Hybrid	Traditional
HHP # of sections	2	4
# of enrollment	27	42
HPR # of sections	3	12
# of enrollment	6	180
NUA # of sections	0	89
# of enrollment	0	1249
NUR # of sections	0	15
# of enrollment	0	168
PHY # of sections	40	3
# of enrollment	725	59
Total CHEO enrollment (N)	758	1698

TABLE A7. COMPARISON OF ENROLLMENT IN HYBRID/ONLINE VERSUS TRADITIONAL CLASSES ACROSS SUBJECTS: FVCC

Subject	Hybrid	Traditional
General education, # of sections	43	261
# of enrollment	736	5058
Business, # of sections	27	116
# of enrollment	373	2028
Computer skill, # of sections	17	26
# of enrollment	244	282
Health, # of sections	43	168
# of enrollment	577	1890
Paramedics, # of sections	38	63
# of enrollment	380	666
Nursing, # of sections	13	18
# of enrollment	279	187
Total CHEO enrollment (N)	2643	10200

TABLE A8. REGRESSION COEFFICIENTS AND STANDARD DEVIATIONS FOR MODELS PREDICTING THE EFFECT OF ONLINE COURSEWORK ITENSITY ON FOUR PROGRAM-LEVEL OUTCOMES: PCC

	(1) Total Credit	(2) Retention in CHEO Program	(3) Retention in Any Program	(4) Credential Earned
Percent Online Courses	0.388	-0.0587**	-0.00174	-0.0142
	(0.82)	(-2.80)	(-0.17)	(-0.95)
Incumbent Worker	0.355	0.00303	-0.00106	-0.00221
	(1.13)	(0.22)	(-0.16)	(-0.23)
Part-Time Status	0.155	0.0166	-0.00179	-0.0235*
	(0.49)	(1.17)	(-0.26)	(-2.33)
Female	-0.767*	0.0973***	-0.0274***	-0.104***
	(-2.26)	(6.49)	(-3.69)	(-9.75)
Age 25+	2.327***	0.0530***	0.0201**	0.0274**
	(7.47)	(3.83)	(2.93)	(2.78)
Constant	6.454***	0.137***	0.0556***	0.174***
	(16.08)	(7.85)	(6.46)	(14.04)
Total (N)	4375	3880	3880	3880

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE A9. REGRESSION COEFFICIENTS AND STANDARD DEVIATIONS FOR MODELS PREDICTING THE EFFECT OF ONLINE VERSUS TRADITIONAL COURSEWORK ON FOUR PROGRAM-LEVEL OUTCOMES: OJC

	(1) Total Credit	(2) Retention in CHEO Program	(3) Retention in Any Program	(4) Credential Earned
Percent Online Courses	0.0000309	0.00000289	-0.0000295	-0.0000543**
	(0.12)	(0.33)	(-1.34)	(-3.01)
Incumbent Worker	-3.682	0.376***	0.0846	-0.298
	(-1.33)	(3.93)	(0.38)	(-1.63)
Part-Time Status	3.085	-0.408***	-0.0571	0.232
	(1.19)	(-4.53)	(-0.26)	(1.29)
Female	-2.455	-0.315***	-0.124	-0.0886
	(-1.10)	(-4.06)	(-0.67)	(-0.59)
Age 25+	-1.303	0.241**	-0.149	-0.101
	(-0.52)	(2.77)	(-0.79)	(-0.65)
Constant	8.381**	0.153	0.864***	1.090***
	(3.26)	(1.72)	(4.39)	(6.76)
Total (N)	49	49	36	36

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.00$

TABLE A10. COHORT PARTICIPANT COUNT BY COURSE CHEO

Cohort Participant Count by Course		
Course	**Comparison**	**Treatment**
BIO 111	279	220
CHEM 111	55	36
PHYS 111	23	71
PHYS 211	33	42