

Colorado Helps Advanced Manufacturing Program

*CTE Students at a Crossroads: Understanding Students'
Credential-Based Pathways through CHAMP Offerings*

Sarah Blanchard Kyte and Heather McKay

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Education and Employment
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INTRODUCTION

The Colorado Helps Advanced Manufacturing Programs (CHAMP) project was funded through the Trade Adjustment Assistance Community College and Career Training (TAACCCT) grant program of the United States Department of Labor (USDOL). The goal of CHAMP was the redesign of postsecondary curricula, certificates, and degrees to respond to the changing needs of 21st century manufacturing. Six Colorado Community College System colleges – among other postsecondary institutions¹ – worked under the grant to reform their Career and Technical Education (CTE) programs and courses to train traditional and non-traditional students to better meet the skilling needs of local employers. As part of this effort, colleges partnered with regional industry employers who in turn provided guidance as to changing technologies, industry standards and the skills sets they required.

In addition to creating and reforming programs and developing stackable credentials – short- and long- term certificates and associate degrees - CHAMP colleges were involved in supporting students’ academic progress and career pathways. Activities related to such support included hiring campus navigators² to assist students in their educational and career trajectories; and providing students with informational resources including a web portal (Colorado Career Action Tools) that linked educational and workforce opportunities.³ CHAMP colleges also cultivated relationships with local employers to identify internships and job openings.

The CHAMP programs varied by college in terms of their programs of study, e.g., welding, engineering graphics, and in the credentials students could earn. They also varied in terms of the educational pathways students could choose through CHAMP curriculum – completing any number of credentials.) Taken together however, the infrastructure around CHAMP – in curricula, credentials, personnel, networks, and informational resources – offered students supported educational pathways rather than structured or guided pathways. As a result, CHAMP students could choose their own paths to pass through CHAMP curricula and along the way complete any number of combinations of credentials – or none at all – en route to the labor market.

This report by Rutgers’ Educational and Employment Research Center (EERC), the third party evaluator for CHAMP, examines the educational pathways taken by students during the CHAMP grant, as well as the role of career navigators and other supports. It identifies patterns of credentials completed by CHAMP students within and across community colleges with

¹ The CHAMP consortium includes Front Range Community College (FRCC), Aims Community College (AIMS), the Community College of Denver (CCD), Emily Griffith Technical College (EGTC), Lamar Community College (LCC), Pikes Peak Community College (PPCC), Pueblo Community College (PCC), Red Rocks Community College/Warren Technical College (RRCC), and Metropolitan State University, Denver (MSU).

² EERC’s report on the career navigator will be available on the EERC website fall 2017

³ See EERC brief on the web portal:

<https://smlr.rutgers.edu/sites/default/files/documents/CHAMP%20Website%20Brief%20FINAL%202-8-16.pdf>

attention to differences in the social backgrounds and prior academic and labor market experiences of the students. Further, it examines how students' pathways align with patterns of participation in further education (including transfer) and the labor force after completing CHAMP coursework. While this report is ultimately about credentials and the stacking of them by students, its findings suggest areas of institutional development and expansion in respect to providing students advisement that links academic and career pathways.

METHODOLOGY

This report uses institutional data from CCCS for students who enrolled in CHAMP courses. These data were merged with postsecondary enrollment records from institutions outside the CCCS system obtained from the National Student Clearinghouse (NSC) as well as employment records from the Unemployment Insurance (UI) Wage Records Data. Details on the statistical comparisons described in the text are included in the appendix.

The reader should note that this report covers the credentials each of the colleges in the CHAMP offered— short and long term certificates and associate degrees – and that not all colleges offered the same array of credentials. Further, some colleges offered only certificates for a CHAMP program of study, and not an associate degree. At the same time, students had the option to complete an associate degree in a non-manufacturing subject area, e.g., FRCC.

OVERVIEW

This report explores the pathways of the 3,070 students who enrolled in CHAMP courses between 2014 and 2017 at six CCCS community colleges.⁴ The analytical decision to include all students who engaged with CHAMP coursework provides a comprehensive view of the pathways students took. It provides some insight into the role of the support structures provided under CHAMP, but can also be viewed as a look at student decisions absent formalized, guided pathways. *Pathways* can refer to a range of dimensions of students' experiences including indicators of progress, credential completion, and early career outcomes (Calcagno, Crosta, Bailey, & Jenkins, 2007; Carnevale, Jayasundera, & Hanson, 2012; Marti, 2008; Pallas, 2003). This report, however, takes an approach consistent with other examinations of community college pathways in the context of stackable credentials. It therefore operationalizes "pathways" as the various credentials completed by students following first enrollment (Giani & Fox, 2016; Karp, 2015; Shulock, Moore, & Offenstien, 2011). As such, the report follows students from their enrollment in CHAMP courses through their completion of various credentials to understand the choices made by students in CHAMP classrooms absent guided pathways.

⁴ These include Community College of Denver (CCD), Front Range Community College (FRCC), Lamar Community College (LCC), Pueblo Community College (PCC), Pikes Peak Community College (PPCC) and Red Rocks Community College (RRCC).

Findings show that indeed, some of these students completed one certificate or a single associate degree but as this report will detail, many chose pathways that entailed earning multiple credentials. Moreover, this report distinguishes between two groups of students who completed multiple – or stacked – credentials. The first group includes students who completed multiple certificates while the other includes those who completed at least one associate degree *as well as* a second credential which could be either a certificate or a second associate degree, regardless of sequence. Typically, these students earned a certificate as well as their associate degree (88%) though a small minority earned two associate degrees (12%). Finally, many students taking CHAMP coursework had earned no credentials as of 2017. Therefore, the five pathways include (1) students who completed no credential, (2) students who completed a single certificate, (3) students who completed multiple certificates, (4) students who completed an associate degree, and (5) students who completed an associate degree and at least one other credential.

After exploring the distribution of CHAMP students across these five pathways, this report proceeds in three parts. First, it identifies patterns of institutional engagement and support by detailing the pathways taken by students at each community college and their patterns of engagement with CHAMP courses and navigators. Second, it examines the demographic and social characteristics of CHAMP students within each pathway to shed light on the extent to which key groups of students engaged with various types of individual or stacked credentials. The report then situates these pathways within long-term patterns of engagement with higher education to understand the extent to which participation in CHAMP represents only a portion of a longer educational trajectory. Finally, the report looks at the impact of various CHAMP pathways on employment and earnings within the Colorado labor market.

DEFINING STUDENT PATHWAYS

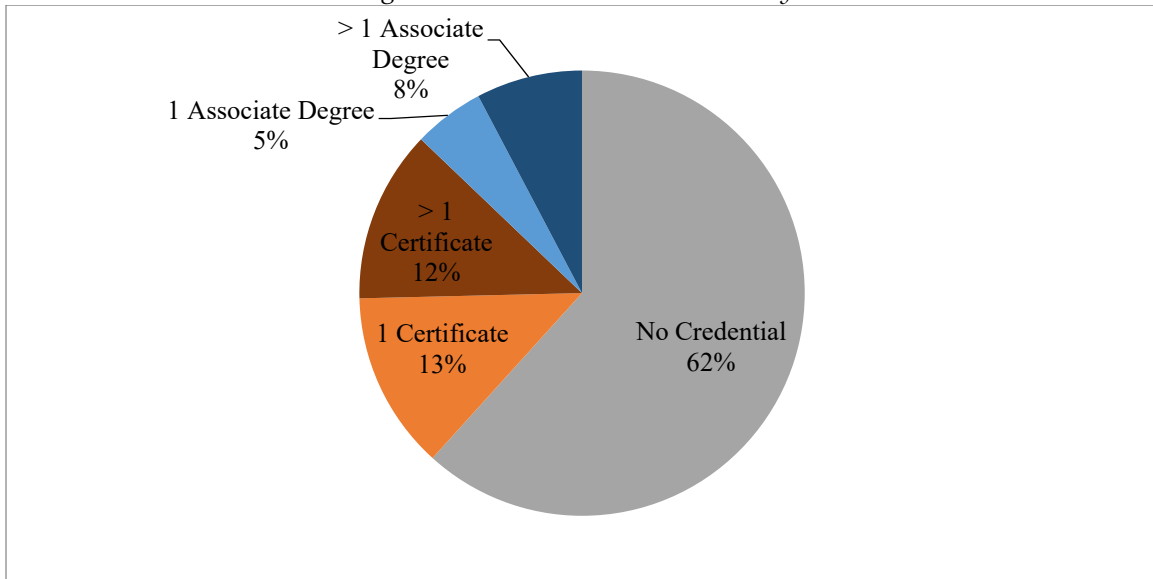
Figure 1 shows the proportion of CHAMP students within each pathway. Sixty-two percent of all students who enrolled in a CHAMP course had not yet completed a certificate or degree at CCCS as of summer 2017. By contrast, 13 percent of CHAMP students earned a single certificate and 12 percent earned multiple certificates. Finally, 5 percent of students completed a single associate degree and 8 percent completed more than one associate degree, meaning they earned an associates *and* at least one other credential. From a different perspective, although students' pathways often entailed only coursework and not a credential (62 percent), a similar percentage of students earned single credentials (18 percent total) as earned multiple, stacked credentials (20 percent total).

The perhaps surprisingly large percentage (62 percent) of students who had not completed a certificate or associate degree following CHAMP enrollment merits some discussion. First and foremost, in focusing on the full breadth of students who enrolled in CHAMP coursework, this analysis includes many students who took CHAMP courses only incidentally as they pursued other programs. Indeed 40 percent of CHAMP students within the “no credential” pathway were in the liberal arts or humanities programs when first enrolled; however, this was also true

for 18 percent of students in the credential-bearing groups. The non-completer group also includes students who chose to pursue the skills gained through useful coursework rather than credentials (Bahr, 2014). Further, 11 percent of the students not earning credentials were enrolled in non-credit courses.

As noted above, there are some other ways to look at this group. The non-completers are disproportionately drawn from the later years of CHAMP – 48 percent enrolled in 2016 and 2017, compared to 33 percent of those in the other pathways – and so it is likely that they may not have had sufficient time to complete a credential (Bahr, 2014). Finally, some non-completers may have dropped out before completing an intended credential as evidenced by a fall to fall retention rate of 39 percent for this group, compared to 68 percent among students in other pathways.

Figure 1. CHAMP Student Pathways



CHAMP PATHWAYS AND ENGAGEMENT ACROSS CCCS COLLEGES

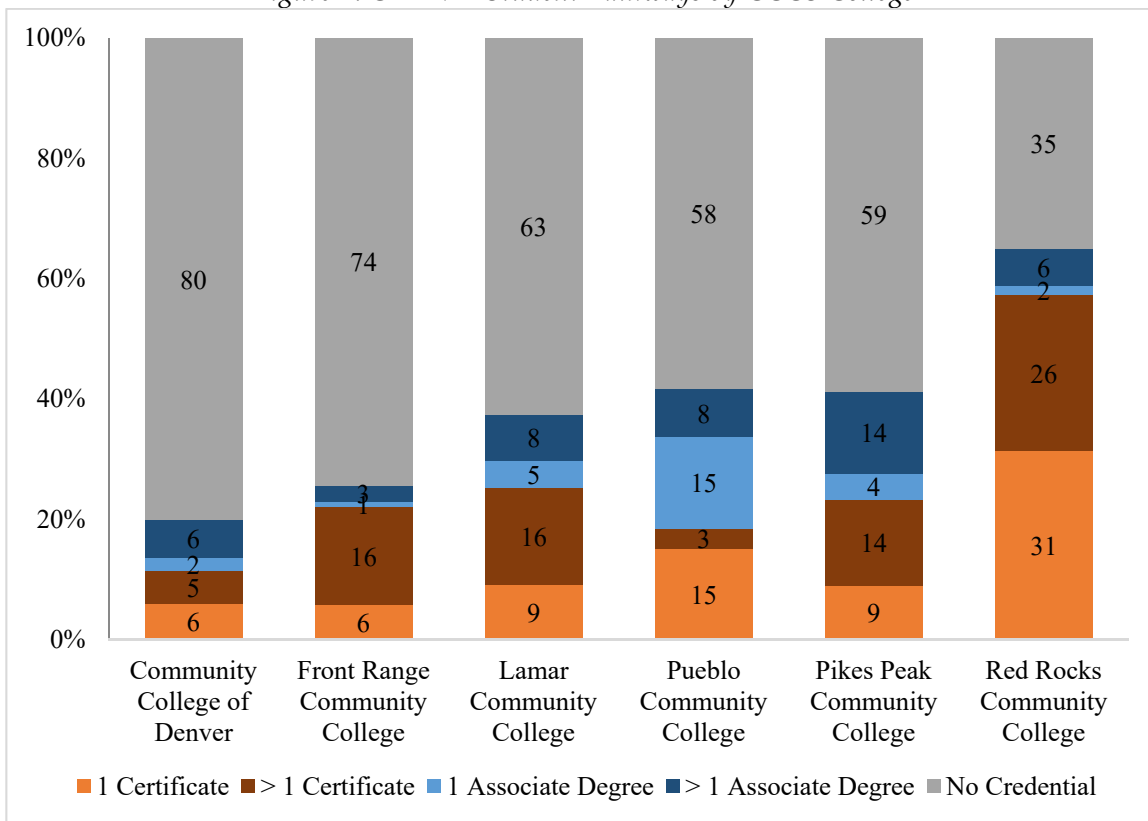
Figure 2 disaggregates the data by college to depict the percentage of students within the five pathways at each of the six CCCS colleges which offered CHAMP programs. Not every college offered the same array of certificates and associate degrees, thus opportunities to stack credentials varied by institution. Student populations also varied by college – such that some had more non-traditional students or students who were incumbent workers seeking to gain skills rather than credentials.

CCD students who enrolled in CHAMP coursework were less likely to complete a credential than students at other colleges in the consortium (80 percent non-completers). Students at FRCC also had a low rate of completion (74 percent). However, among the students who did

complete, 16 percent of the FRCC students earned multiple certificates. FRCC and CCD are due to both time and the inclusion of non-credit students in the data set.

LCC students and PPCC students were statistically identical to one another, with roughly 60 percent of students earning no credential. However, students who completed a credential had higher rates of stacking credentials (roughly 25 percent at each college) than earning a single credential (roughly 15 percent). PCC students were less likely to stack their credentials than students elsewhere, but PCC evidenced the largest percentage of CHAMP students earning an associate degree (15 percent). Fifteen percent of PCC students also earned a single certificate. Finally, RRCC stands out as having had the largest percentage of students completing a credential (65 percent), the largest percentage of students earning a single certificate (31 percent) and earning multiple certificates (26 percent). The completion rate of RRCC students in part reflects the active work of the navigator, reviewing students’ transcripts, even those who had withdrawn from the college, and helping them to apply for the credentials they had earned, but for which they had never applied; or in some cases even knew they had earned. This finding suggests the need for more routine review of students’ transcripts to identify all credentials they have earned.

Figure 2. CHAMP Student Pathways by CCCS College

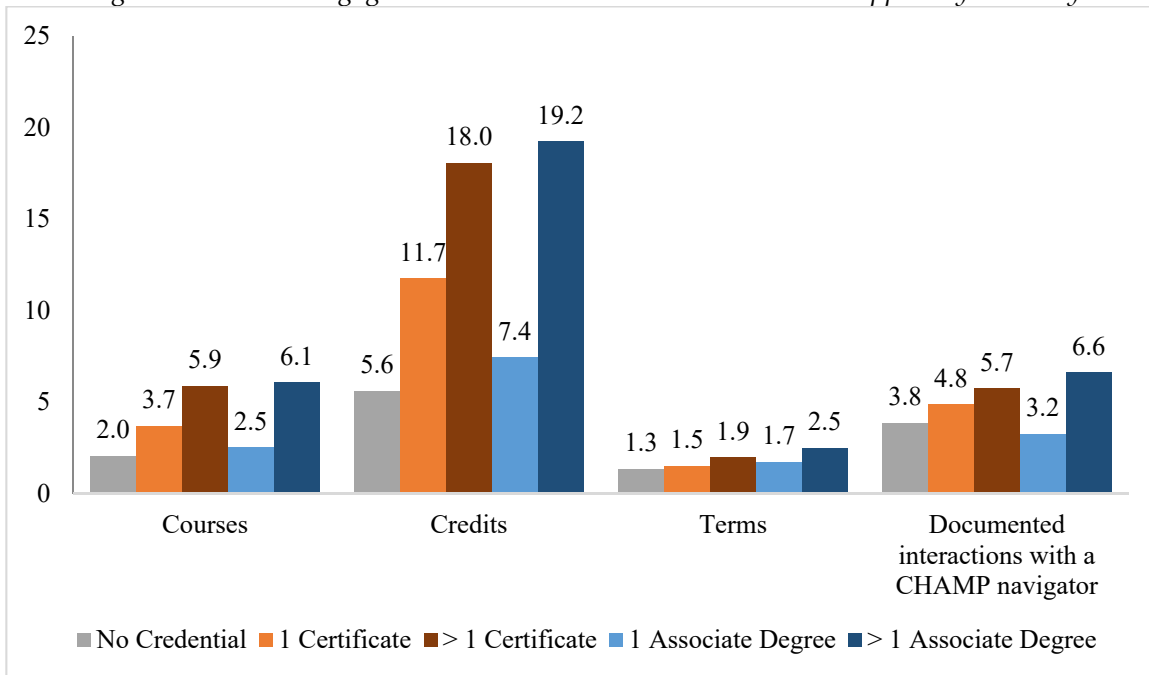


Taken together, despite many commonalities of CHAMP programming across the six campuses, the pathways taken by students at each college result in distinct profiles. We turn now to some

of the patterns of student enrollment and support along these pathways. Figure 3 presents the number of CHAMP courses, credits, and terms of enrollment pursued by students as well as their interactions with CHAMP navigators. Students on the no credential pathway or who earned only one associate degree took the smallest number of CHAMP courses (2.0 and 2.5, respectively). By contrast, students with stacked pathways who earned multiple certificates or multiple credentials including an associate degree took the most CHAMP courses (6 courses in each group). On average, CHAMP students completed 9 credits of CHAMP coursework over 1.5 semesters of enrollment; these measures follow the same general pattern across the five pathway groups.

Tracking the documented interactions between CHAMP students and navigators, EERC found an average of 4.6 interactions with a CHAMP navigator; however, the number of interactions ranged from 3.2 among those earning a single associate degree to 6.6 among those who earned more than one associate degree. Thus, students who had some interaction with a navigator earned more credentials – either certificates or associate degrees. This suggests the effect of navigator support and advisement on credential completion possibly through their discussion with students about the availability of additional educational options as well as linking academic and career pathways.

Figure 3. Student Engagement with CHAMP Coursework and Support by Pathway



DEMOGRAPHIC AND SOCIAL PROFILE OF CHAMP STUDENT PATHWAYS

Table 1 considers the demographic and social characteristics of students across the various pathways. We begin with gender; one in ten CHAMP students was female, EERC found no statistically significant difference in what pathway they pursued.

Ethnic differences in participation across CHAMP pathways do appear and are shown in Table 1. Specifically, white students (64 percent of all CHAMP students) were more likely to pursue a pathway where they received multiple credentials than to be in a pathway with no credential. By contrast, Hispanic students (16 percent of all CHAMP students) were more likely to follow conventional pathways resulting in a single credential – either a certificate or an associate degree – rather than to stack their credentials. Part of this finding may be accounted for by the concentration of Hispanic students at Pueblo Community College where these single-credential pathways were more typical (James & Edwards, 2016).

In terms of students' ages, non-credential earners and those who earned more than a single associate degree tended to be slightly older on average (28-29 years old) than the CHAMP students pursuing other pathways (25-27 years old).

The second half of Table 1 shows social background characteristics - Pell grant eligibility and veteran status of CHAMP students by pathway. The 38 percent of CHAMP students who were Pell grant eligible, were concentrated within the group of students who had earned one or more associate degrees. This suggests that access to financial aid may facilitate students' academic progress and attainment of credentials, i.e., they may have to work less or not at all while they are studying. To clarify if this is the case, a deeper analysis that includes part time/full time student status and concurrent employment would be needed.

Finally, while 12 percent of all students were veterans, these students were more likely to have earned multiple credentials including an associate degree (20 percent) than to have earned no credentials (11 percent). These students also did well in terms of completion. This finding requires future investigation. Does this mirror the experience of the general CCCS veteran student population or is it reflective of the supports these students may have received under CHAMP grant? Alternatively, did CHAMP present a particularly strong pathway for students to leverage their prior military training and development?

Table 1. Demographic and Social Characteristics of CHAMP Students by Pathway

	No credential		1 Certificate		> 1 Certificate		1 Associate degree		> 1 Associate degree	
	Mean	(StD)	Mean	(StD)	Mean	(StD)	Mean	(StD)	Mean	(StD)
Gender (%)										
Male	89.9		87.4		93.0		91.8		92.8	
Female	10.1		12.6		7.0		8.2		7.2	
Race/Ethnicity (%)										
White	60.6		65.4		75.5		64.6		74.7	
Hispanic	16.5		19.4		10.9		24.1		11.8	
Other	23.0		15.2		13.5		11.4		13.5	
Age*	29.1	(12.4)	27.0	(11.5)	25.3	(10.6)	26.1	(10.5)	27.6	(9.6)
Pell grant eligible (%)	33.8		39.4		34.9		61.4		58.2	
Veteran (%)	10.7		11.6		14.6		13.9		20.3	
N	1895		396		384		158		237	

SITUATING CHAMP PATHWAYS WITHIN EDUCATIONAL AND EMPLOYMENT TRAJECTORIES

This section examines students’ pathways within the context of their postsecondary educational experiences. It then looks at students’ pathways in terms of the students’ pre and post CHAMP employment history

First, Figure 4 examines the extent to which CHAMP students on the various pathways earned certificates or associate degrees at CCCS prior to their enrollment in CHAMP. It also uses National Student Clearinghouse (NSC) records to show if post CHAMP, students went on to enroll in a different postsecondary college or university.⁵

Overall, only 6 percent of CHAMP students across all groups had previously earned a certificate at a CCCS college. However, of note, 17.3 percent of students who had earned a certificate prior to enrollment in CHAMP went on to earn multiple degrees including an associate degree. And, 10.1 percent went on to earn a single associate degree. Thus, of the students who had prior certificates, 27.4 percent went on to earn one or more associate degrees. Further research is necessary to assess the clustering of credentials across subject areas.

Far fewer students overall earned an associate degree prior to their enrollment in CHAMP courses (3 percent). However, of interest, 5.1 percent of those who did have a prior associate degree went on to earn a second associate degree and 3.1 percent went on to earn multiple associate degrees.

Finally, CHAMP students who earned either a single CHAMP certificate or multiple CHAMP related credentials, including an associate degree, were more likely to have earned a previous

⁵ This analysis relies on available National Student Clearing House (NSCH) data.

certificate. And students without a prior credential were less likely to have earned a single certificate or completed their CHAMP program of study.

Fifteen percent of all CHAMP students enrolled at another postsecondary institution post CHAMP. Students who had earned one or more associate degrees (38.1 percent) went onto for further post-secondary education. However, almost a third of students who had earned one or more certificates also went on for further post-secondary studies (31.3 percent). Overall, forty-two students, 1.5% of all CHAMP participants in this analysis, went on to enroll at Metropolitan State University (MSU), the four-year college which offered an articulated pathway for students from CHAMP’s community colleges.

Figure 4 shows that students who earned a single associate degree were more likely to transition to postsecondary enrollment elsewhere (23%) than students on other pathways. Thus, CHAMP students built on prior certificates to earn associate degrees, and also used CHAMP as an avenue towards further education. In many cases, it may be best to look at the stacking of credentials within CHAMP as part of a larger sequence of stacking credentials preceding and following from CHAMP.

Figure 4. Pre- and post-CHAMP participation in higher education by pathway

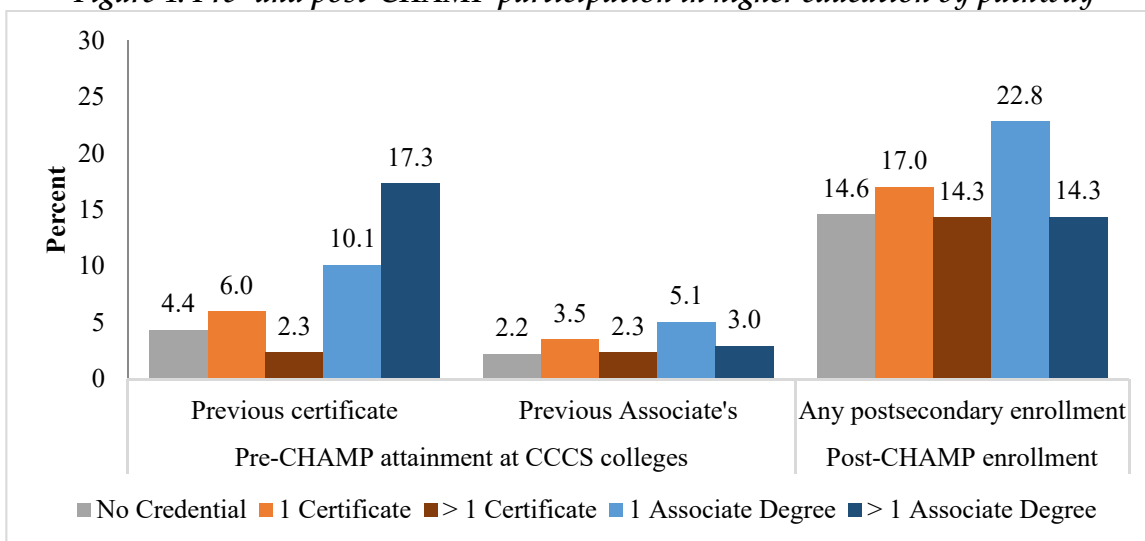
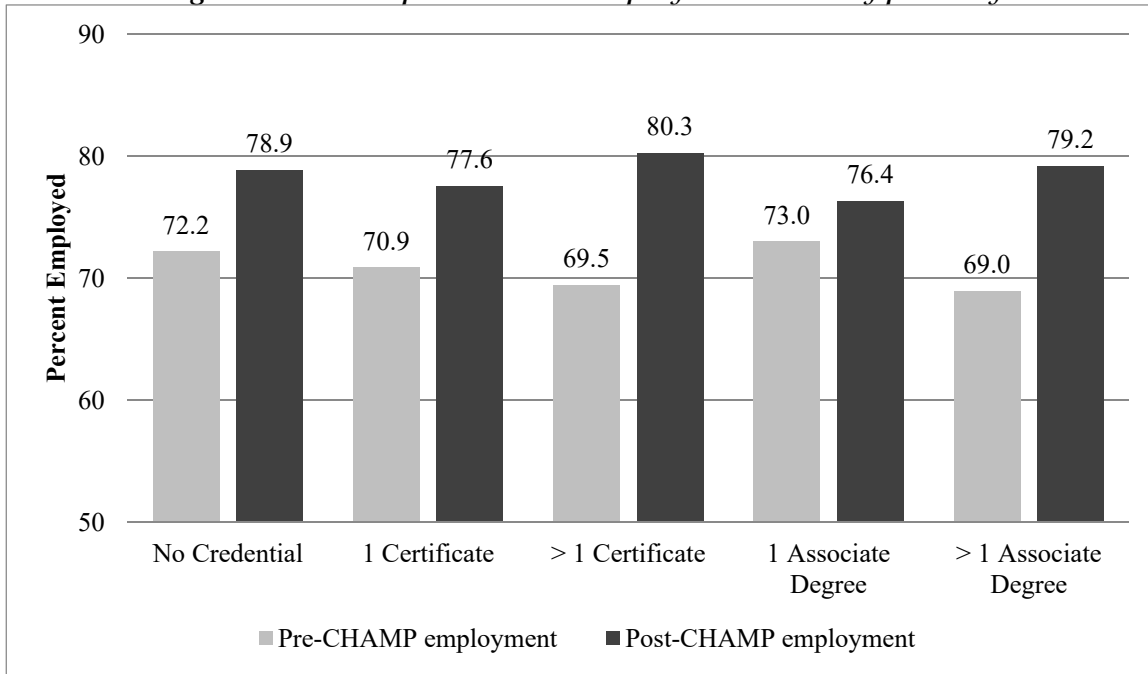


Figure 5 shows the employment rate of CHAMP students within each of the five pathways before and after participation in CHAMP. Students are included in this table if they had quarterly earnings reported in the unemployment insurance (UI) database during the timeframe of this report.⁶ Overall, 71 percent of students were employed in the year prior to enrolling in CHAMP, and 79 percent were employed in the year following, an 8 percentage-point increase. However, given the small sample sizes within some pathways, only the increase in employment

⁶ UI data exclude those employed out of state, in the military or federal civilian workforce, and self-employed workers. Consistent with other CHAMP reporting, employment rates are calculated as the percentage of incumbents earning a minimum of \$1,000 quarterly.

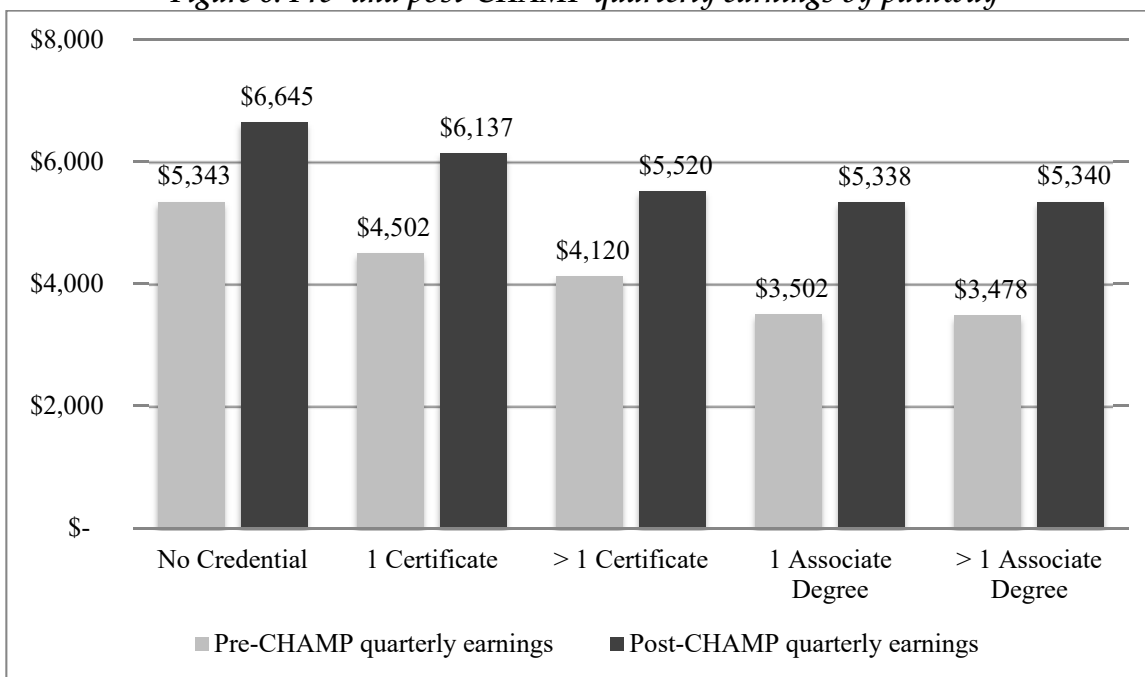
among those who did not earn a credential (72 percent employed before CHAMP and 79 percent employed after) and those who earned multiple certificates (70 percent employed before CHAMP and 80 percent employed after) reached statistical significance. Nevertheless, these findings suggest that in addition to earning credentials, CHAMP coursework resulted in higher rates of employment in the Colorado labor market.

Figure 5. Pre- and post-CHAMP employment status by pathway



Finally, Figure 6 details the average quarterly earnings before and after enrollment in CHAMP coursework for students with available UI data. Across each group, students' earnings increased significantly following participation in CHAMP. For example, students who earned a single certificate had \$4,500 average quarterly earnings prior to CHAMP enrollment and \$6,100 on average following CHAMP. Surprisingly, students who took CHAMP coursework but did not earn a credential had higher incomes before CHAMP participation (\$5,343 quarterly) than those who earned one (\$3,502) or more than one (\$3,478) associate degree. This finding may reflect incumbent workers in manufacturing who were re-skilling rather than individuals coming into manufacturing from other fields where the wages are lower. Nevertheless, following CHAMP, statistical differences in earnings were no longer present, and the gaps in students' quarterly earnings across pathways closed following CHAMP participation.

Figure 6. Pre- and post-CHAMP quarterly earnings by pathway



KEY FINDINGS

- One in five CHAMP students earned multiple credentials.
- CHAMP students were almost as likely to stack credentials (20 percent) as they were to earn a single credential (18 percent); still, many had completed no credentials as of 2017.
- Institutional factors play an important role in the choices students make about their pathways:
 - Colleges varied in the number and nature of available certificates and CHAMP related associate degrees.
 - The types of pathways students took varied across colleges.
 - Students who took more CHAMP coursework and interacted with the navigators were more likely to stack credentials.
- Older students, Pell grant eligible students, and veterans were more likely to stack associate degrees with additional credentials suggesting that this is an important pathway for the postsecondary success of these groups.
- The completion of credentials in CHAMP often built on previously earned certificates; and in many cases led to further engagement with higher education.
- Students often are not aware that they have earned a credential – thus colleges have to be more active in identification credential completion and helping students to apply for them.
- CHAMP students were more likely to be employed a year after CHAMP participation than they were the year prior to participating.
- Regardless of pathway, students from all groups had significantly higher earning after CHAMP participation, closing prior gaps in earnings across pathways.

DISCUSSION AND IMPLICATIONS

The above findings suggest some programmatic interventions that the CCCS colleges should consider in respect to student pathways. Given some variations by race/ethnicity, age, Pell eligibility and veteran status – colleges might consider new strategies to further assist those students who are historically less successful in completing credentials, if not stacking credentials. Further, the impact of the navigator on the completion and stacking of credentials suggest that the navigator role can make a critical difference for students' academic as well as employment trajectories.

This report is limited by the number of students who have moved on from coursework to credentials and/or employment. More time is needed to study the whole cohort of CHAMP enrollees especially those who entered the program towards the end of the grant when support for pathways was arguably the strongest. As such, this report is suggestive of possible patterns – more definitive pathway patterns and the factors that influence them require further study.

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APPENDIX

	<i>All CHAMP</i>								1 Associate degree		>1 Associate degree	
	<i>Students</i>		No Credential		1 Certificate		>1 Certificate		Mean	(Std)	Mean	(Std)
	<i>Mean</i>	<i>(Std)</i>	Mean	(Std)	Mean	(Std)	Mean	(Std)				
CHAMP Pathways (Figure 1)												
Percentage of all CHAMP students (%)	100.0		61.7		12.9		12.5		5.2		7.7	
Campus (%)* (Figure 2)												
Community College of Denver	21.6		80.1		6.0		5.4		2.3		6.2	
Front Range Community College	14.6		74.4		5.8		16.3		0.9		2.7	
Lamar Community College	4.3		62.6		9.2		16.0		4.6		7.6	
Pueblo Community College	20.3		58.4		15.1		3.4		15.3		7.9	
Pikes Peak Community College	22.3		58.8		8.9		14.3		4.4		13.6	
Red Rocks Community College	17.0		35.0		31.4		26.0		1.5		6.2	
CHAMP Participation (Figure 3)												
Courses ^{a, b, d, e, f, g, h, j}	3.1	(3.1)	2.0	(1.8)	3.7	(2.6)	5.9	(4.4)	2.5	(2.0)	6.1	(4.7)
Credits ^{a, b, d, e, f, g, h, j}	9.1	(10.3)	5.6	(6.6)	11.7	(8.6)	18.0	(13.5)	7.4	(6.6)	19.2	(15.4)
Terms ^{a, b, c, d, e, g, h, i, j}	1.5	(1.0)	1.3	(0.7)	1.5	(1.0)	1.9	(1.1)	1.7	(1.0)	2.5	(1.5)
Documented interactions with a CHAMP navigator ^{c, d, g, j}	4.6	(4.6)	3.8	(3.6)	4.8	(4.7)	5.7	(5.7)	3.2	(3.1)	6.6	(6.1)
Demographics (%) (Table 1)												
Gender												
Male	90.3		89.9		87.4		93.0		91.8		92.8	
Female	9.7		10.1		12.6		7.0		8.2		7.2	
Ethnicity												
White ^{b, d, e}	64.4		60.6		65.4		75.5		64.6		74.7	
Hispanic ^{e, h, j}	16.2		16.5		19.4		10.9		24.1		11.8	
Other ^{a, b, c, d}	19.4		23.0		15.2		13.5		11.4		13.5	
Age ^{a, b, c}	28.1	(11.8)	29.1	(12.4)	27.0	(11.5)	25.3	(10.6)	26.1	(10.5)	27.6	(9.6)
Pell-grant eligible ^{c, d, f, g, h, i}	37.9		33.8		39.4		34.9		61.4		58.2	
Veteran ^{d, g}	12.2		10.7		11.6		14.6		13.9		20.3	
Pre-and Post-CHAMP Educational Characteristics (%) (Figure 4)												
Pre-CHAMP postsecondary attainment at CCCS colleges												
Previous certificate ^{d, g, i}	2.6		4.4		6.0		2.3		10.1		17.3	
Previous associate degree	5.6		2.2		3.5		2.3		5.1		3.0	
Any postsecondary enrollment ^d	15.3		14.6		17.0		14.3		22.8		14.3	
Postsecondary enrollment at MSU after CHAMP	1.5		1.5		2.0		0.5		2.5		1.7	

Pre- and Post-CHAMP Employment Status (%) (Figure 5)

Pre-CHAMP employment	71.4	72.2	70.9	69.5	73.0	69.0
Post-CHAMP employment	78.8	78.9 §	77.6	80.3 §	76.4	79.2

Pre- and Post-CHAMP Average Quarterly Earnings (\$) (Figure 6)

Pre-CHAMP quarterly earnings ^{b, c, d}	4809	(5952)	5343	(6461)	4502	(4953)	4120	(6049)	3502	(3826)	3478	(4007)
Post-CHAMP quarterly earnings	6198 §	(6543)	6645 §	(6992)	6137 §	(5860)	5520 §	(6899)	5338 §	(5206)	5339 §	(4637)
N	3070		1895		396		384		158		384	

*Note that percentages sum to 100 across the pathways columns for each college.

Superscript letters denote significant differences between group means via Tukey's range test ($p < 0.05$) as follows: no credential compared to [a] 1 certificate, [b] >1 certificate, [c] 1 associate degree, [d] >1 associate degree; 1 certificate compared to [e] >1 certificate, [f] 1 associate degree, [g] >1 associate degree; >1 certificate compared to [h] 1 associate degree, [i] >1 associate degree; [j] 1 associate degree compared to >1 associate degree.

§ Denotes statistically significant gain in pre-post comparison of employment or earnings via paired t-test ($p < 0.05$).