



Third-Party Evaluation of the Outcomes and Impact of the National Information, Security & Geospatial Technologies Consortium (NISGTC)

September 2015

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Katie Bridges
Cari Bishop
Matthew Giani

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INTRODUCTION

The Trade Adjustment Assistance Community College and Career Training (TAACCCT) grant was launched in 2011 by the United States Department of Labor (DOL), in partnership with the United States Department of Education (DOE). As stated in the Round One Solicitation for Grant Applications (SGA), a primary goal of TAACCCT is to “increase attainment of degrees, certificates, and other industry-recognized credentials and better prepare the targeted population, and other beneficiaries, for high-wage, high-skill employment” (USDOL SGA, 2011, p. 5). Since issuing this SGA, DOL has awarded an unprecedented level of funding to community and technical colleges throughout the country, exceeding any other single federal program to direct funding to community colleges. Through nearly \$2 billion awarded in grants since October 1, 2011, TAACCCT has focused on raising the skill level and employability of low-skilled individuals, including those adversely impacted by the nation’s Great Recession.

The Office of Community College Research and Leadership (OCCRL) at the University of Illinois at Urbana-Champaign conducted the third-party evaluation of the National Information Security & Geospatial Technology Consortium (NISGTC) that was funded with a Round One TAACCCT grant of over \$19M. The overall evaluation has three major components: 1) implementation evaluation, 2) outcomes and impact evaluation, and 3) performance reporting on behalf of the NISGTC Consortium to the DOL. This report describes outcomes associated with student enrollment in grant-funded programs of study at all seven NISGTC co-grantee and their affiliate colleges (listed below) and also utilizes various quantitative methods to estimate the impact of NISGTC on students’ educational and employment outcomes. A co-grantee college is defined as an institution that received funds from the DOL as part of NISGTC, and affiliate colleges are colleges partnering with co-grantee colleges to implement similar strategies, but they did not receive any federal funding through NISGTC. For co-grantee colleges with an affiliate, all data in this report includes that of their affiliates in addition to their own, unless otherwise noted.

The seven NISGTC co-grantee college and their affiliates (listed in parentheses) are:

- Bellevue College, Bellevue, WA (Everett Community College, Everett, WA)
- Bunker Hill Community College, Boston, MA
- Collin College, Frisco, TX (*NISGTC lead*)
- Del Mar College, Corpus Christi, TX (Austin Community College, Austin, TX and Laredo Community College, Laredo, TX)
- Moraine Valley Community College, Palos Hills, IL (Rock Valley College, Rockford, IL)
- Rio Salado College, Tempe, AZ
- Salt Lake Community College, Salt Lake City, UT

The NISGTC Grant

The mission of NISGTC was stated as follows: “To expand and enhance a variety of best-in-class education and training strategies to help trade-impacted and other low-skilled workers persist and complete post-secondary education and to secure employment with family sustaining wages in the IT industry” (NISGTC, 2015). To this end, NISGTC sought to execute the grant in the following ways:

- 1) To work with national businesses to identify the requisite knowledge areas for certificate and degree graduates to be readily employable over the next 12-24 months;
- 2) To align curriculum to cover the requisite knowledge areas;

- 3) To implement virtual laboratory equipment to mirror the world of work in IT and to provide 24/7 laboratory access;
- 4) To offer as much of the curriculum as possible in an online modality;
- 5) To provide specialized tutoring, career coaching, mentoring, and placement services to improve student outcomes;
- 6) To implement other cutting edge pedagogical and content interventions to help students better prepare for the world of work.

OCCRL conducted two site visits at each of the seven co-grantee colleges at different points throughout the grant to understand and evaluate how the mission and strategies of NISGTC were implemented across sites. These visits culminated in a final NISGTC Implementation Evaluation Composite Report (OCCRL, 2015), which is available at <http://occrll.illinois.edu/files/Projects/TAA/nisgtc-Implementation.pdf>. This report contains additional information about implementation and promising practices of each co-grantee college, and may be of interest to readers seeking to gain a broader understanding of each co-grantee college, their affiliates, and the consortium overall.

Evaluation Questions

This report addresses a number of descriptive questions concerning the outcomes of NISGTC students. The following questions focus on the descriptive analysis of enrollment and outcomes:

- 1) What is the distribution of student enrollment among the seven community colleges and their affiliates in NISGTC? What are the demographic characteristics of these students?
- 2) How is enrollment in specific NISGTC disciplines distributed among colleges?
- 3) How is participation in NISGTC strategies distributed among colleges?
- 4) What educational outcomes, specifically in terms of program completion and credential attainment (one or more), do we see among NISGTC students? Are these outcomes related to student background and characteristics?
- 5) How did NISGTC students' wage change from pre-NISGTC enrollment to after credential attainment?

The evaluation questions that guide the impact analysis are:

- 1) Are NISGTC students more likely than retrospective students to be retained in their program of study?
- 2) Are NISGTC students more likely than retrospective students to earn a credential?
- 3) Are NISGTC students more likely than retrospective students to be employed?
- 4) Do NISGTC students make, on average, more in quarterly wages once employed than retrospective students?

METHODS

Results presented in this report are both descriptive and inferential to provide a comprehensive picture of student outcomes. This outcomes evaluation utilized student level data collected through June 30, 2015, and analyzed by OCCRL for the DOL-mandated performance reporting. OCCRL led the DOL reporting for NISGTC because most community colleges associated with the consortium had limited experience with DOL reporting and OCCRL had expertise in this area. In addition, OCCRL provided a centralized point for consistent and secure data analysis and reporting.

The OCCRL team worked with NISGTC colleges to create a secure process for transmitting and storing data, utilizing Box.com to upload data to OCCRL. On a quarterly basis since the beginning of the grant, OCCRL has sent formal instructions and templates to all NISGTC co-grantee colleges for quarterly performance report data and annual reporting. Using these Excel templates, NISGTC co-grantee college personnel, often the Institutional Research office staff, gathered, encrypted, uploaded, and transmitted student-level data, including data on all students enrolled in courses affected by NISGTC funds. Institution level data on new and enhanced courses, virtual capstone courses, and bridge courses associated with DOL grant funding was also reported. If a co-grantee college had an affiliate, staff at the co-grantee college reported data for both their college as well as for their affiliate. Once transmitted to Box.com, all data were cleaned and analyzed on a quarterly basis by OCCRL to ensure consistency across colleges and across time. OCCRL created a primary dataset for using this data, and this dataset was used to carry out both quarterly DOL performance reporting and the outcomes evaluation and impact analysis reported herein.

On an annual basis, OCCRL provided further information for analyzing and preparing the Consortium's annual performance report, including securing wage records from states' Unemployment Insurance data systems (UI wages) with the assistance of NISGTC colleges. Furthermore, select colleges transmitted data on a comparison group of students that were enrolled at the colleges prior to the implementation of NISGTC (the retrospective samples), which was submitted in the same way as NISGTC student data. The method for identifying and providing OCCRL with student level data for the retrospective samples was designed by OCCRL in conjunction with local personnel of the two NISGTC co-grantee colleges that provided this data: Moraine Valley Community College and Collin College. Data from students who participated in grant-funded programs and a retrospective sample of students in similar programs not funded by the grant made up the sample for the comparison cohort study.

Because OCCRL was conducting research on human subjects, it was necessary for this project to receive Institutional Review Board (IRB) approval, which was achieved during the first year of the grant, prior to gathering any student-level data for DOL reporting.

In the impact section of this report, we also utilize logistic regression, linear regression, and propensity score matching (PSM) techniques. Logistic regression is used when looking at binary outcomes, such as whether or not students earned a credential or whether or not students were employed. Linear regression is used when the outcome is continuous, such as quarterly earnings. Propensity score matching is a statistical matching technique that reduces bias in the estimates of the treatment effect by matching students with similar characteristics across retrospective and NISGTC samples.

Enrollment and Distribution of NISGTC Students

The enrollment of students involved in grant-funded programs of study (POS) and strategies evolved throughout the four years of NISGTC's existence, as shown in Table 1. The quarters in this table reflect the DOL grant years that span from October 1 to September 30 of each year. NISGTC had the largest numerical increase in enrollment in Quarter 2 of 2013, when 878 students enrolled for the first time in the grant. Growth was sustained throughout the grant, with more than 500 students being added for the first three consecutive quarters of 2014. By the end of Quarter 2 in 2015, 6,166 students had enrolled in

NISGTC across the seven co-grantee colleges and their affiliates. Of note, although colleges were only focused on enrolling new students into short-term certificate programs during the final year of the grant, the students who enrolled during the latter quarters had less time to complete a credential compared to students who enrolled earlier in the grant period.

Table 1: Cumulative NISGTC Enrollment

	2012	2013	2014	2015
Quarter 1	0	460	2787	5508
Quarter 2	0	1338	3558	5898
Quarter 3	0	1640	4150	6166
Quarter 4	337	2227	4979	

Student Demographics

Table 2 displays the demographic characteristics of NISGTC students, revealing a total of 6,166 students enrolled by the end of the third quarter of the last year of the grant, in June 30, 2015. These results show two community colleges enrolled more than 1,000 students each: Collin College and Del Mar College. Together, these two Texas community colleges enrolled over 40% of students in NISGTC. Each of the remaining five colleges made up at least 10% of all NISGTC enrollees. Additionally, 70% of NISGTC students were men, and less than half (47%) were White. A quarter of NISGTC students were Pell-eligible (27%), and NISGTC co-grantee colleges and affiliates served 687 veterans and 54 TAA workers.

Table 2: Selected Demographics Characteristics of NISGTC Students

College	Number of Students							
	All NISGTC	Bellevue	Bunker Hill	Collin	Del Mar	MVCC	Rio Salado	Salt Lake
Total	6166	737	823	1475	1069	793	628	641
Sex								
Men	4348	532	567	1204	578	690	469	308
Women	1818	205	256	271	491	103	159	333
Race/Ethnicity¹								
American Indian/ Alaskan Native	57	10	*	*	*	*	20	*
Asian	569	145	106	201	30	37	35	15
Black	741	73	238	210	48	80	82	10
Latino	1405	68	130	195	641	145	166	60
Native Hawaiian/ Pacific Islander	18	*	*	*	*	*	*	*
White	2902	398	240	641	322	508	286	507
Multiracial	74	10	*	47	13	*	*	*
Unknown	400	33	101	171	*	15	38	36
Age at NISGTC Intake								
19 and under	644	53	41	69	190	150	61	80
20-21	684	42	85	100	177	130	69	82
22-24	805	82	134	114	165	142	65	103

College	Number of Students							
	All NISGTC	Bellevue	Bunker Hill	Collin	Del Mar	MVCC	Rio Salado	Salt Lake
25-29	1059	123	194	233	150	132	97	130
30-34	813	116	121	216	107	73	82	98
35-49	1444	204	174	494	170	111	163	128
50+	717	117	74	249	111	55	91	20
Pell Eligibility								
Eligible	1560	120	442	248	46	239	191	274
Not-eligible	4249	617	381	1227	910	554	437	123
Unknown	357	0	0	0	113	0	0	244

¹Students who identified as ethnically Latino are counted in the Latino category regardless of the additional racial categories they selected. All other racial categories include only non-Latino students. The non-Latino race categories include only students that did not identify as Latino.

*Cells with 10 or fewer students have been omitted and an unknown variable is only included if n>10

Disciplines Affected by NISGTC

NISGTC students were enrolled in four primary disciplines: Geographic Information Systems (GIS), Networking, Programming, and Cybersecurity. Each quarter, all NISGTC co-grantee colleges and their affiliates reported the discipline(s) in which their students were enrolled. Some limitations existed in collecting these disciplines in that these data originated from NISGTC intake forms, and therefore were self-reported or completed by career counselors at NISGTC co-grantee and affiliate colleges. Due to limitations in both of these sources, many colleges were unable to report data on disciplinary enrollment for all of their students. For those students whose data were reported, the distribution of the four identified disciplines is shown in Table 3.

Table 3: Student Disciplines in Information Technology by College

Discipline	All NISGTC	Bellevue	Bunker Hill	Collin	Del Mar	Moraine Valley	Rio Salado	Salt Lake
GIS	778	3	22	38	74	0		641
Networking	2569	235	286	782	746	49	471	
Programming	863	213	135	278	37	84	116	
Cybersecurity	389		51	285	8	17	28	
Combination of above	562					562		
Unknown/ Not Reported	1005	286	329	92	204	81	13	

Whereas 16.3% of students did not have a discipline reported, the most declared discipline among students who had a discipline or multiple disciplines declared was Networking, followed by GIS, Cybersecurity, and Programming, respectively.

STRATEGY PARTICIPATION

Online and Hybrid Courses

As noted earlier, one of the primary NISGTC strategies was offering as many courses as possible in an online modality. All courses that were created, enhanced, or redesigned using grant funds were reported each quarter, with each course being designated as a course offered in the classroom, online, or as a hybrid of the two. Given the value the consortium placed on online coursework and the grant's goal to improve online offerings, OCCRL documented both the number of courses offered online or as a hybrid course by college each semester and the number of students enrolled in these courses. As seen in Table 4, online and hybrid courses were taught within the consortium every semester that the grant was active, and taught at all seven co-grantee colleges. This table only takes into account unique courses and unique students. Thus, if a single course (i.e. CIT 268) was taught in two different course sections via the same format in the same semester, it is only counted once.

Table 4: Online and Hybrid Courses and Enrollment

College	Course Type	Number of Courses and Students	Fall 2012 and before	Spring 2013	Fall 2013	Spring 2014	Fall 2014	Spring 2015
Bellevue	Online	N Unique Courses		1	2	3	4	3
		N Unique Students		55	66	76	69	45
	Hybrid	N Unique Courses			2	3	7	4
		N Unique Students			19	35	38	49
Bunker Hill	Online	N Unique Courses	14	2	3	2	1	
		N Unique Students	9	18	8	23	1	
	Hybrid	N Unique Courses	4	3	3		1	
		N Unique Students	15	19	26		--	
Collin	Online	N Unique Courses	6	9	8	9	8	4
		N Unique Students	71	71	111	65	49	20
	Hybrid	N Unique Courses	2	3	2	1	4	2
		N Unique Students	4	44	4	19	46	16
Del Mar	Online	N Unique Courses		2	1	1	1	
		N Unique Students		--	1	--	5	
	Hybrid	N Unique Courses		2		1	2	
		N Unique Students		--		1	10	
Moraine Valley	Online	N Unique Courses	6	4	8	5	16	9
		N Unique Students	10	9	40	30	80	27
	Hybrid	N Unique Courses	17	16	19	17	16	17
		N Unique Students	159	166	219	210	237	156
Rio Salado	Online	N Unique Courses				6	19	14
		N Unique Students				15	59	39
	Hybrid	N Unique Courses				19	19	22
		N Unique Students				142	113	84
Salt Lake	Online	N Unique Courses	4	4	10	9	10	9
		N Unique Students	5	12	59	62	222	96
	Hybrid	N Unique Courses	9	11	11	11	12	11
		N Unique Students	37	39	59	36	35	29
ALL NISGTC	Online	N Unique Courses	30	22	32	35	59	39
		N Unique Students	95	165	285	271	485	227
	Hybrid	N Unique Courses	32	35	37	52	61	56
		N Unique Students	215	268	327	443	479	334

Notes: Summer and fall semesters were combined in this analysis. Data from two affiliate colleges, Rock Valley and Laredo, are included in their co-grantee's data as well.

The number of hybrid courses offered by the consortium increased steadily throughout the grant period, led by Moraine Valley, until spring 2015 when the number dipped. This drop likely reflects the grant cycling through the rise in implementation and approaching completion in 2015. Student enrollment in online courses increased by nearly 400 students from fall 2012 to fall 2014 and enrollment in hybrid courses increased by more than 250 students in the same time period. At the peak of implementation in summer/fall 2014, a total of nearly 120 courses were taught either online or as a hybrid course by the seven co-grantee colleges and these courses served almost 1,000 students.

Virtual Capstone Courses

Another mission of NISGTC was to “work integrally with national businesses to identify requisite knowledge for employability” and “implement cutting edge pedagogical and content interventions to help students better prepare for the world of work.” Three NISGTC colleges, Collin College, Moraine Valley Community College, and Salt Lake Community College, sought to implement these strategies through virtual capstone courses (VCC). VCC allow students to prepare for a competitive job market by working with businesses and employers to develop their skills and knowledge through virtual internships/externships. Collin College offered five courses with 66 unique NISGTC students enrolled, Moraine Valley Community College offered one course with 44 unique students enrolled and Salt Lake Community College offered three courses with 20 unique NISGTC students enrolled (one student enrolled in two VCCs). Of the total 131 students, 108 successfully completed the VCC with a grade of C or higher. Specific course offerings, as well as enrollment in and completion of virtual capstone courses at these three colleges are shown in Table 5.

Table 5: Virtual Capstone Course Offerings and Enrollment

College	Course Name	Course Subject	Course Number	Semester	NISGTC Course Enrollment	NISGTC Course Completion
Collin College	Advanced Problems in Geographic Information Systems (GIS)	GISC	2231	Spring 2013	4	4
	Comprehensive Software Project: Planning and Design	INEW	2330	Spring 2013	3	2
	Advanced Computer Networking Case Study	ITNW	2474	Spring 2013	3	3
				Spring 2014	16	15
				Spring 2015	7	5
	CCNA 2 - Routing and Switching Essentials	ITCC	1374	Spring 2015	20	13
CCNA 4 - Connecting Networks	ITCC	2372	Spring 2015	13	11	
Moraine Valley Community College	Security Awareness	LAN	103	Fall 2014	22	20
				Spring 2015	22	22
Salt Lake Community College	Intermediate GIS	GEOG	1820	Fall 2014	--	--
				Spring 2015	11	8
				Summer 2015	--	--
	Geography Co-op	GEOG	2000	Summer 2014	1	1
				Fall 2014	--	--
				Spring 2015	--	--
				Summer 2015	--	--
Spatial Analysis	GEOG	2920	Spring 2015	9	5	

A total of 108 students successfully completed a VCC with a grade of C or better, and one student completed two VCCs. Of these 108 students, 70 students earned a total of 133 credentials, including 20 associate's degrees. Among the 70 students who earned a NISGTC credential, 29 earned their first NISGTC credential during the same term they completed the VCC, 14 earned their first NISGTC credential after completing the VCC, and 27 earned their first NISGTC credential before completing the VCC. Seventeen of the 27 who earned their first NISGTC credential before completing the VCC went on to earn one or more additional NISGTC credentials after completing the VCC. Of the 108 students who completed a VCC, the remaining 38 have not yet earned a NISGTC credential. However, 35 of these students completed their VCC in the past two semesters, and thus they may be continuing to make progress toward a NISGTC credential.

EDUCATIONAL OUTCOMES OF NISGTC PARTICIPANTS

Credentials Earned by NISGTC Students

Each quarter, OCCRL tracked all credentials earned by students who participated in grant-funded programs of study associated with NISGTC. These data have been subsequently reported to NISGTC co-grantee colleges, their affiliates, and the DOL. However, it should be emphasized here that students pursuing industry-recognized certifications did not always receive a postsecondary credential, even if they completed the requisite coursework for that credential. NISGTC colleges have begun implementing policies related to the auto-awarding of postsecondary credentials to address this issue, which is particularly prevalent in industries such as IT in which students often receive greater employment benefits from the industry certification rather than the postsecondary award. Thus, it is likely that our estimates of the number of programs of study NISGTC participants completed are conservative. Counting credentials according to the date that they were conferred, OCCRL calculated a total of 2,707 credentials earned as of June 30, 2015. Student credentials were reported in three lengths, as follows:

- Marketable skill or short certificate; a marketable skill credential is a “credit program of 9-14 semester credit hours or a workforce continuing education program of 144-359 contact hours that meet minimum standard for program length specified in the federal Workforce Investment Act, but are too short to qualify as certificate programs on the Coordinating Board program inventory” (Texas Higher Education Coordinating Board. 2012), while a short certificate is a certificate designed to be completed in one year or less
- Certificate lasting longer than a year
- Associate’s Degree

Table 6: NISGTC Credentials Earned, by Length

Credential Length	All NISGTC	Bellevue	Bunker Hill	Collin	Del Mar	Moraine Valley	Rio Salado	Salt Lake
Marketable Skill or Certificate ≤ year	2001	154	135	462	70	951	160	69
Certificate > 1 year	175	22	0	25	5	79	44	0
Associate's Degree	531	108	105	88	12	116	71	31

The total number of credentials awarded by length at each college is reported in Table 6. As seen above, 73.9% of all credentials earned are marketable skills or certificates designed to be completed in one year or less, whereas certificates that are longer than one year were the least-earned credential during NISGTC (6.5%). The remaining 19.6% of credentials were associate’s degrees, with Bellevue, Bunker Hill, and Moraine Valley each conferring over 100.

For the Consortium overall, over one-third of these credentials (34.9%) were earned in spring 2014. However, three NISGTC co-grantee colleges– Bellevue, Bunker Hill, and Del Mar –awarded more credentials in spring 2015 than any other semester. Unsurprisingly, for NISGTC overall, the fewest credentials were earned in the summer semesters, and all spring semesters had more credentials earned than any fall semester. These findings are not necessarily consistent across all colleges, and Table 7 shows the number of credentials conferred per term, by college.

Table 7: Credentials Earned by NISGTC Participants by Term and by College

Academic Term	All NISGTC	Bellevue	Bunker Hill	Collin	Del Mar	Moraine Valley	Rio Salado	Salt Lake
Spring 2012	2							2
Fall 2012	74	13	1	29		25	1	5
Spring 2013	246	17	33	62		115	8	11
Summer 2013	69	12		28		21		8
Fall 2013	177	17	22	28	22	25	54	9
Spring 2014	947	71	65	218	16	512	49	16
Summer 2014	130	31		49	1	6	30	13
Fall 2014	465	27	48	80	15	205	70	20
Spring 2015	597	96	71	81	33	237	63	16
Total	2707	284	240	575	87	1146	275	100

A total of 1,457 students earned 2,707 credentials, and 38% percent of all students who earned any credential earned multiple credentials, possibly evidencing the “stackable credential” concept associated with career pathways. The number of students and the respective number of credentials they earned is shown across colleges in Table 8. Of note are programs at Moraine Valley Community College where 64% of students received multiple credentials, with 77 students earning five or more credentials.

Table 8: Number of Students Earning Multiple Credentials by College

Number of Credentials Earned	All NISGTC	Bellevue	Bunker Hill	Collin	Del Mar	Moraine Valley	Rio Salado	Salt Lake
1	904	121	112	283	87	161	59	81
2	234	27	26	65		100	8	8
3	144	18	10	38		69	8	1
4	66	11	6	5		36	8	
5+	109	2	4	5		77	21	
Total Students Earning Multiple Credentials	1457	179	158	396	87	443	104	90

Demographic Characteristics of NISGTC Students Earning Credentials

Table 9 compares the demographic characteristics of the 1,457 students who completed one or more credentials to the 4,710 students who did not earn a credential. These results reveal some potentially important similarities and differences in students who earned credentials versus those who did not. Whereas 16% of students who earned credentials were Latino, they made up nearly 25% of those who did not earn credentials. In contrast, White students comprised 55% of students who earned credentials and 44.5% of those that did not. Also, the percentage of those who earned credentials who were 25 or older was slightly larger than the percentage of those that did not earn a credential, with a 9.8% change when summed across all age groups over 25. Importantly, whereas women made up almost a third of students (32.3%) not earning credentials, they made up only 20.5% of those earning credentials. Further analysis by gender reveals a potential gender gap in attainment of multiple credentials, with 40% of men earning two or more credentials, but only 31% of women earning more than one credential (see Table 10).

Table 9: Demographic Characteristics of NISGTC Students by Credential Attainment

Demographic Characteristic	Students Earning Credentials	Students not Earning Credentials	Difference
Gender			
Men	79.5%	67.7%	11.8%
Women	20.5%	32.3%	-11.8%
Race/Ethnicity¹			
American Indian/ Alaskan Native	0.5%	1.1%	-1%
Asian	9.7%	9.1%	1%
Black	11.2%	12.3%	-1%
Latino	16.0%	24.9%	-9%
Native Hawaiian/ Pacific Islander	0.0%	0.4%	0%
White	55.3%	44.5%	11%
Multiracial	0.8%	1.3%	-1%
Unknown	6.5%	6.5%	0%
Age at NISGTC Intake			
Under 19	6.7%	11.6%	-4.9%
20-21	9.0%	11.7%	-2.7%
22-24	11.2%	13.6%	-2.4%
25-29	19.2%	16.5%	2.7%
30-34	14.1%	12.9%	1.2%
35-49	25.6%	22.7%	2.9%
50+	14.2%	10.8%	3.4%
Pell Eligibility			
Eligible	27.3%	24.7%	2.7%
Not Eligible	70.3%	68.5%	1.8%
Unknown	2.4%	6.9%	-4.5%

¹Students who identified as ethnically Latino are counted in the Latino category regardless of the additional racial categories they selected. All other racial categories include only non-Latino students. The non-Latino race categories include only students that did not identify as Latino.

Table 10: Multiple Credentials Earned by Gender

	N Credentials	N Students	Percent
Men	1	696	60.2%
	2	189	16.3%
	3+	275	23.6%
Women	1	209	68.2%
	2	45	15.6%
	3+	46	15.2%

In addition to looking at demographic differences across credential attainment and number of credentials, an analysis of demographic differences across the length of credential earned indicates that different programs were serving different populations. Table 11 shows demographic characteristics disaggregated by credential length. Patterns of credential attainment varied by student demographics in important ways. While women accounted for 20.8% of students who earned marketable skills or certificates that are a year or less, that percentage is 5.7% less when looking at certificates longer than a year and 4% smaller with

associate's degrees. Furthermore, individuals who are 22-29 years old make up 28.3% of students who earn marketable skills or certificates that are a year or less, yet this same group comprises 38.2% of all students who earn associate's degrees. The opposite is seen with individuals 35 and older, who make up 41.1% of all students earning marketable skills or certificates but only 32% of students earning associate's degrees.

Table 11: Demographic Characteristics Disaggregated by Length of Credential Earned

	Students Earning Any Credential	Students Earning Credentials < or = 1 year or Marketable Skills	Students Earning Credentials >1 year	Students Earning Associate's Degrees
Gender				
Men	79.5%	79.2%	84.9%	83.2%
Women	20.5%	20.8%	15.1%	16.8%
Race/Ethnicity¹				
American Indian/ Alaskan Native	0.5%	0.5%	0.0%	0.9%
Asian	9.7%	9.1%	8.9%	10.6%
Black	11.2%	11.1%	8.2%	11.9%
Latino	16.0%	16.4%	16.4%	14.3%
Native Hawaiian/ Pacific Islander	0.0%	0.0%	0.0%	0.0%
White	55.3%	55.3%	61.0%	56.8%
Multiracial	0.8%	0.8%	1.4%	0.9%
Unknown	6.5%	6.7%	4.1%	4.7%
Age at NISGTC Intake				
19 and under	6.7%	7.6%	8.2%	4.5%
20-21	9.0%	9.2%	13.7%	9.4%
22-24	11.2%	10.9%	17.8%	15.2%
25-29	19.2%	17.4%	19.2%	23.0%
30-34	14.1%	13.8%	8.2%	15.9%
35-49	25.6%	25.6%	24.0%	23.0%
50+	14.2%	15.5%	8.9%	9.0%
Pell Eligibility				
Eligible	27.3%	25.0%	20.5%	37.0%
Not Eligible	70.3%	72.6%	79.5%	61.5%
Unknown	2.4%	2.4%	--	1.5%

¹Students who identified as ethnically Latino are counted in the Latino category regardless of the additional racial categories they selected. All other racial categories include only non-Latino students. The non-Latino race categories include only students that did not identify as Latino.

ANNUAL PERFORMANCE REPORT COMPARISON COHORT STUDY

One way to understand the impact of specific programs within NISGTC is through a comparison cohort study that compares the outcomes of NISGTC students to a cohort of students who enrolled in similar courses and/or POS prior to the grant. The DOL's Annual Outcome Report called for data on a cohort of program participants as well as a comparison cohort. With a program such as the TAACCCT grant, where many or all students enrolled in programs during the grant period are likely to be affected, a retrospective cohort study represents a feasible option for this analysis. Twelve measures were selected for comparing NISGTC and retrospective students (TAACCCT, 2015, p.9-10):

- New student enrollees
- Number of students completing the program
- Number of students retained in the program
- Number of students retained in other education program(s)
- Number of credit hours completed
- Number of degrees/certificates awarded
- Degree/certificate completion rate
- Number of placements into employment
- Entered employment rate
- Number retained in employment
- Employment retention rate
- Average earnings

Importantly, a distinction exists between workers who were not employed in the quarter before enrollment in NISGTC (number of placements into employment, and entered employment rate) and those who were incumbent workers (number retained in employment, employment retention rate). In the Year 3 Annual Performance Report, OCCRL used a sample drawn from Moraine Valley Community College, a community college located in Palos Hills, Illinois, for selection of both a NISGTC and retrospective comparison cohort. Moraine Valley was selected due to both its rich data on retrospective students as well as the large number of students enrolled in grant-funded POS.

Outcomes were assessed for the Cisco Certified Network Associate Certificate (CCNA), which prepares students for employment as Cisco network technicians. The CCNA is a 2-semester certificate program that had over 100 students enrolled throughout the period of the grant. Moraine Valley also had a sufficiently large number of retrospective students in this POS to conduct a comparison cohort study. Looking at the curriculum for this CCNA program, a single course, LAN 246, was found to be a "gatekeeper course", meaning this class was required for all students who enrolled in the certificate program since at least the 2009-2010 school year. Since both past and current students enrolled in this course for the CCNA certificate, both the grant-funded participants and the comparison cohort students were established based on enrollment in this course.

OCCRL received all student-level data for all students in both cohorts. Once received, all students who enrolled in this class during the first two semesters of full NISGTC implementation in fall 2012 and spring 2013 for the NISGTC cohort, and all students who enrolled in this course during spring 2010, fall 2010, and spring 2011 for the retrospective cohort, were included in the samples for the subsequent analyses. Three semesters were used for the retrospective sample to ensure a large enough sample to match to the NISGTC cohort. This sampling method resulted in 51 students in the NISGTC cohort and 82

students enrolled in the retrospective cohort. We then matched the two cohorts on average age (28.8 for NISGTC and 28.3 for retrospective) and percentage male (92.2% in NISGTC and 91.8% in retrospective), and the resultant sample included all 51 NISGTC students and 73 retrospective students. These students were then followed for two subsequent semesters to determine their retention and credential attainment rates.

Table 12: Annual Performance Report Cohort Outcomes: Moraine Valley Community College

Performance Items	Outcomes at the end of the semester in which the gateway course was taken		Outcomes at the end of second semester after taking the gateway course	
	Program Participants	Comparison Cohort	Program Participants	Comparison Cohort
B. STUDENT PROGRESS BY PROGRAM (PARTICIPANT AND COMPARISON COHORTS ONLY):				
PROGRAM OF STUDY 1				
1. Program:	Cisco Certified Network Associate Certificate (CCNA)			
2. Colleges offering the program (for consortia only):	Moraine Valley Community College			
3. Typical/Expected Length of Program:	2 semesters			
4. Cohort Start Date(s):	Fall 2012, Spring 2013	Spring 2010, Fall 2010, Spring 2011		
5. Total Number of Students in Cohort (new students enrolled in program of study at cohort start date)	51	73		
6. Total Number of Students Completing This Program	0	0	33	12
6a. Total Number of Completers in This Program Who Are Incumbent Workers	0	0	16	7
7. Total Number of Students Retained in This Program	38	46	2	17
8. Total Number of Students Retained in Other Education Program(s)	0	0	0	0
9. Total Number of Program Credit Hours Completed by Students	591	697	731	1129
9a. Total Number of Students Completing Credit Hours in This Program	50	69	50	70
10. Total Number of Earned Credentials in This Program	0	0	160	59
10a. Total Number of Students Earning Certificates in This Program - Less Than One Year	0	0	42	13
10b. Total Number of Students Earning Certificates in This Program- More Than One Year	0	0	0	0
10c. Total Number of Students Earning Degrees	0	0	14	26
11. Total Number Pursuing Further Education After Program of Study Completion	0	0	14	9
12. Number of Non-Hispanic White Graduates Employed After Program Completion	0	0	1	0
13. Number of Non-White (Hispanic or Non-Hispanic) Graduates Employed After Program Completion	0	0	0	0
14. Entered Employment Rate for All Graduates for This Program				
15. Number of Graduates Retained in Employment	0	0		
16 Employment Retention Rate for This Program				
17. Average Program Graduate Six-Month Earnings (gross)	0	0		

Overall results from each of the cohorts are reported in Table 12. The first two columns indicate students' outcomes after one semester of enrollment in the CCNA program, and the second two columns show results after a student's second semester (if they were retained in the first). The retention and completion rates of both cohorts are also summarized in Figure 1. In terms of retention, 38 of 51 NISGTC students (75%) were retained after the first semester, while 46 of 73 retrospective students (63%) were retained. Additionally, this analysis illustrates that NISGTC students were more likely than retrospective students to complete the CCNA POS among the sample of those retained after the first year. Out of the students retained after their first-year, 87% of those in the NISGTC cohort completed the POS compared to 26% of the retrospective cohort. Limited sample sizes precluded us from disaggregating the samples into demographic subgroups and exploring whether POS retention and completion varied according to factors such as race and gender.

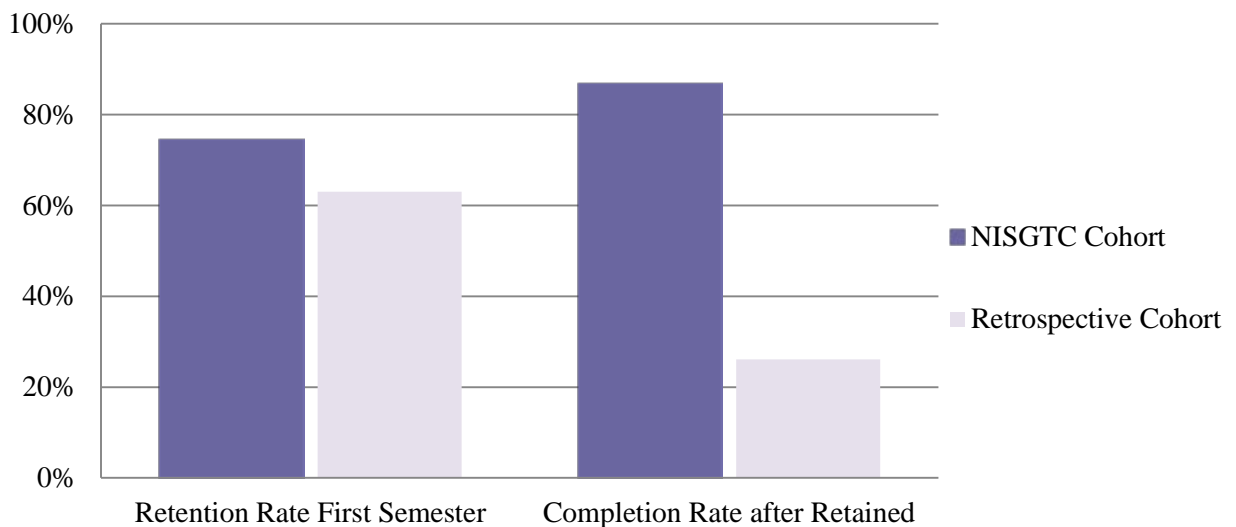


Figure 1: Retention and Completion CCNA POS at Moraine Valley Community College

Importantly, the employment outcomes for Moraine Valley's CCNA programs were extremely limited. In the NISGTC cohort, of the ten completers who were exited and were non-incumbent workers, one was employed in the first quarter after the quarter of exit. There were five additional students in this group that did not have wage data for the quarter after the quarter of exit, due to the quarter of exit being the last quarter for which wage data were collected by the college. In the retrospective cohort, of the three POS completers who were exited and non-incumbent workers, none were employed the first quarter after the quarter of exit. Unlike the NISGTC cohort, where wage data was unavailable due to timing, wage data for retrospective students was complete and fully available beyond the quarter of exit. Given new Moraine Valley wage data and new exit data from colleges in the coming months, this data will be updated for the Year 4 APR.

In the summer of 2015, Collin College provided similar data on a retrospective sample, and the comparison cohort study was replicated using students enrolled in Collin's CCNA program. The CCNA program was selected again due to high enrollment and to provide further analysis on the same POS at two co-grantee colleges in NISGTC. Analyzing a POS that was a marketable skill or a short certificate (intended to be completed in a year or less), we were able to select students from multiple quarters, knowing that they would have time to complete the program. With limited student enrollment in some semesters, expanding cohorts to students who started in different semesters increased the number of students in each cohort, strengthening the overall analysis.

Similar to Moraine Valley Community College, a single course was selected as a “gateway course” for students enrolling in the CCNA program at Collin College. This course was ITCC 1301: Cisco Exploration 1: Networking Fundamentals. Whereas the majority of students enrolled in this course, a continuing education version of this course was also offered as ITCC 1001: Cisco Exploration 1: Networking Fundamentals. This course was also used to select students due having the same content and leading to the same credential. Students in NISGTC were selected if they enrolled in either ITCC 1301 or 1001 in fall 2012, spring 2013, and fall 2013, and retrospective students were selected if they enrolled in one of these courses in fall 2009, spring 2010, or fall 2010.

After matching the cohorts on average age (33.62 for NISGTC and 33.85 for retrospective) and percentage male (88.7% in NISGTC and 89.5% in retrospective), there were 333 retrospective students and 345 NISGTC students. Due to local concerns about student privacy and potential disclosure of identifiable student level data, UI wage data was not available for retrospective students, and thus employment outcomes were not examined for the Collin College comparison cohort study. The results of this comparison cohort analysis for Collin College students are documented in Table 13. Again, the first two columns indicate students’ outcomes after one semester of enrollment in the CCNA program, and the second two columns show results after a students’ second semester (if they were retained in the first).

Table 13: Annual Performance Report Cohort Outcomes: Collin College

Performance Items	Outcomes at the end of the semester in which the gateway course was taken		Outcomes at the end of second semester after taking the gateway course	
	Program Participants	Comparison Cohort	Program Participants	Comparison Cohort
B. STUDENT PROGRESS BY PROGRAM (PARTICIPANT AND COMPARISON COHORTS ONLY): PROGRAM OF STUDY 1				
1. Program:	Cisco Certified Network Associate Certificate (CCNA)			
2. Colleges offering the program (for consortia only):	Collin College			
3. Typical/Expected Length of Program:	2 semesters			
4. Cohort Start Date(s):	Fall 2012, Spring 2013, Fall 2013	Fall 2009, Spring 2010, Fall 2010		
5. Total Number of Students in Cohort (new students enrolled in program of study at cohort start date)	345	333		
6. Total Number of Students Completing This Program	0	0	65	31
7. Total Number of Students Retained in This Program	263	220	117	65
8. Total Number of Students Retained in Other Education Program(s)	0	0	0	0
9. Total Number of Program Credit Hours Completed by Students	996	711	699	396
9a. Total Number of Students Completing Credit Hours in This Program	228	242	143	132
10. Total Number of Earned Credentials in This Program	0	1	66	32
10a. Total Number of Students Earning Certificates in This Program - Less Than One Year	0	1	66	32
10b. Total Number of Students Earning Certificates in This Program- More Than One Year	0	0	0	0
10c. Total Number of Students Earning Degrees	0	0	0	0
11. Total Number Pursuing Further Education After Program of Study Completion	0	0	48	22

Similar to results for Moraine Valley Community College, at Collin College a higher percentage of NISGTC students were retained after the first semester in the CCNA program than were retained in the retrospective cohort (76.2% vs. 66.1%). For those that did not complete in a year, this difference in retention rates persisted after the second semester wherein only 34.4% of retrospective students were retained compared to 59.1% of NISGTC students. Additionally, a higher percentage of NISGTC students completed the CCNA program in a year or less (24.7%) than did students in the retrospective cohort (14.1%). These comparisons are illustrated in Figure 2.

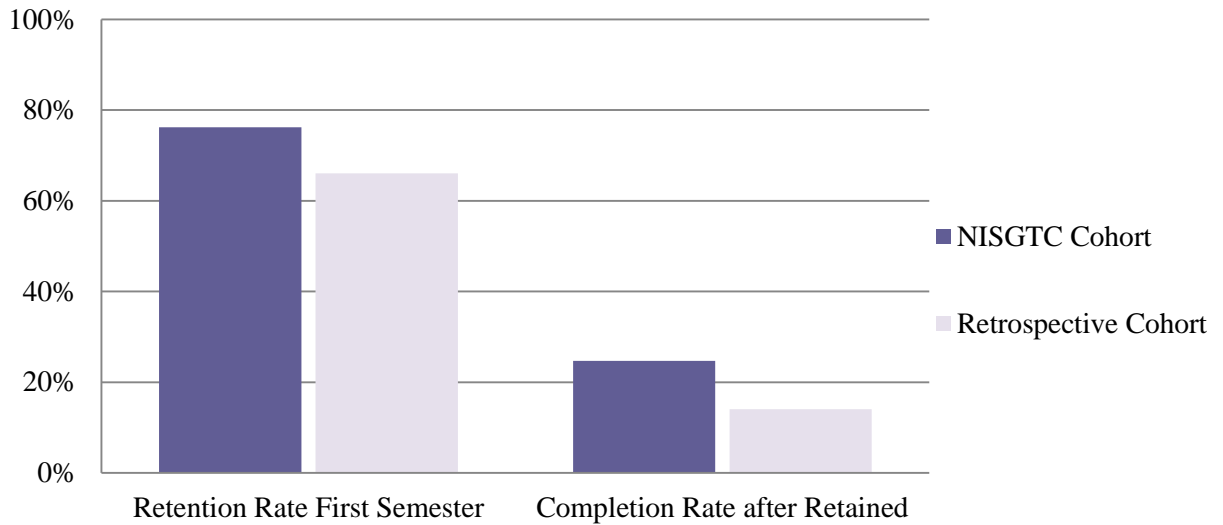


Figure 2: Retention and Completion in CCNA POS at Collin College

IMPACT OF NISGTC ON EDUCATIONAL OUTCOMES

Whereas the aforementioned comparison cohort analysis showed percentage differences in retention and completion between the participant and retrospective cohorts, it did not test for statistical significance. Using regression analysis and PSM, OCCRL performed analyses on grant-funded POS at both Moraine Valley Community College and Collin College to provide partial evidence of the impact of the grant on educational outcomes.

Overall Comparison

In this analysis, we combined data from Moraine Valley Community College and Collin College to yield a larger sample with which to analyze outcomes. For this educational analysis, any student enrolled in a “Local Area Networking” or LAN class at Moraine Valley in Fall 2009 or Fall 2012 (for retrospective students and NISGTC students, respectively) were selected, which resulted in 72 retrospective students and 202 NISGTC students. This selection was made due to the initial decision to submit retrospective students to OCCRL based on their enrollment in any LAN course, not specifically the CCNA courses which are a small subset of LAN courses. Additionally, only selecting CCNA students enrolled in the cohort start semesters (fall 2009 for retrospective students and fall 2012 for NISGTC students) would yield a very small sample for both retrospective and NISGTC, which is why multiple semesters were used for the comparison cohort study. At Collin College, the selection was different than Moraine Valley, as any CCNA student enrolled in fall 2009 for retrospective students or fall 2012 for NISGTC students was selected, resulting in 173 retrospective students and 175 NISGTC participants. This decision was made because all of Collin College’s retrospective students were submitted to OCCRL as a result of having taken the CCNA gateway course, and a large number of students took this course in both cohort start semesters. Combined, the total sample consisted of 244 retrospective students and 377 NISGTC participants, with 274 student from Moraine Valley Community College and 347 students from Collin College. By combining students from Moraine Valley and Collin College, which each had their own selection method, we are also gaining a better picture of NISGTC overall. Specifically, whereas in this analysis, 63% of students were known to be in a POS that was a year or less (CCNA), the other 37% (from Moraine Valley) were likely in a longer program of study. We know from credential attainment that 73.9% of credentials awarded across NISGTC colleges are a year or less, while the other 26.1% are longer than a year. Thus, by including students in longer programs of study in statistical analyses, we can parallel the NISGTC population and better understand overall educational outcomes instead of educational outcomes for a single POS. While combining the samples in this way is beneficial, we also want to better understand the systematic differences between the Moraine Valley Community College students and the Collin College students in these samples, and thus after the initial regression with the combined sample (which will not control for college) these two colleges will be subsequently analyzed separately.

Demographic Characteristics of Cohorts

Before looking at education outcomes for the combined sample, demographic differences between the NISGTC and retrospective samples were assessed using t-tests. A t-test shows statistically significant differences between the two populations, and these were run comparing all demographic variables for the retrospective and NISGTC samples. Results from each variable are shown in Table 14. American Indian/American Natives were not included since only two individuals identified as such in the sample, and no students identified solely as Native Hawaiian/Pacific Islander. Demographic categories that showed a statistically significant difference between the populations were Latino, Asian, and Pell eligible. Latinos accounted for 10.7% of students in the retrospective sample and 16.2% of the NISGTC sample. Asians made up a 4.7% larger portion of the retrospective sample than of the NISGTC sample. The percent of Pell eligible students was the most pronounced difference between retrospective and NISGTC samples, with the percent of Pell-eligible students in NISGTC being over twice the percentage of Pell-eligible students in the retrospective sample. This difference is statistically significant at the $p < 0.001$

level. Additionally, 2.5% more students in the retrospective sample had no race reported than in the NISGTC sample.

Table 14: T-test comparing demographic characteristics in retrospective and NISGTC samples

Race/Ethnicity Variables	NISGTC mean	Retrospective mean	Mean Difference	Significance Level
Percent Male	0.8773	0.9057	-0.0284	0.2732
Age	31	30.703	0.297	0.754
Latino ¹	0.1631	0.1065	0.0566	0.0483**
Asian	0.0716	0.1189	-0.0473	0.0448**
Black	0.1114	0.0861	0.0253	0.3078
White	0.6229	0.5995	0.0234	0.5589
Multiracial	0.0265	0.0123	0.0142	0.227
No Race Reported	0.0239	0.0492	-0.0253	0.0886*
Percent Pell Eligible	0.2626	0.127	0.1356	0.000***

¹Students who identified as ethnically Latino are counted in the Latino category regardless of the additional racial categories they selected. All other racial categories include only non-Latino students. The non-Latino race categories include only students that did not identify as Latino.

Notes: * p < .10, ** p < .05, *** p < .01.

Regression Analyses of Credential Attainment

Logistic regression was used to estimate the impact of NISGTC on credential attainment, controlling for student characteristics. The outcome variable is whether or not students earned any credential during the period of analysis (fall 2009 to fall 2011 for retrospective students, and fall 2012 to fall 2014 for NISGTC students), with the important caveat that students who completed industry-recognized certifications but did not receive a postsecondary certificate or degree would be coded as having not completed a postsecondary credential. The estimates take the form of marginal effects, which represent the percentage point difference in the likelihood of the outcome occurring when all other variables in the model are set to their mean value. The NISGTC treatment effect estimate therefore represents the difference in the probability of credential attainment for the “average” student at these colleges (in terms of the other variables included in the model). All variables apart from age were coded as dummy variables, meaning each variable had mutually exclusive categories. Specifics regarding the coding of race are as follows: If a student identified as Latino, he or she was classified as such, regardless of if any other race was selected. If a student selected multiple races (not including Latino), they were classified as “Multiracial,” and if a student had no race selected, he or she was categorized under “Race Not Reported.” All other racial groups consisted of individuals who identified as that race and not Latino. Only two American Indian/American Native and no Native Hawaiian/Pacific Islander students were part of the samples. Age was calculated based on age as of August 15, 2009 for retrospective students and August 15, 2012 for NISGTC students. Whereas we understand age may vary slightly if adjusted for students’ initial course enrollment or enrollment in NISGTC, calculating age this way allows for consistency across the cohorts. Veteran status and disability status were unavailable for all retrospective students and thus were not included in the model. The results of this analysis are presented in Table 15.

Table 15: Logistic Regression on Credential Attainment for Combined Sample

VARIABLES	Credential Attainment
NISGTC	0.3813*** (0.0462)
Age	-0.0035* (0.0019)
Male	-0.0792 (0.0678)
Latino	-0.0838 (0.0612)
Asian	-0.1460* (0.0788)
Black	-0.2632*** (0.0779)
Multiracial	-0.4422** (0.187)
Race not reported	-0.1162 (0.1265)
Observations	619

Notes: Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.10

This marginal effects model shows that among students of the same race, age, gender, and Pell-status, students in NISGTC were estimated to be 38.1 percentage points more likely to earn a credential than students in the retrospective sample. Importantly, Asian, Black, and multiracial students were all estimated to be significantly less likely to earn a credential compared to White students, with differences of 14.6% (p=0.064), 26.3% (p=0.001), and 44.3% (p=0.001), respectively. These results point to a gap in credential attainment by race across both retrospective and NISGTC cohorts. Age was also statistically significant, with each one-year increase of age estimated to decrease the likelihood of credential attainment by 0.36 percentage points.

Next, OCCRL fit separate regression models to each college’s sample to assess whether the impact of NISGTC varied between the samples at Moraine Valley Community College and Collin College. Table 16 details regression results for Moraine Valley Community College. The race categories of “Multiracial” and “American Indian/American Native” were omitted in this model because of limited or no student identification with these categories at Moraine Valley.

At Moraine Valley Community College, holding age, gender, race, and Pell-status constant, NISGTC students are estimated to be 34.8 percentage points more likely to earn a credential than retrospective students. For each year older a student is at the time of enrollment, he or she is estimated to be 0.62 percentage points less likely to earn a credential (holding all other variables constant). In other words, a 40-year-old student is roughly 12% less likely than a demographically equivalent 20-year-old student to earn a credential. Additionally, holding all other variables constant, Black students are estimated to be 24.8 percentage points less likely to earn a credential than White students at Moraine Valley.

Table 16: Logistic Regression on Credential Attainment at Moraine Valley Community College

VARIABLES	Credential Attainment
NISGTC	0.3485*** (0.0662)
Age	-0.0062** (0.0028)
Male	-0.0767 (0.1003)
Latino	-0.0508 (0.0837)
Asian	-0.0082 (0.1642)
Black	-0.2486** (0.0779)
Race not reported	-0.1718 (0.1715)
Pell Eligible	0.0132 (0.0715)
Observations	267

Notes: Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.10

Table 17: Logistic Regression on Credential Attainment at Collin College

VARIABLES	Credential Attainment
NISGTC	0.1821*** (0.0425)
Age	0.0032* (0.0017)
Male	-0.0499 (0.0592)
Latino	-0.1059 (0.0719)
Asian	-0.0172 (0.0633)
Black	-0.0753 (0.0658)
Multiracial	-0.1067 (0.1207)
Race not reported	-0.2012 (0.1586)
Pell Eligible	-0.069 (0.0615)
Observations	345

Notes: Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.10

Next, we look at Collin College, with output from the regression on credential attainment in Table 17. Holding age, gender, race, and Pell eligibility constant, students at Collin College in NISGTC were estimated to be 18.2 percentage points more likely than students in the retrospective sample to earn a credential. Age was marginally significant ($p=0.069$), with each one-year increase of age resulting in a 0.32 percentage point increase in the likelihood of earning a credential as a CCNA student at Collin College. No racial category was statistically significant in predicting credential attainment.

Propensity Score Matching (PSM)

A PSM estimator was used to compare credential attainment among those enrolled in NISGTC and those in the retrospective cohort, using the combined sample from Moraine Valley Community College and Collin College. Students were matched on college, age, gender, race, and Pell eligibility. Again, the two students who identified as American Indian/American Native were excluded from the model, and an additional four students with missing data (in age or gender) were also excluded. The output from this estimation is presented in Table 18.

Table 18: Propensity Score Matching Estimates of Impact of NISGTC on Credential Attainment

VARIABLES	Credential Attainment
NISGTC	0.3255*** (0.0431)
Observations	615

Notes: Standard errors in parentheses. *** $p<0.01$

This model estimates that after matching students on demographic characteristics, NISGTC students at Moraine Valley Community College and Collin College were estimated to be 32.6 percentage points more likely to earn a credential than those in the retrospective cohort, an estimate that is quite similar to the previous logistic regression estimates. We are 95% confident that the true difference in credential attainment between retrospective and NISGTC students at Moraine Valley Community College and Collin College is somewhere between 23.8%-40.7%.

EMPLOYMENT OUTCOMES OF NISGTC PARTICIPANTS

In addition to analyzing the educational outcomes of NISGTC students and estimating the impact NISGTC had on credential attainment, this evaluation sought to understand the employment and earnings benefits NISGTC students received and the impact NISGTC had on students' labor market outcomes. We begin by descriptively analyzing changes in quarterly wages for NISGTC students from pre- to post-NISGTC and then use similar techniques as the previous section to statistically estimate the impact NISGTC had on students' labor outcomes.

Descriptive Changes in Quarterly Wages for NISGTC Students

To estimate the magnitude of wage growth students experienced as a result of NISGTC, we compared students' pre-NISGTC wages to the last quarter of wages available for each student. The most recent UI wage data reported from colleges ranged from Quarter 4 of 2013 to Quarter 3 of 2014, and is shown below in Table 19. Bunker Hill was not included in employment analysis since their wage records were aggregated across students and not submitted to OCCRL at the student level.

Table 19: Last Quarter of UI Wage Data Reported to OCCRL

Last Quarter of Wage Received by 8/1/2015	
College	Year Quarter
Bellevue	20141
Collin College	20142
Del Mar	20142
Moraine Valley	20143
Rio Salado	20134
Salt Lake	20142

To analyze changes in quarterly wages before and after NISGTC, first the total student sample with any UI wage record was identified (n=3,194). The percentage of students with wage data at all colleges (excluding Bunker Hill) is shown in Table 20.

Table 20: Percent of Students with UI wage data by college

Percent of Students with Wage Data as of 8/1/2015	
College	% of Students
Bellevue	38.1%
Collin College	68.3%
Del Mar	44.4%
Moraine Valley	84.5%
Rio Salado	55.6%
Salt Lake	64.0%

OCCRL identified all NISGTC students who had wages in at least one quarter before they enrolled in NISGTC (n=3,034) and calculated both the maximum and average wages for all available quarters pre-enrollment. Next, we looked at all students with pre-enrollment wages who had also earned a NISGTC credential (n=920) and documented the date of credential (or their last credential if they earned more than one) and their maximum credential length. We then flagged students who had earned their credentials

after their enrollment in NISGTC to ensure UI wage quarters would not overlap (n=780). Lastly, we identified all students who met all previous criteria and had at least one quarter of wage after the quarter of their last credential (n=238).

The average was taken of all mean wages and maximum wages post-credential for these 238 students. Mean wages may better represent typical earning capacity or potential, as they take into account all quarters of wage (either pre-enrollment or post-credential). On the other hand, maximum wage looks at the change from the highest earnings pre-enrollment and post-credential. Maximum wages may best estimate earning potential for some students, especially if he or she had several low quarters of wage due to looking for work or working part-time (researchers have discussed trends such as Ashenfelter’s dip (Xu and Trimble, 2014), in which students may be more likely to be unemployed or under-employed immediately prior to enrollment in college). Table 21 shows the average mean and maximum wages pre-enrollment of the 278 students who also had post-credential wages, disaggregated by the length of credentials that students would go on to attain.

Table 21: Mean and Maximum Pre-Enrollment Quarterly Wages by Future Credential Length

Max Credential Length	N Students	Avg. Mean Wage Pre-Enrollment (Quarterly Wages)	Avg. Max Wage Pre-Enrollment (Quarterly Wages)
Marketable Skill or Certificate = or <1 year	158	\$7,330.51	\$10,735.75
Certificate > 1 year	15	\$6,595.20	\$9,796.20
Associate's Degree	68	\$6,286.49	\$10,176.03

We then took the difference of post-credential earnings and these pre-enrollment earnings. Differences of mean and maximum wages for all students across credential lengths are detailed in Table 22. Of note, the wage change for the average maximum wages pre-enrollment and post-credential may partially be explained by the amount of workplace experience and wage data in both of those periods. NISGTC students on average had 11.3 quarters of pre-enrollment wage data and only 2.3 quarters of post-credential data. In contrast, the average change in mean earnings increased for all students who earned a credential. The largest change was seen for students who earned an associate’s degree. These students made \$1,712.31 more per quarter on average than they did before NISGTC enrollment, which equates to \$6,849.24 more annually. The smallest change in wages was for students earning a certificate longer than a year, but this change still resulted in an average increase of \$2,419.20 in annual earnings. Students earning marketable skill credentials or certificates meant to be completed in a year or less also saw fairly substantial wage gains in mean wages pre-enrollment and post-credential, with an average annual wage increase of \$5,301.84.

Table 22: Average Change of Mean and Maximum Quarterly Wages by Credential Length

Max Credential Length	Wage Change in Average Mean Wage (Quarterly Wages)	Wage Change in Average Max Wage (Quarterly Wages)
Marketable Skill or Certificate = or <1 year	\$1,325.46	-\$1,186.86
Certificate > 1 year	\$604.80	-\$1,384.87
Associate's Degree	\$1,712.31	-\$1,398.81

IMPACT OF NISGTC ON LABOR MARKET OUTCOMES

Regression Analysis of Employment and Wages

To estimate the impact of NISGTC on students' labor market outcomes, Moraine Valley Community College students were selected due to available wage data for retrospective students as well as recent wage data for NISGTC students. We selected all students who took an "LAN" course in fall 2009 for the retrospective sample (n=72) and in fall 2012 for the NISGTC sample (n=210). Students were excluded from this analysis if they never had wage data reported (n=48). All other students were coded as either having or not having UI wage data in the pre-enrollment and post-cohort quarters of interest.

We first estimated the impact of NISGTC on employment using logistic regression. Once again, the estimate for the NISGTC variable represents the difference in the probability of the outcome (employment) between NISGTC and retrospective students, controlling for all variables in the model. In addition to the demographic characteristics we controlled for in previous analyses, we also included a variable in the current model representing whether students were employed during the pre-cohort time period. The model also estimates the impact of receiving a postsecondary credential on earnings, although once again we reiterate that industry-recognized certifications are excluded from the data on postsecondary credentials awarded. Findings from this regression, in Table 23, estimate that students in NISGTC were no more likely than students in the retrospective cohort to be employed post-cohort. Furthermore, those who earned credentials were no more likely than those who did not earn credentials to be employed in the quarter of interest. The only statistically significant predictor of estimated employment is pre-cohort employment, as students employed pre-cohort were an estimated 13.9 percentage points more likely to be employed than those who were not employed before the course.

Table 23: Logistic Regression on Employment for Moraine Valley Community College

VARIABLES	Employment
NISGTC	-0.0074 (0.0474)
Earned Credential	0.0160 (0.0532)
Employed Pre-Cohort	0.1388*** (0.0401)
Age	0.0033 (0.0024)
Gender	0.0072 (0.7177)
Latino	-0.0807* (0.0488)
Asian	-0.1046 (0.0858)
Black	-0.01435 (0.0903)
Pell Eligible	0.0482 (0.0503)
Observations	234

Notes: (Standard errors in parentheses)

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$

Next, students were matched to UI wage data in any quarter before their respective course enrollment (20092 and before for retrospective students and 20122 and before for NISGTC students) and post-cohort (20121 and after for retrospective students and 20141 and after for NISGTC students), with mean wages in each of these time period calculated for each student (n=164). Students who had no wages in one or both of these periods were excluded from this analysis. Mean post-cohort wages were regressed on demographic variables and mean pre-enrollment wages, with results displayed in Table 24. A linear regression was used since the predicted outcome is a continuous variable of quarterly wages.

Table 24: Linear Regression on Wages for Moraine Valley Community College

VARIABLES	Mean Quarterly Wage Post-Cohort
NISGTC	1772.09** (682.28)
Earned Credential	315.34 (1664.94)
Earned Credential During NISGTC	210.12 (1798.93)
Wage Pre-Cohort	0.64*** (0.055)
Age	9.89 (34.43)
Gender	-1330.07 (898.71)
Latino	-1826.50** (709.07)
Asian	-2987.71 (2032.05)
Black	-70.21 (1131.75)
Pell Eligible	-899.15 (648.92)
Observations	164

Notes: (Standard errors in parentheses)

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$

Mean pre-enrollment wages was the strongest predictor of mean post-cohort wages. Holding all other demographic variables constant, for each additional dollar a student made pre-enrollment, quarterly post-cohort wages were estimated to increase by \$0.64. Latino students had estimated post-cohort quarterly earnings of \$1,826.50 less than white students, which is statistically significant. Holding pre-enrollment earnings and other demographic variables constant, NISGTC students were estimated to have post-cohort earnings of \$1,772.09 more than retrospective student. However, as those who earned a credential did not have wages significantly different than those without a credential, and as NISGTC credentials did not affect wages any more than retrospective credentials, this estimated increase is likely due at least partially to broader economic changes that occurred from the retrospective to NISGTC timeframe rather than the effect of NISGTC activities grant funds.

CONCLUSION

This report analyzed the outcomes of NISGTC participants and estimated the impact of NISGTC on students' postsecondary and labor market outcomes. Since awarded the \$19 million federal grant in 2011, NISGTC has worked to educate students for high-paying jobs in the IT sector, and has done this through various strategies that help students complete programs of study and find employment in high-paying IT jobs. This report sought to understand the outcomes of students enrolled in NISGTC through descriptive data collected over the four years of the grant. In addition, OCCRL has carried out rigorous statistical analysis with available data to understand educational and employment outcomes through regression and PSM. OCCRL's evaluation approach is mixed-methods, combining qualitative information gained from site visits and compiled in the implementation report (OCCRL, 2015) with quantitative findings reported in the quarterly performance reports, detailed in this report.

Key findings from this report illustrate student outcomes and participation in strategies, as well as the impact of the grant on student educational and employment outcomes. NISGTC affected the educational experience of 6,166 students, representing men and women, a broad age range, and different races. Co-grantee colleges and their affiliates should continually assess enrollment and completion of NISGTC POSs, even after the grant. Some traditionally underserved populations in IT (specifically women and Latinos) made up a substantially larger percentage of students not earning credentials than they did students earning credentials. Furthermore, if these students did earn credentials, they made up a larger percentage of those students earning marketable skills or short certificates rather associate's degrees. Overall, 23.6% of NISGTC students earned a credential, and updated UI wage data will provide a fuller picture of employment outcomes for these students. For those students for whom we do have UI wage data, we see positive wage outcomes for students who earn all levels of credentials, with associate's degrees resulting in the largest mean earnings growth from pre-enrollment. Concerning strategy implementation, some strategies, such as online and hybrid courses, were used across all sites with a broad range of student enrollment and engagement; there was a total of 1,528 enrollments in online courses and 2,066 enrollments hybrid courses since the beginning of the grant until June 30, 2015. However, other strategies, such as Virtual Capstone Courses, had a narrower focus, with only three schools and 131 students participating. Wider implementation and longer observation of these students' outcomes could provide a richer understanding of the potential role of this strategy in student outcomes.

Results from comparison cohort studies at both Moraine Valley Community College and Collin College found that a higher percentage of students in NISGTC were retained and eventually completed the CCNA program compared to retrospective students. Using the retrospective data in regression analysis, OCCRL found that NISGTC CCNA students at Collin had an expected likelihood of completing a credential 18 percentage points higher than retrospective CCNA students. In both the regression on the combined sample and the regression on Moraine Valley students, when the population of students is expanded beyond just CCNA students, the expected likelihood of NISGTC students completing a credential increases to over 30 percentage points more than retrospective students. PSM further evidences these findings using the combined sample of Collin and Moraine Valley. In all of these regressions, at least one demographic characteristic (age or race) was statistically significant, and again exemplifies the need for continual college level assessment and improvement in terms of students enrolling and completing POS.

The impact of NISGTC on employment outcomes is less clear. Given Moraine Valley Community College's data, credential attainment and enrollment in NISGTC were not statistically significant predictors of employment post-credential attainment. Findings on quarterly earnings for those who were employed are inconclusive. While being in NISGTC was a significant predictor of post-cohort earnings, economic factors associated with the time frame of each cohort could be confounding the true impact of NISGTC, particularly since the marginal difference of credentials between the two cohorts was not significant. In conclusion, while the grant was able to serve many students and lead to positive educational outcomes, colleges should continue to assess how to improve employment outcomes,

specifically through UI wage data, and strategize on how to best serve traditionally under represented students in IT.

The analyses in this report were limited in important ways by data availability. Five particular areas of data limitations are of note: intake data, credential data, UI wage data, retrospective student data, and data concerning outside forces of the grant. Intake data, including Pell eligibility and TAA Status, were only taken at one point of the grant. Due to this timing, these variables do not capture how students' status change over time, and using them in regression analyses up to four years after enrollment may limit the applicability of these variables to findings. Specifically, Pell eligible was not significant in any impact findings, but had this data been kept over time, we could have seen different results.

As mentioned previously, credential data did not include all industry-recognized certifications students received. In an industry such as IT which relies heavily on such certifications, relying on postsecondary credential data alone likely underestimates the number of programs of study students completed and limits the ability to accurately estimate the impact of program of study completion on students' labor market outcomes. Obtaining data on the specific certifications students obtained would surely provide a more robust picture of the educational and employment outcomes of NISGTC students.

Limitations around UI wage data are twofold. First, a lack of UI wage data in a quarter does not necessarily mean a student is unemployed. Students could have been working in a different state or in an industry that does not report wages. While OCCRL sought to minimize this limitation by only selecting students who ever had UI wage, students could easily move between quarters, or have additional wages within reported quarters. Second, due to student privacy concerns and timing around UI wage pulls, available data can be fairly outdated by the time it is analyzed. As discussed in the in Table 19, most colleges only had wage data through quarter 1 of 2014. As we attempt to understand employment outcomes, this data limits findings because we know spring 2014 had the largest number of credentials in the consortium, yet we are unable to look at wage outcomes of students who earned these credentials. Thus, as more UI wage data becomes available, findings around employment outcomes will no doubt be refined.

As only two colleges were able to give retrospective student data, impact studies are limited in their applicability to the consortium overall. While regressions on educational outcomes sought to parallel students in the sample with NISGTC overall, given that all students in POS longer than a year were from one college, the applicability of findings to all students is potentially limited. Specifically, outcomes will likely vary by college due to both college resources and student populations and characteristics. Additional retrospective data would allow a much fuller picture of how the grant impacted outcomes differently at different sites.

Lastly, as mentioned in employment outcomes section, factors such as the economy play a role in students' decision to attend college and pursue specific programs of study. With the economic volatility since 2008, employment and wages for retrospective students and NISGTC students are likely very different, and we are unable to control for all possible changes in both the economy and demand for workers in IT industries in this report. Our analyses of the impact of NISGTC on student outcomes should therefore be interpreted as suggestive estimates rather than conclusive findings.

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Office of Community College Research
and Leadership
University of Illinois at Urbana-Champaign
129 CRC, 51 Gerty Drive
Champaign, IL 61820
E-mail: occr@illinois.edu
PH: 217-244-9390
<http://occr.illinois.edu>



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