



New Horizons: Puerto Rico Lasers and Photonics Career Pathways

Program Evaluation Final Report

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Executive Summary

I. New Horizons: Puerto Rico Lasers and Photonics Career Pathways Intervention Program and Activities

The Puerto Rico Photonics Institute, housed at Universidad Metropolitana (UMET), in San Juan, Puerto Rico, was awarded a round 4 Trade Adjustment Assistance Community College and Career Training Act (TAACCCT) grant by the U.S. Department of Labor (DOL) to implement the *New Horizons: Puerto Rico Lasers and Photonics Career Pathways* intervention program. The main goals of this intervention program were to 1) create a one year certificate program in photonics technology, and 2) recruit and train workers who lost their jobs due to trade adjustments, other unemployed workers on the island, and veterans, among others.

The one-year certificate program was designed after the model of OP-TEC, the National Science Foundation National Center for Optics and Photonics Education for technicians. The certificate in Lasers, Photonics and Fiber Optics, totals 40 credit hours and consists of 6 credit hours of general education, 29 credit hours of core technical courses, and 5 credit hours of on-the-job training through internships.

Program participants were TAA eligible displaced workers, veterans, reservist, and other unemployed workers. The average age of these workers was 35. All participants are of Hispanic origin, bilingual in Spanish and English, 88% male and 12% female.

The intervention program admitted four cohorts of students who were trained, placed and monitored through their internships, and assisted with job placement. The program graduates will be followed after graduation to monitor their professional progress and expected increase in their earnings because of the intervention.

The main outcomes of this intervention were to recruit and enroll 60 students in this program, and graduate and place in photonics jobs at least 90% (54 students) of the program participants.

This intervention created a one-year certificate in Lasers and Photonics with a strong industrial internship component of nine weeks. In addition, employability skills, job searching, resume writing, and interviewing skills were an integral part of the Certificate program. This intervention created skillful employees in the niche technology of photonics for which industry has difficulty finding quality trained technicians. The creation and execution of this one-year program has been very well documented so that it can be easily replicated and scaled up as needed in other parts of the U.S.

II. Evaluation Design Summary

During the formative evaluation of the New Horizons project, data were collected and analyzed with the goal of informing all stakeholders of the progress of the project in achieving its targeted outcomes. Continuous feedback from the project management led to adjustments and

improvements in processes and tasks to achieve successful results. The goals of the summative evaluation, conducted towards the end of the project, were to assess achievement of program outcomes and impacts so that future DOL projects and policy makers can learn from the experiences of New Horizons.

The Logic Model summarizing the evaluation activities, with the Theory of Chance Model summarizing the possible changes during project execution, can be found in the appendix.

The implementation evaluation of the New Horizons project examines the extent to which project tasks and activities were implemented as planned in the project proposal. The implementation evaluation focused on the seven questions listed in Exhibit 1.

The outcomes and impacts evaluation of the New Horizons project determined the extent to which the program achieved its goals. The questions dealing with students' academic success and employment outcomes are shown in Exhibit 2.

Exhibit 1

Implementation Evaluation Questions

1. What process is used to plan the various program parts?
2. What changes need to be made to improve the program as we learn from executing it?
3. What factors affect the positive or negative contribution of partners to the program?
4. Which partner contributions are the most critical to project success?
5. Which partner contributions are less critical to project success?
6. Were the implementation activities and outputs consistent with the original plan?
7. What changes had to be made to the original plan to make sure the established goals were achieved?

Exhibit 2

Outcome Evaluation Questions

1. How many unique participants were served?
2. What is the total number of participants completing the NH project?
3. What is the total number of participants still retained in their program of study?
4. What is the total number of participants completing credit hours?
5. What is the total number of participants earning credentials?
6. How many participants who completed the program found employment in the field?
7. From the participants who found employment, how many retained employment six months after completion?
8. What are the average earnings of employed participants?
9. How many participants who completed the program matriculated in a higher degree program?

Using a mixed method evaluation design, the evaluation team drew from the following types of evidence:

1) student tracking and progress data, 2) student baseline and completion surveys, 3) program documents, 4) meeting summaries, 5) interviews with key New Horizons stakeholders (students, employers, program personnel, faculty, UMET personnel). Analyzing this data from different perspectives, we were able to identify implementation indicators such as the recruitment methods, financial aid availability, industry commitment, and student academic preparation. Data analysis also indicates program outcomes for participants who completed the one-year certificate and are employed in the field.

III. Implementation Findings

Program timeline and start-up

The New Horizons project was originally hosted by the School of Environmental Affairs of Universidad Metropolitana located in San Juan, Puerto Rico. The project's administration and staff are located at the main campus of the university in San Juan, and the labs where the technical training originally took place are located in the town of Barceloneta, about 60 miles west of San Juan. After the devastation of hurricane Maria, the Barceloneta site was not accessible due to lack of power and buildup of mold in the buildings. Some of the most essential trainers were moved to a physics lab at the San Juan campus of UMET where the remaining students completed their lab work.

Students could take classes in San Juan, or those who were far away could watch and participate in the lectures via live interactive video broadcasts at the UMET Center in Aguadilla as seen in figure 1. This remote accessibility increased the potential candidate pool from across the island. Before hurricane Maria, all students travelled to Barceloneta once a week for a full day of hands-on training in the labs of the Puerto Rico Photonics Institute.

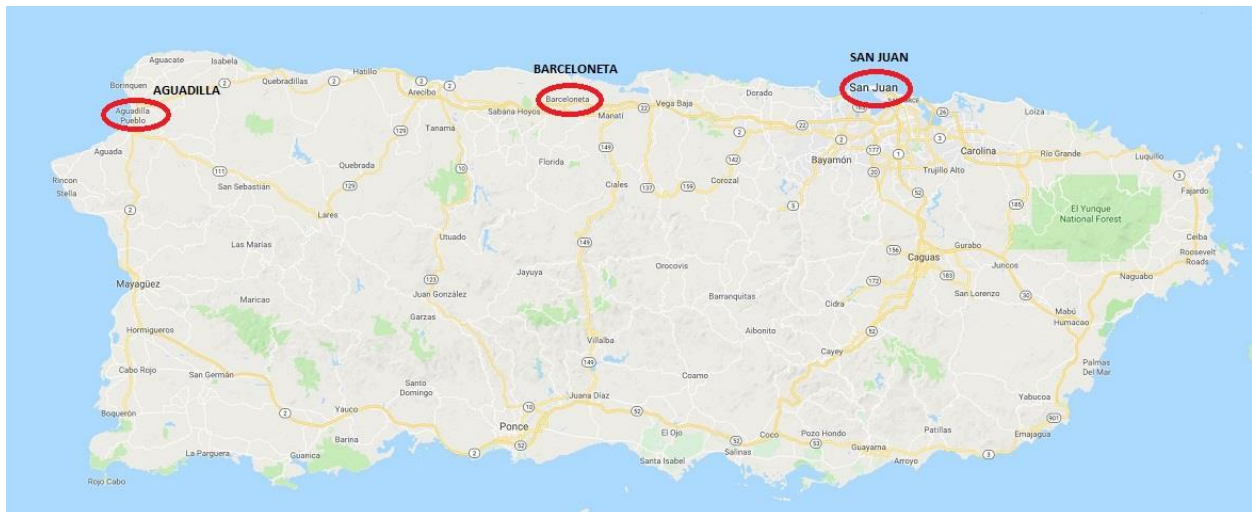


Figure 1. Program Locations

The original timeline called for the start of the first cohort in August 2015. The second cohort would start in January 2016, and the third one in March 2016. Please see the complete project timeline in Exhibit D of the appendix. Even though the project management followed the proper procedures for new program approval and filed the necessary forms on February 25, 2015, the approval from the Puerto Rico Higher Education Council arrived a few days late for the program to be included in UMET’s application to the US Education Department for Title IV support. Thus, the program would not be eligible for federal financial aid. In the fall, due to a US Education Department audit, a second opportunity to be included for federal aid was postponed, and it was not finally approved until February 25, 2016. This was one year after the initial application. This delay delayed the starting of the first three out of six planned cohorts, which had a significant effect on all aspects of the project. Additionally, the devastation hurricane Maria had on Puerto Rico caused the entire program to shut down from September until late October of 2017, and the complete closure of the labs in Barceloneta up to end of April 2018. The devastating effects of hurricane Maria also prevented many students from continuing their studies, and stopped others who were planning to start the certificate in the Fall of 2017 and Spring of 2018. The hurricane also created obstacles in the internship part of the program; many of the participating companies were also affected and had to change their production schedules and priorities, postponing the internships to later dates.

Implementation Support, Leadership, and Continuous Improvement

The project management received significant support from UMET, but the starting time was still delayed because of a hold placed on UMET by the Federal Department of Education because of an on-going investigation of the sister university Universidad del Este. Once the first cohort started in March 2016, the implementation followed its course with amendments in the timeline to make up for lost time. The project’s outreach and recruiting team conducted 32 outreach events with 5,099 attendees. Despite the large recruitment effort, the number of students that finally started the program was significantly lower than expected. Table 1 summarizes the outreach and recruitment effort per cohort.

Table 1. Recruitment Retention and Placement Results by Cohort

Type of Activity	Coh1	Coh2	Coh3	Coh4	Total
Number of recruiting events	6	10	11	5	32
Number of event participants	980	2,110	1,935	74	5099
Number of participants expressed interest	77	106	39	27	249
Number of participants applied	13	8	3	5	29
Number of applicants enrolled	6	7	3	3	19
Number of enrollees retained and completed the certificate	2	4	1	1	8
Number of completers finding employment in the photonics field	0	0	0	1	1

Changes in Program Implementation

To make up for the eight month delay in starting the first cohort, the program management intensified its program promotion efforts, holding the 32 events between March 2016 and October 2017. These events included visits to companies with displaced TAA-eligible workers, US Army Transition Services, participation and interviews on radio and TV programs, open houses at the Barceloneta Laboratory, Photonics Roadshows, Laser and Photonics demonstrations, and more. A very aggressive social media campaign was undertaken using Facebook, Twitter, Instagram, the PRPI website, and the UMET website outreach services. Despite the increased push and intensity of the marketing campaign, the program enrollment results did not reflect the effort. The situation became worse after September 2017 when Hurricane Maria ravaged Puerto Rico. According to the Puerto Rico government, more than 200,000 Puerto Ricans migrated to the U.S. mainland after hurricane Maria¹. Lack of demonstrable graduates with gainful employment diminished interest among recruits. Younger students who are looking into higher education are not choosing the certificate program because it does not lead to a bachelor's degree, which they believe is their ticket to professional employment.

After Hurricane Maria, the most essential lab equipment was transferred from Barceloneta to the UMET San Juan campus where students in the third and fourth cohort could finish their lab work and graduate from the program. Those cohorts were able to finally return to the Barceloneta laboratory for the Photonics-Enabled Technologies instrumentation course, which required use of those facilities, in late April 2018.

IV. Participant Impacts and Outcomes

The New Horizons program had a good beginning and achieved all the goals set out for year one to establish the one year certificate program in Optics and Photonics as shown by the following outcomes:

- Created a 40 credit hour certificate program using evidence based curricula.
- Created a bridge program for students who needed help with math and English.
- Acquired the necessary equipment and established the Photonics and Electro-optics labs in Barceloneta.
- Procured all the needed equipment required for ETA certifications.
- Certified all instructors with ETA, the credential issuing agency.
- Established PRPI as an ETA certification and testing site.
- Established internship agreements with industrial partners.

Despite the accomplishments of year one, the New Horizons program did not perform as expected because of two unforeseen factors: 1) the long bureaucratic process of new program approvals that postponed the enrollment of the first two cohorts by eight months, and 2) hurricane Maria's devastation of the island of Puerto Rico which entirely changed the economy, and peoples' outlook towards education in a new field of study. As can be seen from Table 2,

¹ Hernandez, A. (2018, March 6). *Exodus from Puerto Rico grows as island struggles to rebound from Hurricane Maria*. Retrieved from https://www.washingtonpost.com/national/exodus-from-puerto-rico-grows-as-island-struggles-to-rebound-from-hurricane-maria/2018/03/06/b2fcb996-16c3-11e8-92c9-376b4fe57ff7_story.html?utm_term=.139a1dc73dfe

from the expected unique participants, only 22% enrolled, 20% completed the TAACCCT funded program, and 14% are employed after finishing the program.

Table 2. DOL TAACCCT Grant Outcome Measures for New Horizon Program

	DOL Outcome Measures	Goal	Current Through May 2018	Percentage of Goal Achieved
1	Total unique participants served/enrolled	60	19	32%
2	Total number of participants who have completed a TAACCCT-funded program	45	8	18%
3	Total number of participants still retained in the program of study or another TAACCCT-funded program	57	8	14%
4	Total number of participants completing credit hours	54	8	15%
5	Total number of participants earning credentials	45	8	18%
6	Total number of participants enrolled in further education after grant-funded program of study completion	5	1	20%
7	Total number of participants employed after grant-funded program of study completion (non-incumbent workers only)	28	4	14%
8	Total number of participants employed after and retained in employment three months after program of study completion (non-incumbent workers only)	28	4	14%
9	Total number of those participants employed at enrollment (for purposes of this reporting, "Incumbent Workers") who receive a wage increase post-enrollment	0	0	0%

Limitations

People are not venturing into a new field of study without evidence of employment. After the beginning of the program, companies like General Electric and 3M Caribe announced closure of their PR plants and moved them to other locations in the Caribbean.

The bureaucratic system of Puerto Rico is very slow to move and it took longer to establish the new program in the UMET system in order to start the Photonics Certificate Program on time.

The unexpected devastation of hurricane Maria, and the mass migration of people from PR to the United States mainland, prevented the program from expanding and made it difficult for graduates to find employment.

V. Conclusions

The New Horizons: Puerto Rico Lasers and Photonics Career Pathways certificate program was developed according to the planned schedule. The leadership team procured the necessary equipment and set up the photonics and electro-optics labs at the Barceloneta site of UMET. The program goals of enrolling 60 students and graduating at least 54 were met with 32% success because of the bureaucratic delay in enrolling students into the program, the people's aversion to taking risk in a program in which it is not clear that it will lead to employment, the unexpected devastation of the island by hurricane Maria, and the mass migration of Puerto Ricans to the U.S. mainland.

The evaluation of the New Horizons program found that the certificate program was very well designed, and industry was satisfied with the skills and abilities of the interns it employed. After Hurricane Maria, a strong need for fiber optic technicians was required in the process of rebuilding the island's infrastructure. Two program participants interned with the fiber optics company Critical Hubs, and one completer was hired. PRPI requested to DoL and received approval to acquire additional equipment to reflect this need. The demand for more technicians is increasing as other companies involved in the rebuilding process are hiring more photonics technicians. It is recommended that the program enrollment and output be monitored past the performance period, because the indications are that this intervention will fulfill its promised goals as the rebuilding of the Puerto Rico infrastructure continues.

It is also recommended that when a new program is proposed, the time needed to go through the bureaucratic processes is determined ahead of time and taken into account in the planning of the project.

Introduction

In October 2014, the Puerto Rico Photonics Institute, which is an organization within Universidad Metropolitana (UMET), located in San Juan, Puerto Rico, was awarded a round 4 Trade Adjustment Assistance Community College and Career Training Act (TAACCCT) grant by the U.S. Department of Labor (DOL) to implement the *New Horizons: Puerto Rico Lasers and Photonics Career Pathways* intervention program. The purpose of this program was primarily to retrain displaced TAACCCT eligible workers, veterans and, secondarily, other unemployed or under-employed Puerto Ricans, in the new field of Lasers and Photonics, and to provide them with unique, high-demand, and high-wage skills.

The TAACCCT grant requires a third party evaluation, and UMET, through a competitive request for tenders, awarded the evaluation of the New Horizons project to Higher Education Evaluations. This final report is submitted to UMET and New Horizons administration, completing the evaluation contract requirement.

This report is organized into six units: 1) description of the New Horizon Program and Activities; 2) evaluation design; 3) study limitations 4) implementation study findings; 5) outcomes study findings; 6) conclusion.

1. Description of the New Horizons Program

The New Horizons program was established to help satisfy two needs: 1) to provide employment and a career path for TAA eligible (see Exhibit 1), veterans, displaced, unemployed or under-employed adults and 2) to fill the need for trained technicians in the new high wage technologies of lasers and fiber optics.

In Puerto Rico, there are hundreds of workers who have been displaced by closings and relocations in industries such as pharmaceuticals, medical devices, electronics, and textiles. There are thousands of veterans and reservists, a large percentage of whom are likely academically well-prepared for the technical certificate level of training offered by PRPI, and of whom roughly half are currently unemployed or under-employed². There is also a large, technically skilled, but unemployed or under-employed, workforce in Puerto Rico which is ready to learn the new laser and photonics skills in order to access new career opportunities. Exhibit 1 shows the TAA qualified displaced workers, the companies they worked for and their location in Puerto Rico.

² New Horizons Proposal

Exhibit 1: TAA-qualified worker displacements in Puerto Rico

Company	Location	Impact and Expiration Date	No. of Workers	Reason
3M CARIBE LLC (textile manufacturing)	Las Piedras, P.R.	03/17/2013 – 04/03/2016	35	3M Company decision to move the manufacturing to Juarez, Mexico.
Osram Sylvania (Lighting products)	Luquillo, P.R.	10/21/2012 – 11/27/2015	51	Production has been moved to Czech Republic to gain a 30% savings in operational costs.
Micron Technology (memory chips)	Aguadilla, P.R.	08/01/2012 – 06/04/2015	40	Company was bought it by a Japanese company named Miyota.
Baxter (medical devices)	Aibonito, P.R.	05/07/2012 – 12/03/2015	400	Production is being shifted to a foreign country – Dominican Republic.
GE Industrial of PR LLC (light switches)	San German, P.R.	01/22/2012 – 02/25/2015	149	Transfer of Auto Q Lines to Dominican Republic.
TOTAL			675	

In addition to the 675 TAA-eligible population, 108,464 veterans currently reside in Puerto Rico³. Of these, 19% live below poverty level and would likely be interested in this kind of training that could help them get out of poverty. The New Horizons program was designed with input from pharmaceutical, medical devices, aerospace, and telecommunications companies to provide the laser and photonics skills needed.

The New Horizons: Puerto Rico Lasers and Photonics Career Pathways Certificate

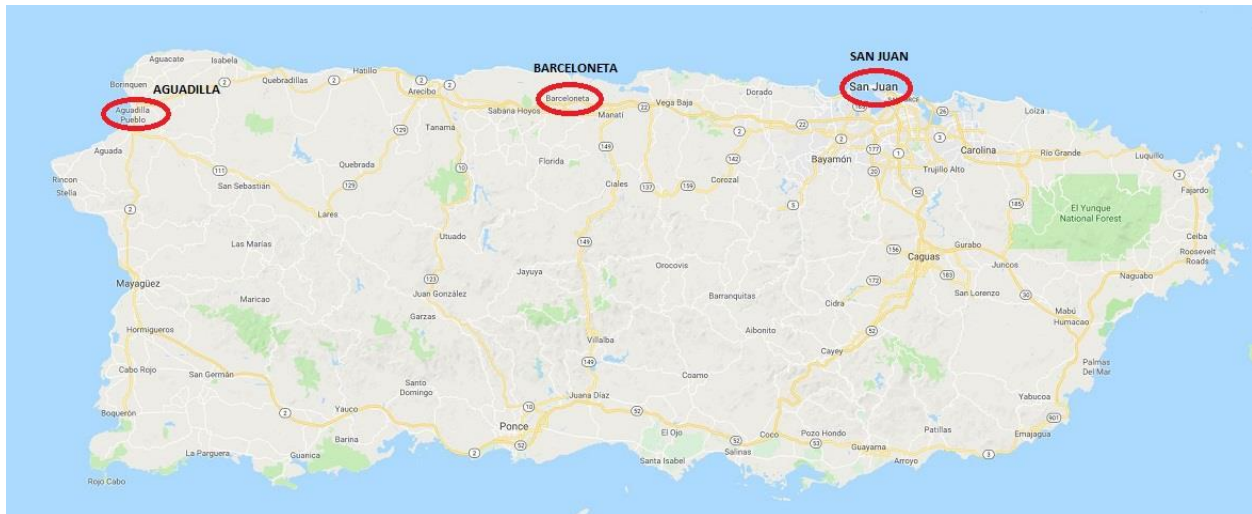
The Certificate program aimed at producing high quality laser photonics technicians that would fill openings in industry and also provide a pathway for further education for those who wished to continue on to higher studies.

The certificate program used evidence-based curriculum developed and tested by OP-TEC, the National Center for Optics and Photonics Education, in more than 34 community colleges around the country for more than 10 years with outstanding results⁴. The model consisted of a one-year certificate in Lasers and Photonics, totaling 40 credit hours and made up of 6 credit hours of general education, 29 credit hours of core technical courses, and 5 credit hours of on-the-job training through internships. The complete certificate program can be seen in Appendix C. The program consisted of classroom instruction at the UMET facilities in San Juan, and hands-on experimentation at the laboratories of Puerto Rico Photonics Institute in Barceloneta, located about one hour west of San Juan as can be seen in Exhibit 2. Participants in Aguadilla and Barceloneta could attend the lectures via live two-way video feed originating from the San Juan UMET campus.

³ New Horizons Proposal

⁴ Accessed from: <https://www.optecstore.org/products/fundamentals-of-light-and-lasers/>

Exhibit 2: Program Locations



All the courses were taught in a mix of English and Spanish by qualified professors fluent in both languages. This enabled the students to gain a deep understanding of complex concepts by hearing the explanation in both English and Spanish. In addition to the technical courses, the program offered instruction in entrepreneurship for those interested in starting their own business, and job searching and interviewing workshops and support for all participants. The New Horizons leadership team met with industry and obtained commitment of support from the North Technological Initiative (INTENOR) and Northeast Technological Initiative (INTENE). Also the Puerto Rico Small Business Technology Development Center (SBTDC) and PRiMEX have both pledged to support program participants who expressed interest in entrepreneurship.

Program Development and Changes

The original project outline called for project start up and curriculum development from October 2014 to September 2015. The start of the first cohort was scheduled for August 2015, followed by continuous startup of five more cohorts as show in Exhibit 3. The goal was to enroll 10 adult learners in each cohort and graduate at least 90% of them.

Most of the applicants could not afford the cost of this certificate without assistance through federal financial aid. Only a minority were eligible for TAA benefits. However, UMET was not able to include this new certificate in its computer system for federal financial aid in time, and as a consequence, the first cohort did not start until March 2016. In other words, the time allotted for starting and running cohorts 1 and 2 was lost. The program was, therefore, left with time to enroll only four cohorts. Another setback to this project was the devastating Hurricane Maria that hit Puerto Rico on September 20, 2017. The entire island lost power and experienced flooding and destruction of infrastructure and buildings. Electrical power was restored at the San Juan campus of UMET in December 2017, and at Barceloneta in March 2018. The administration of the New Horizons project was able to obtain an extension from the DOL to continue its programmatic part until June of 2018. The new schedule for the four actual cohorts that have completed the certificate program is shown in Exhibit 4.

PROJECT YEAR ONE Oct 2014 – Sept 2015					PROJECT YEAR TWO Oct 2015 – Sept 2016					PROJECT YEAR THREE Oct 2016 – Sept 2017					PROJECT YEAR FOUR Oct 2017 – Sept 2018												
Oct – Dec	Jan – Mar	Mar – May	May – Jun	JULY	Aug – Oct	Oct – Dec	Jan – Mar	Mar – May	May – Jun	JULY	Aug – Oct	Oct – Dec	Jan – Mar	Mar – May	May – Jun	JULY	Aug – Oct	Oct – Dec	Jan – Mar	Mar – May	May – Jun	JULY	Aug – Oct				
Project start-up and curriculum development					1 st Cohort = 10 adult learners										Tracking updates, data gathering, and completion of requirements for 3 rd party evaluation												
					Term 1	Industry Intern.	Term 3	Term 4																			
Subject matter experts approve curriculum					2 nd Cohort = 10 adult learners																						
OP-TEC advises on Industry Comp. Model							Term 1	Industry Intern.	Term 3	Term 4																	
					3 rd Cohort = 10 adult learners																						
Universal Design integral part of online course development.							Term 1	Industry Intern.	Term 3	Term 4																	
					4 th Cohort = 10 adult learners										By September 2017, at 57 workers will have completed the Certificate and 45 will be employed.												
					5 th Cohort = 10 adult learners																						
					All participants receive entrepreneurship training by the PRSBTDC.							Term 1	Industry Intern.	Term 3	Term 4					By October 2016, curriculum available and online.							
					6 th Cohort = 10 adult learners																						
							Term 1	Industry Intern.	Term 3	Term 4																	

Exhibit 3: Program Timeline

Exhibit 4: Modified Program Timetable

	START	END
COHORT 1	March 2016	May 2017
COHORT 2	August 2016	May 2017
COHORT 3	January 2017	May 2018
COHORT 4	April 2017	May 2018

Program Recruitment and Placement

The project’s outreach and recruiting team conducted 32 outreach events attended by 5,099 persons as seen in Exhibit 5. The events consisted of open houses in San Juan and Barceloneta, presentations to high schools, military bases, unemployment offices, advertisements on the radio, newspaper and movie theaters, talks to social gatherings and more. Despite the large recruitment effort, the number of students that finally started the program was significantly lower than expected. Exhibit 5 summarizes the outreach and recruitment effort per cohort.

Exhibit 5: Recruitment Effort by Cohort

	Coh1	Coh2	Coh3	Coh4	Total
Number of recruiting events	6	10	11	5	32
Number of event participants	980	2,110	1,935	74	5099
Number of participants expressed interest	77	106	39	27	249
Number of participants applied	13	8	3	5	29
Number of applicants enrolled	6	7	3	3	19
Number of enrollees completing the certificate	2	4	1	1	8
Number of completers finding employment in the photonics field	0	0	0	1	1

Placement of program graduates was made more difficult after the massive social, economic and infrastructure changes Hurricane Maria caused to the island. As life started to return to normal in the spring of 2018, companies started hiring more employees, especially those involved with infrastructure restoration and repair.

Student Characteristics

The New Horizons program was designed to serve TAA qualified persons, unemployed, under-employed, and veterans. The demographics, socio-economic data and prior work experience was captured for each student.

Demographics

From the total of participants, there were 17 males, two female, 19 Hispanics (Puerto Ricans), one veteran, 19 full time students, 8 employed while attending, no one with disabilities, and four received TAA assistance. Amongst completers, 7 were male, one female, 8 Hispanics, no veterans, eight full time students, four employed while attending, none with disabilities and two receiving TAA assistance.

Socio-Economic Data

From the eight program completers, no one reported collecting public assistance at program entry.

Work Experience

No participants reported prior work experience in a STEM related occupation. Five out of the eight participants reported prior work experience in the retail service industry. Three were unemployed at the start of the program.

2. Evaluation Design

The evaluation commissioned by DOL has a dual purpose: a) To provide UMET/PRPI and DOL with information, data, and analysis needed to properly manage the execution of the program in the most efficient and effective way to deliver the proposed outcomes through the implementation study, b) to provide UMET/PRPI and DOL the information needed to determine

if the project accomplished its intended outcomes and impacts by providing the new laser/photronics skills to program participants and assist them in finding employment with improved wages in a more stable work environment. The latter purpose was accomplished through the outcomes study. The outcomes study also has the purpose of informing the DOL and policy makers on the effectiveness, advantages and disadvantages of different intervention techniques tried in this project. Considering the evaluation methods outlined in the SGA⁵ and the accepted methods of statistical analysis, we determined that a simple method of pretest-posttest approach was the most appropriate for the expected small population size of 60, which actually became 8 participants. A pre and a post test were carefully created by subject matter experts and was administered to all program participants at the entry and exit points of the program respectively.

2.1 Implementation Study Design

During the program execution, the evaluation team monitored the progress and the challenges participants and program staff encountered, and offered suggestions for changes and modifications that were necessary to overcome obstacles and achieve the original outcomes and impacts.

2.1.1 Research Questions

The following four questions, and shown in Exhibit 6, mentioned in the SGA⁶, as well as data sources, were answered.

Exhibit 6: Implementation Evaluation Research Questions

No	QUESTION
1	How was the particular curriculum or activity selected, used, or created?
2	How were programs/program designs improved or expanded using grant funds? What delivery methods were offered? What was the program administrative structure? What support or other services were offered?
3	Are in-depth assessment of participant abilities, skills, and interests conducted to select or enroll individuals into the program being evaluated? What assessment tools and process were used? Who conducted the assessments? How were the assessment results used? Were the assessment results useful in determining the appropriate program and course sequence for participants? Was career guidance provided? If so, through what methods?
4	What contributions did each of the partners and other key stakeholders make towards: 1) program design, 2) curriculum development, 3) recruitment, 4) training, 5) placement, 6) program management, 7) leveraging of resources, and 8) commitment to program sustainability? What factors affected partner involvement or lack of involvement? Which contributions from partners were most critical to the success of the grant program? Which contributions from partners had less of an impact?

2.1.2 Program Logic Model

To evaluate the progress and outcomes of the New Horizons project, the evaluation team created a logic model that can be found in Appendix A. This model diagrammatically depicts

⁵ U.S. Department of Labor. 2001. Improving the Evaluation of DOLETA Pilot and Demonstration Projects – A Guide to Practitioners

⁶ Page 79 of SGA/DFA PY-13-10

the sequence of steps that had to be taken during program implementation in order to achieve the desirable outcomes.

2.1.3 Methodology/Data Collection and Analysis

The implementation evaluation provided to UMET/PRPI administration important information and suggestions for changes in the scheduled processes in order to achieve the project goals. The evaluation team employed several formative evaluation strategies during the implementation phase.

Performance data as well as program data were collected to evaluate the program implementation. Protocols and data collection instruments were created and shared with program staff and administration to ensure smooth gathering of important information. PRPI submitted the instruments and data collection procedures to the UMET IRB, and obtained approval before the gathering of data, which began in October of 2015.

The evaluation team gathered data from the New Horizons program staff, lecture and lab instructors, program partners, and students through classroom observation, interviews, focus groups, surveys, and document review. Also, via surveys, the evaluation team was able to measure knowledge gain, aspirations, and perceptions of training program value. Site visits during the Fall and Spring semesters with classroom and lab observations, document review, focus groups, and interviews with key personnel from UMET/PRPI and industry complimented the data collection process. Lessons learned and best practices were recorded and shared with all program staff and UMET administration. Exhibit 7 shows all the various data collection activities.

Exhibit 7: Various Data Collection Activities

Evaluation Question	Outcome	Data Collection Instrument	Data Source	Frequency
How was the particular curriculum or activity selected, used, or created?	Increased institutional capacity	Document review Observation Interviews	NH grant proposal Participants NH personnel	Four interviews with NH Personnel Interviews with eight participants
How were program designs improved or expanded using grant funds? What delivery methods were offered? What was the program administrative structure? What support or other services were offered?	Increased institutional capacity	Document review Interviews	NH grant proposal, Participants, NH personnel	Four interviews with NH Personnel Interviews with eight participants
Are in-depth assessment of participant abilities, skills, and interests conducted to select or enroll individuals	Increased graduation success rate	Pre-test procedure and data NH document review	NH grant proposal, Participants, NH personnel	Four interviews with NH Personnel Interviews with eight participants.

<p>into the program being evaluated? What assessment tools and process were used? Who conducted the assessments? How were the assessment results used? Were the assessment results useful in determining the appropriate program and course sequence for participants? Was career guidance provided? If so, through what methods?</p>		
<p>What contributions did each of the partners and other key stakeholders make towards: 1) program design, 2) curriculum development, 3) recruitment, 4) training, 5) placement, 6) program management, 7) leveraging of resources, and 8) commitment to program sustainability? What factors affected partner involvement or lack of involvement? Which contributions from partners were most critical to the success of the grant program? Which contributions from partners had less of an impact?</p>	<p>Increased graduation success rate</p>	<p>NH document review Industry surveys Visit and interviews with industrial partners like Critical Hub.</p>

To analyze and assess implementation information, the evaluation team studied the data from program personnel, program participants, and industry partner interviews. Participants' transcripts and grades were compared from cohort to cohort. Donations from partners and

suggestions for program improvement were studied and analyzed to find their effect on program success.

2.2 Outcomes and Impact Study Design

The outcome and impacts study measures the impact of the NH program on its participants. The metrics of this study include program completion, certificate attainment, pursuit of higher education, employment, and wage increases.

2.2.1 Research Questions

The SGA requires the study and answer of the following nine research questions shown in Exhibit 8.

Exhibit 8: Outcomes and Impact Study Evaluation Research Questions

No.	Research Question
1	How many unique participants were served?
2	What is the total number of participants completing the NH project?
3	What is the total number of participants still retained in their program of study?
4	What is the total number of participant completing credit hours?
5	What is the total number of participants earning credentials?
6	What is the total number of participants enrolled in further education after completing the NH program?
7	What is the total number of participants employed after completing the NH program?
8	What is the total number of participants who were hired the first quarter after program completion and retained employment after the second and third quarter?
9	What is the total number of participants who were employed at enrollment and received a wage increase post-enrollment?

2.2.2 Methodology

For the outcomes study, the evaluation team used the pre/post design to study the outcomes of the New Horizons participants. A comparison cohort study was explored, but a similar group was not found at UMET or at any of the other 31 community colleges of the Optics and Photonics College Network (OPCN). All of the OPCN colleges have two year associate in science degrees and a few have certificates in optics or photonics. The certificate programs were examined carefully but none was similar enough in scope and content to be used as comparison group. The majority of the examined OPCN certificates were at 12 credit hours or less, containing only photonics and electronics courses, and did not include any general education courses or internships⁷.

2.2.3 Data Collection and Analysis

The evaluation team and the New Horizons administration team took an 80 hour certification training in research compliance and ethics offered through Collaborative Institutional Training Initiative (CITI Program) of the University of Miami before applying and obtaining permission from the IRB of UMET to start data collection⁸. The training included the following topics: animal subjects research, human subjects research, responsible conduct of research, biosafety and biosecurity, conflicts of interest, export control, and information privacy and security. The evaluation team designed data collection protocols to collect all the relevant data from program

⁷ <http://www.op-tec.org/opcn>

⁸ <http://uresearch.miami.edu/regulatory-compliance-services/citi>

participants. During the lifetime of the NH program, the evaluation team conducted three surveys with each cohort of program participants. The first was a baseline survey and the data were collected by the NH program advisors during the registration period. The baseline survey collected information about participants before the start of the NH intervention program. The data from the baseline survey are used in the pretest-posttest analysis. Two surveys were conducted, one at six months and the second at 12 months after program completion. The post completion surveys were completed with a combination of online surveys and telephone calls in order to access all applicants who have spread throughout the island and were not easily accessible after the social disruption caused by Hurricane Maria. The NH personnel persisted with many phone calls and emails to all applicants over a period of many months to collect the post program surveys. Because of the extension granted to the completion date of the fourth cohort, due to Hurricane Maria, we will not be able to have the six and twelve month post program surveys for that group. The evaluation team conducted three sets of faculty and staff interviews and three focus group interviews with students during each of the three site visits to UMET.

The research questions for the outcomes and impact evaluation, along with the data collection methods, data sources, and frequency are displayed in Exhibit 9. Data collected included program completers, certificates earned, employment, continuing education, and earnings.

Exhibit 9: Outcome and Impact Evaluation Data Collection

No.	Research Question	Data Collection Method	Data source	Frequency
1	How many unique participants were served?	UMET student data	NH personnel	Four times, at end of each cohort
2	What is the total number of participants completing the NH project?	UMET student data	NH personnel	Four times, at end of each cohort
3	What is the total number of participants still retained in their program of study?	UMET student data	NH personnel	Four times, at end of each cohort
4	What is the total number of participants completing credit hours?	UMET student data	NH personnel	Four times, at end of each cohort
5	What is the total number of participants earning credentials?	UMET student data	NH personnel	Four times, at end of each cohort
6	What is the total number of participants enrolled in further education after completing the NH program?	UMET student data	NH personnel	Four times, at end of each cohort
7	What is the total number of participants employed after completing the NH program?	UMET student data	NH personnel	Four times, at end of each cohort
8	What is the total number of participants who were hired the first quarter after program completion and retained employment after the second and third quarter?	UMET student data	NH personnel	Four times, six month survey after end of each cohort

9	What is the total number of participants who were employed at enrollment and received a wage increase post-enrollment?	UMET student data	NH personnel	Four times, at end of each cohort
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UMET/PRPI records were used to monitor short-term outcomes of participants at their entrance, retention and completion of the program. Data for medium-term program outcomes such as program completers, employed completers, participants earning certificates, and participants continuing with higher education, were also obtained from UMET/PRPI records. Data about employment after graduation were obtained from PRPI personnel through email surveys and telephone calls. Data on long-term outcomes such as retention of employment six and twelve months after graduation were collected by PRPI through requests to the Puerto Rico Department of Labor.

Due to the sample size of eight participants, the evaluation is limited to the use of only basic descriptive statistics such as mean, median and mode to describe the outcomes of this study.

3. Study Limitations

From the outset, this study was limited by the small sample size of 60 expected participants. However, because of institutional the previously described delays, the program started late and the first two cohorts were never enrolled, bringing the possible total sample size to 40 expected participants. Hurricane Maria in September 2017, had such a negative impact on all aspects of the NH program that it even further limited the number of possible participants. Because of these limitations, the evaluation team had to work with primarily qualitative data collected through interviews with NH program personnel, instructors, student focus groups, and employers to assess the implementation of this program.

The outcomes study was based on the data collected from NH program personnel, instructors, student focus groups, and employers. However, because of the limited variety of data available for analysis, and because of the small sample size (n=8), a more robust evaluation, with results that could be generalized, was not possible.

Employment status and wages after graduation were self-reported and the evaluation team has no way of verifying the accuracy or the truthfulness of this data.

4. Implementation Study Findings

The implementation study incorporated several methods and strategies during the implementation and evolution of the New Horizons program. This included copy on email correspondence while the program was unfolding and monthly telephone calls with the program leadership. The information collected was used to communicate back to the UMET/PRPI leadership and to suggest changes that were necessary to modify the program in order to maintain and achieve its original outcomes and impacts.

4.1 Program Delivery

The New Horizons program had a hybrid delivery that enabled participants from remote areas such as Aguadilla and Barceloneta to participate. The lecture part of the courses was delivered

live from a classroom in San Juan, and the experiments were conducted once a week at the Puerto Rico Photonics Institute labs in Barceloneta, which is geographically in the middle of the northern part of the island as shown in Exhibit 10.

Exhibit 10: Map with Program Locations



The Barceloneta location has three labs very well equipped with industrial grade laser and photonics training equipment, instrumentation and materials. The first lab was used for the introductory photonics courses, the second lab was used for higher level laser skills, and the third lab was for basic electronics skills.

In addition to the technical skills, the program included a course in English, and training in entrepreneurship, job search and interviewing skills. Tutoring was also available to program participants by the instructors and lab assistant.

4.2 Technical Skills Training

The New Horizons provided world-class technical training using the best optical components and instrumentation from Newport and other manufacturers, optical tables with vibration isolation, a laser system on loan from the Arecibo Observatory, and a state-of-the-art optical coating system. The electronics laboratory was equipped with twelve stations, each containing a state-of-the-art digital storage oscilloscope, a signal generator, a power supply, a National Instruments experiment and bread-boarding station, and a computer with industry standard LabView® software and interface system. Additionally, the technical training was delivered by instructors with Ph.D. degrees in electronics and photonics and industrial experience. The laboratory instructor also had a bachelor's degree in electrical engineering and industrial experience.

Students who had some difficulties with mathematics were individually tutored by the instructors and brought up to speed quickly. Students from the remote locations in all cohorts expressed some annoyance for the long travel and cost of gasoline to travel to Barceloneta once a week for training.

4.3 Professional Development Training

The professional development training was comprised of resume and cover letter writing, conducting a job search, and interviewing skills. This training was delivered before the internship course to prepare the students for their first professional interviews. A refresher of the job search using the World Wide Web was given before the end of each cohort.

4.4 Student Performance Assessment

NH participants were assessed initially to determine if they were ready to enter the program so they could be properly placed in the different courses. During program execution, the participants were regularly assessed in every course of the program to determine knowledge and technical skills gain.

4.4.1 Placement Assessment

NH students were assessed for their readiness to enter the program. The college placement test, which tests mathematics and English language readiness for college level coursework, was required for all applicants. All applicants also took the technical content pre-test that was designed by OP-TEC, who publishes the textbook used to teach the photonics content of the program. Prospective students who required math or English remediation were tutored by program instructors to become proficient enough to take the placement test again and enroll in the following cohort. The most common deficiency reported by instructors was in mathematics.

Student A: "Traveling to Barceloneta is a problem for me because I have an old car that may break at any time. Also the cost of gas is important because I am unemployed at this time."

4.4.2 Ongoing Assessment

In all courses of the program, students were regularly assessed to determine their progress in gaining new knowledge. Additionally, in the technical courses, program participants were tested in their proficiency in using laboratory equipment, handling specialized photonics materials, and the gain of specific technical skills. Students expressed their pleasure in learning how to use specialized and sophisticated equipment such as lasers, optical power meters, optical time domain reflectometers and other equipment. The assessment modules on equipment use ensured that every program participant learned how to use these specialized equipment for troubleshooting, repairing and maintenance of sophisticated photonics systems.

Student B: "It was very exciting for me to get my hands on the OTDR and learn how to use it to find where the fiber optic cable broke 20 miles away."

4.7 Program Administrative Structure

The program was managed by the Puerto Rico Photonics Institute (PRPI), which is an organization of Universidad Metropolitana (UMET). At the beginning of the program, PRPI was administratively under the School of Environmental Studies. In the third year of the NH program, PRPI was moved under the control of the School of Science and Technology. These two Schools have since been unified under the School of Science, Technology and Environment.

The NH program had a stable and strong administrative structure throughout its existence. The structure consists of the program director, the program manager, an administrative assistant, a recruiter and outreach coordinator, and an instructor for the technical courses.

The math courses were taught by the program director who is a photonics scientist with close to 30 years' experience in the field. The non-technical courses like English, and Entrepreneurship, were taught by UMET instructors. Both the program director and the technical course instructor are fluent in English and Spanish, which enabled them to explain difficult concepts in the students' native language for better comprehension.

4.8 Program Improvement and changes

Because of the delay in the start of the program, which was beyond the control of the program leadership, certain changes had to be made in order to make up for the lost time. Originally, the lecture part of the program was planned to be taught at the main campus of UMET in San Juan in a traditional face-to-face classroom. When the first cohort started in March of 2016, NH classes were moved to a studio class that enabled students at two remote locations, Barceloneta and Aguadilla, to be able to participate live along with the face-to-face students. Also, because of time lost between September 2015 and January 2016, with permission from DOL, the programmatic part of the project was extended to April 2018. From January 2018 to April 2018, after Hurricane Maria, the laboratory courses were moved to the San Juan campus with the minimum equipment needed because the Barceloneta facility had no electricity until January 2018. After electricity was restored in Barceloneta, the laboratories were still non-operational because of the presence of mold, for another three months.

Student C: "I am grateful to the New Horizons administration and NSF for providing the stipend that enabled me to finish my certificate and get a job at Critical Hubs. Thank you."

4.9 Program Supports

NH provided the participants with many supporting services to enable them to take the courses of the certificate program, learn the new skills, and prepare them for starting a job in the new high technology field of lasers and photonics.

The bridge program assisted participants in improving their skills and ready them to enter the next cohort. Math tutoring was offered at the end of classes. The explanation of difficult concepts in Spanish, the native language of all participants, helped them gain new complex technical skills.

After Hurricane Maria, many companies did not want to offer the internships they had promised, and the students could not afford to quit their part time jobs to attend a non-paying internship. After consultation between the project director and the leadership of OP-TEC and LASER-TEC, both NSF Centers of Excellence in Photonics, LASER-TEC obtained from NSF a supplemental grant that provided subsistence funds for three students to finish their internships⁹.

4.10 Career Guidance

Before the required internship, every participant went through a program that consisted of resume and cover letter writing, job searching using the World Wide Web (WWW), and interviewing skills. Participants found these services useful and necessary, especially the older

⁹ <http://www.laser-tec.org/laser-tec-and-nsf-assist-puerto-rico-photonics-institute-to-recover-from-hurricane-maria.html>

students that were not so familiar with navigating the WWW. The majority of participants expressed high satisfaction for the entrepreneurship course which gave them knowledge and tools needed to start their own business.

4.11 Capacity Building

The New Horizons project did not meet the initial goals set for capacity, which was 10 participants for each of the six cohorts. The recruiting and outreach efforts were intense and quite effective in creating excitement and interest among the general public. Before the first cohort started for example, with six recruiting events, the program was presented to 980 attendees, 77 of whom expressed interest in participating. However, out of the 77, only 6 applied to the program, or 8%. Looking at cohort 2, the percentage of those applied over those who expressed interest was 7%, for cohort 3 was 8%, as can be seen in Exhibit 11. Cohort 4 started after Hurricane Maria with most of the island having no power and 200,000 Puerto Ricans migrating to the United States¹⁰. A follow-up survey of the participants that expressed interest, but had not applied, revealed that the reason for not applying was the lack of financial means. Puerto Rico (PR) has been in financial turmoil in recent years, which peaked in 2015 when the government of PR defaulted on bond payments, and in 2016 the U.S. government appointed an oversight board with ultimate control over the commonwealth's budget and debt¹¹. As a result of this financial crisis, people have no money, and those who have it are not willing to invest it in education in a new field that they have no prior knowledge of or its potential.

Exhibit 11: Recruitment Activities and Enrollment Figures

Type of Activity	Coh1	Coh2	Coh3	Coh4	Total
Number of recruiting events	6	10	11	5	32
Number of event participants	980	2,110	1,935	74	5099
Number of participants expressed interest	77	106	39	27	249
Number of participants applied	6(8%)	7(7%)	3(8%)	3(11%)	19(8%)
Number of applicants enrolled	3	5	2	3	13
Number of enrollees retained and completed the certificate	2	4	1	1	8
Number of completers finding employment in the photonics field	0	0	0	1	1

4.12 Participant Satisfaction

In the implementation evaluation, surveys were distributed to measure the participants' perception of quality and value of the program and their degree of satisfaction. Satisfaction surveys concentrated on resources and services offered, quality of instruction and the overall satisfaction and value of the program. The program satisfaction data were collected from the nine month and 12 month follow-up surveys.

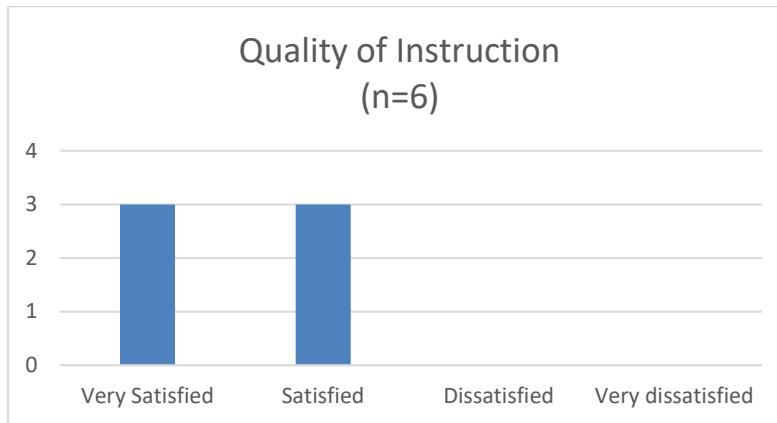
¹⁰ <http://www.orlandosentinel.com/business/brinkmann-on-business/os-bz-puerto-rico-numbers-20180105-story.html>

¹¹ https://en.wikipedia.org/wiki/Puerto_Rican_government-debt_crisis

4.13 Quality of instruction

In a survey on participant satisfaction of course instruction, lab experience, tutoring, academic advising, resume and job searching preparation, internship experience, job placement assistance, and further education assistance, 50% of participants were satisfied and the other 50% were very satisfied as shown in Exhibit 12.

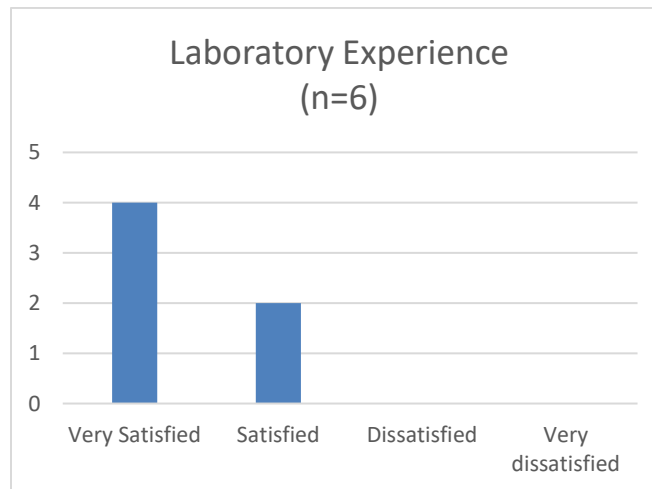
Exhibit 12: Quality of instruction



4.14 Laboratory experience

Participants spent fifty percent of their time in the laboratory gaining the hands on skills needed by the laser/photonics industry. Exhibit 14 show participant satisfaction in the laboratory component of the program.

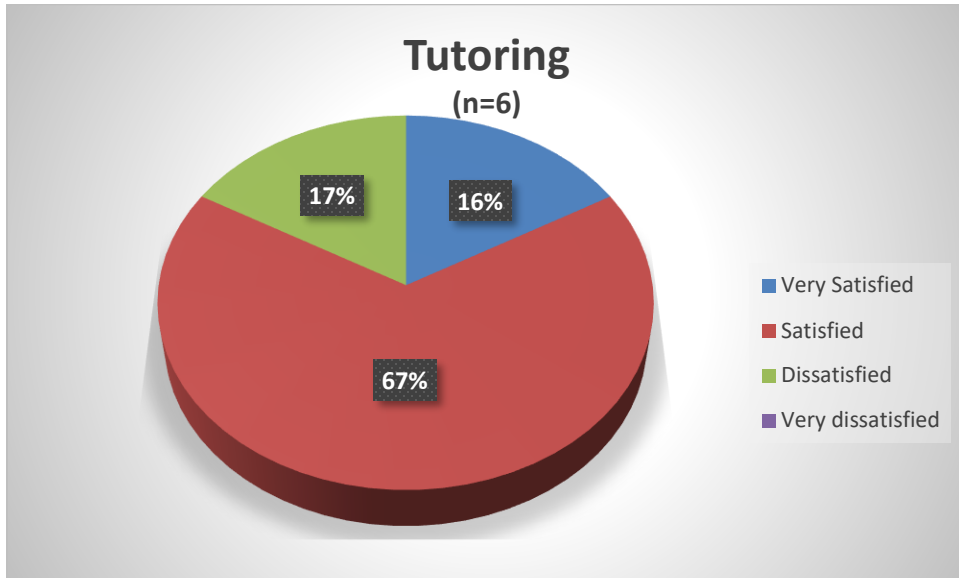
Exhibit 13: Laboratory experience



4.15 Tutoring

Tutoring was required to bring the math and English skills of older participants up to par. Additionally, most participants took advantage of the tutoring that was made available for the technical courses. 83% of participants were satisfied and very satisfied, while 17% were dissatisfied as shown in Exhibit 14.

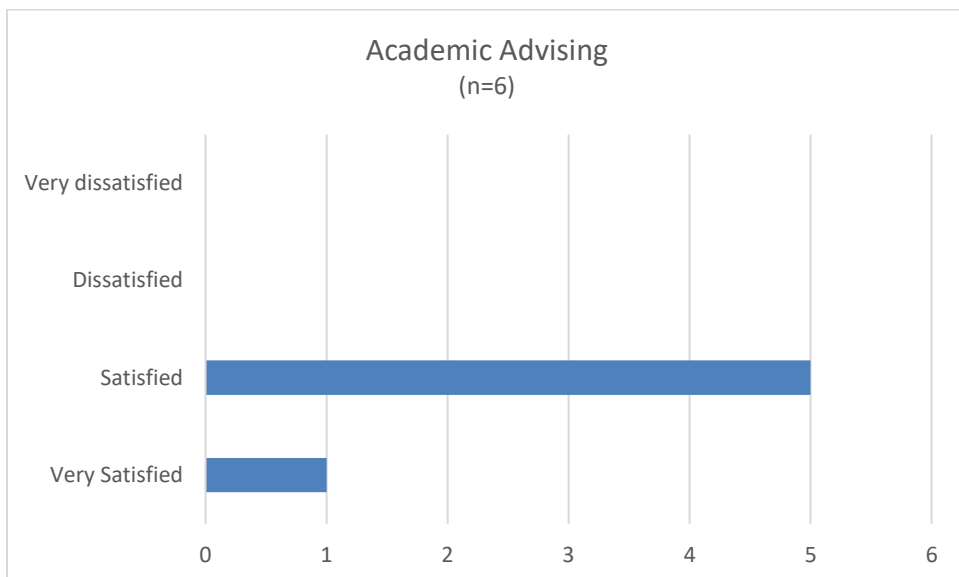
Exhibit 14: Tutoring Experience



4.16 Academic advising

The academic advisors of the New Horizon project, and the advisors of UMET were able to assist and advise all participants as shown by the high degree of satisfaction in Exhibit 16.

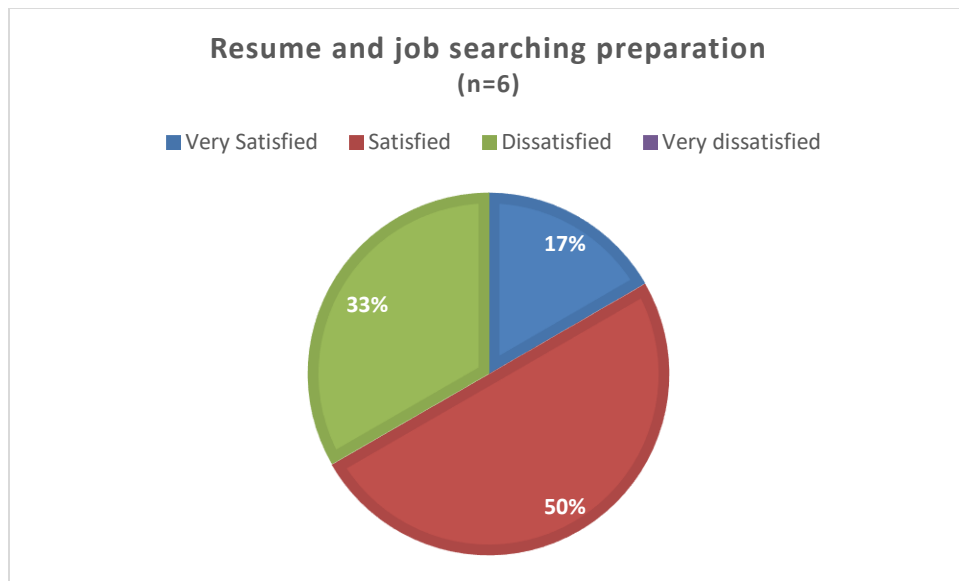
Exhibit 15: Academic Advising



4.17 Resume and job searching preparation.

Seventeen percent of participants were very satisfied with the resume and job searching services provided. However, one third of the participants were not satisfied, which reflects the number of participants that have not found employment at the nine month survey.

Exhibit 16: Resume and job searching preparation



4.14 Employer Interaction

All participants had very good experiences with the employers during the internship. Here are some of their comments:

Exhibit 17: Internship experience

- Very good experience and a lot of learning
- Interesting! I learned concepts and vocabulary of this industry and how to measure and calibrate machines.
- Excellent, a unique experience.

The interns reported their newly gained technical knowledge from internship in their own words:

Exhibit 18: Gained technical skills

- Laser alignment
- Analyzing measurements taken with sophisticated equipment
- Learned the role of the optical chopper in a LIDAR system
- Calibration and maintenance of lenses, optics and lasers

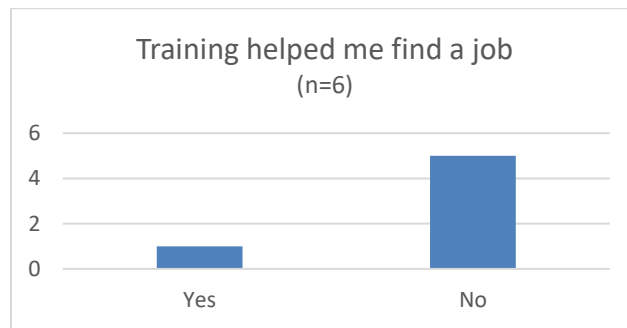
4.15 Overall Training Satisfaction and Knowledge Gain

At the twelve month survey, 100% of respondents indicated that they desire additional and more advanced training and knowledge in the field of lasers and photonics.

All participants expressed the desire to earn more certifications and higher degrees or diplomas in the area of lasers and photonics.

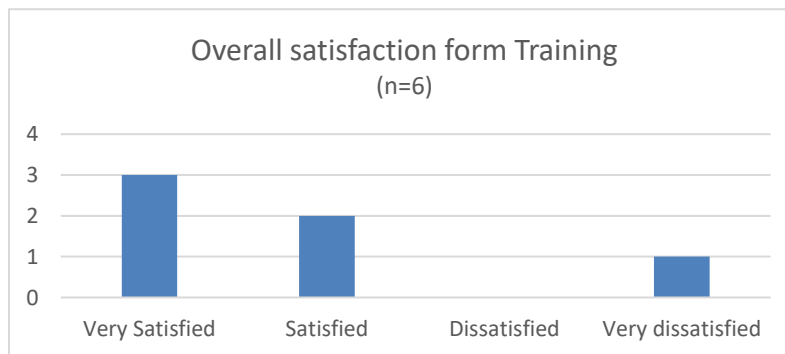
The question “Did the training helped you find a job and get ahead in my career?” was answered with a “no” for five out of six participants, and only one responded with a “yes”. This reflects exactly the number of participants who found a photonics related job at the end of training, and those who are still unemployed or employed in another field.

Exhibit 19: The training helped me perform my job



Five of the six respondents indicated that they were satisfied or very satisfied with the training provided by the New Horizons program. The participant that was “very dissatisfied” indicated that the reason for his rating was his inability to find employment in the laser/photonics industry after finishing the program.

Exhibit 20: Overall satisfaction from training



5. Outcome Study Findings

Data collected from the participant exit survey, and the six month and twelve month follow-up surveys, are used in the study of outcome findings. The participant outcomes collected and

analyzed are certificates completed, employment status, industry sector, job title, and wages. For the number of participants served, graduates, and certificates earned, we used institutional data collected by PRPI/UMET. The surveys used to collect these data are available in Appendix F and G.

5.1 Participants Served and Certificates Earned

There are nine metrics that the SGA requires to measure how successful the NH program is in serving participants, their success in credential attainment and employment. Exhibit 21 displays all the metrics as listed in the SGA. A total of 19 students enrolled in the NH program and 8 completed the program. Of the eight completers, eight earned credentials (100%), and one participant enrolled in other educational programs to further his education. From the enrollees, one was employed at the start of the program in a non-technical field and found employment in the laser photonics field upon completion.

Exhibit 21: Outcome Measures Required by the SGA

	DOL Outcome Measures	Goal	Actual	Percentage of Goal Achieved
1	Total unique participants served/enrolled	60	19	32%
2	Total number of participants who have completed a TAACCCT-funded program	45	8	18%
3	Total number of participants still retained in the program of study or another TAACCCT-funded program	57	8	14%
4	Total number of participants completing credit hours	54	8	15%
5	Total number of participants earning credentials	45	8	18%
6	Total number of participants enrolled in further education after grant-funded program of study completion	5	1	20%
7	Total number of participants employed after grant-funded program of study completion (non-incumbent workers only)	28	4	14%
8	Total number of participants employed after and retained in employment three months after program of study completion (non-incumbent workers only)	28	4	14%
9	Total number of those participants employed at enrollment (for purposes of this reporting, "Incumbent Workers") who receive a wage increase post-enrollment	0	0	0%

Certificates earned

All program applicants received the certificate in Photonics and Lasers from UMET. No third party certificates were pursued because all of the employers, when polled, mentioned that the UMET certificate is the only credential they needed to make a hiring decision. They discouraged the program participants from sitting for a third party certification, which is very

costly, considering the financial situation on the island, and the fact it would not affect their hiring decision.

5.2 Enrollment in Further Education

Two of the eight participants are continuing their education into higher degrees after finishing the Photonics and Lasers certificate which expanded their scientific and technological horizons. The first participant is currently pursuing a bachelor's degree in Physics, and the second one is pursuing a bachelor's degree in Electrical Engineering.

5.3 Employment and Wage Outcomes

5.3.1 Employment

In this section we examine the employment outcomes of NH participants using pre-and-post program data. We will examine the number of participants employed pre-program and at 6 and 12 months post-program. We will also look at the participants' industry sector of employment pre-and-post program completion.

Exhibit 22 shows the pre-and-post program completion employment data for the four cohorts.

5.3.2 Wages

The wages of all participants have increased after the intervention as it can be seen in Exhibit 22. However, this increase is likely because of the improved labor market of Puerto Rico at the end of this program¹². Only one participant found employment in the laser/photronics industry, and he did not provide information on his current wages.

Exhibit 22: New Horizons Annual Wages of All Participants

	Base Line n=(8)	9 Months Post Program (n=8)	12 Months Post Program (n=8)
Average	15,600	27,406	27,406
Median	18,000	31,380	31,380
Maximum	28,800	34,838	34,838
Minimum	00.00	16,000	16,000

There were no incumbent workers among the project participants.

¹² Craig, T. (2018, February 22). *Labor market improving in Puerto Rico, Virgin Islands, but hurricane recovery still 'hampered'*. Retrieved from <https://www.washingtonpost.com/>

6. Conclusion

6.1 Major Findings and Key Lessons

The New Horizons: Puerto Rico Lasers and Photonics Career Pathways certificate program was developed according to the planned schedule. The leadership team procured the necessary equipment and set up the photonics and electro-optics labs at the Barceloneta site of UMET. The program goals of enrolling 60 students and graduating at least 54 were met with 22% success because of the bureaucratic delay in enrolling students into the program, the people's aversion to taking risk in a program uncertain to lead to employment, and the unexpected devastation of the island by hurricane Maria and associated mass migration of Puerto Ricans to the U.S. mainland.

The evaluation of the New Horizons program found that the certificate program was very well designed, and industry was satisfied with the skills and abilities of the interns it employed. After hurricane Maria, a strong need for fiber optic technicians was created in the process of rebuilding the island's infrastructure. One program completer has been employed by the fiber optics company Critical Hubs, and more technicians were requested. The demand for more technicians is increasing as other companies involved in the rebuilding process may be hiring more photonics technicians. It is recommended that the program enrollment and output be monitored past the performance period, because the indications are that this intervention will fulfill its promised goals as the rebuilding of Puerto Rico's infrastructure is intensifying.

It is also recommended that when a new program is proposed, the time needed by the host institution to go through its internal bureaucratic processes of establishing the intervention program be determined ahead of time and taken into account in the planning of the project.

6.2 Implications for Future Workforce and Education Research

The main goal of the TAACCCT Grant Program was to enable community colleges and other eligible higher education institutions to build or strengthen their capacity to deliver quick, quality career training to TAA displaced workers and prepare them for high wage, high skill jobs. One of the challenges was the mistrust of displaced workers to enroll in a program to obtain new skills in a new profession that was unknown to them and that they were unsure that there would be employment opportunities after the training. It is recommended that, in future grants, the availability of employment be made evident and clear to new participants with evidence of need and desire to hire by the targeted industry sector. Deep involvement with employers in the program creation and the promise of employment after the intervention are vital pieces to the success of programs like this.

To train a worker in a new high skill, high wage job in a period of twelve months requires a worker that is academically prepared and has no educational voids in Mathematics and English language. The data collected from the New Horizons project inform us that the majority of displaced workers needed at least one year of remediation in English and Mathematics before they were ready to learn the high skills curriculum of the program. Looking at Exhibit 23, 5,099 participants were informed about the training opportunity, but only 249 expressed interest, about 5%. They had told the New Horizons recruiter that it was

impossible for them to fill their educational gaps and learn the new high skills in the period of 12 months,.

Exhibit 14

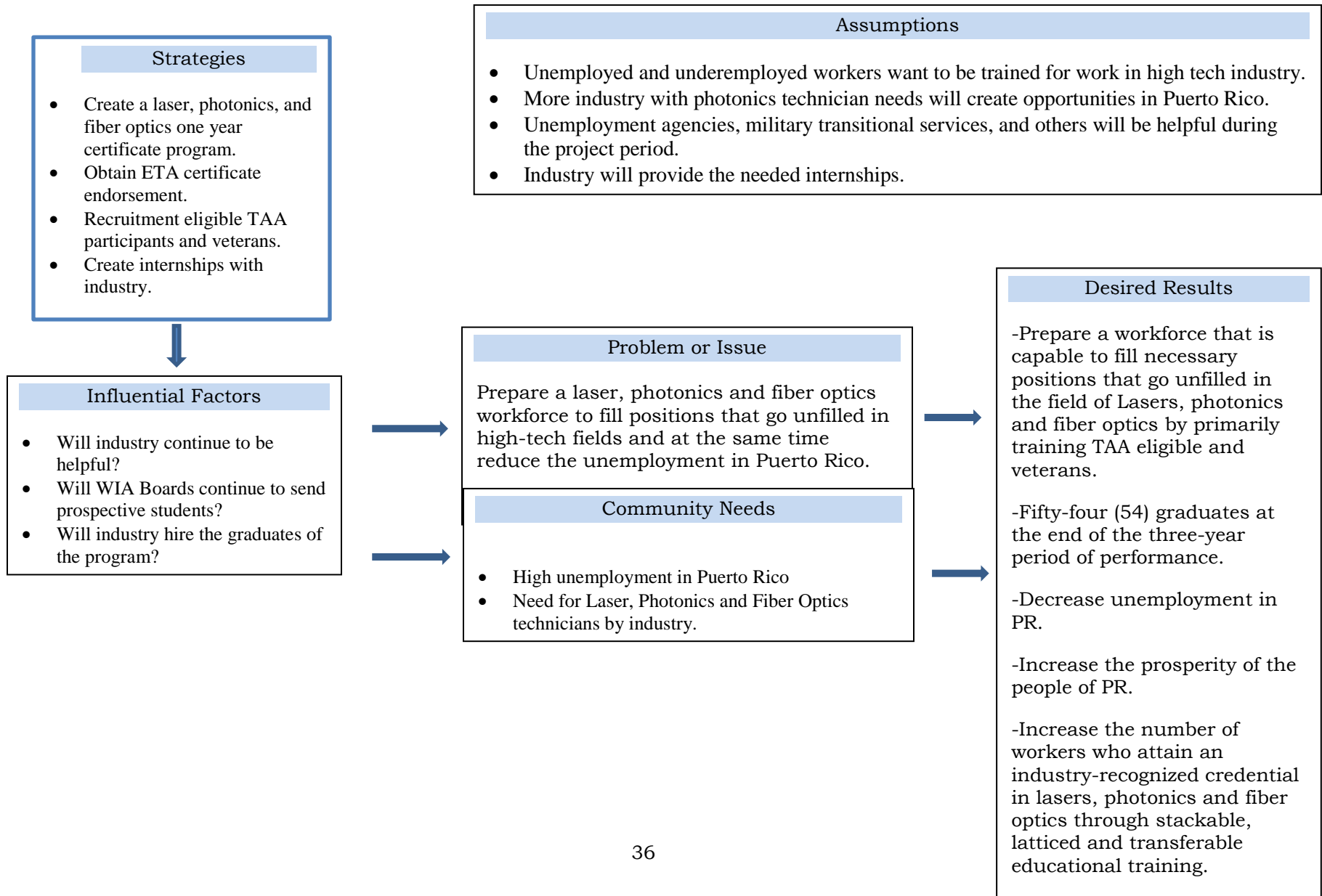
Type of Activity	Coh1	Coh2	Coh3	Coh4	Total
Number of event participants	980	2,110	1,935	74	5099
Number of participants expressed interest	77 (8%)	106 (5%)	39 (2%)	27 (57%)	249 (5%)

It is recommended that, in the future, the duration of time that the participant is remediating on Math and English skills not be counted towards the program, and that the intervention program start when the applicant is ready for the high skills training. For quick interventions, training for low-skill occupations, in which the Math and English language skills are not a barrier, is suggested.

Appendix A: Logic Model

RESOURCES/INPUTS →	ACTIVITIES →	OUTPUTS →	OUTCOMES/IMPACTS
<ul style="list-style-type: none"> • Staff • Funds • Partners <ul style="list-style-type: none"> ○ Universidad Metropolitana - Puerto Rico Photonics Institute ○ Regional WIA Boards ○ State WIA Board ○ University of Arizona ○ College of Lake County ○ PR Labor Development Administration (ADL) ○ Puerto Rico Manufacturers' Extension ○ Puerto Rico Small Business Technology Develop. Center ○ Puerto Rico TechnoEconomic Corridor ○ Arecibo Observatory ○ OP-TEC ○ PRIDCO • TAA Certified workers: 674 since 2012 • Reservists in National Guard: 7,000 • Veterans: 108,464 • Research 	<ul style="list-style-type: none"> • Create one-year certificate program using evidence-based design. • Develop stackable certificates for the program. • Recruit qualified TAA participants, veterans and other adults to the program. • Build career pathways that include the following components: skillsets needs, Industry input, Internships, access to Employers, training programs and Entrepreneurship. • Track and report progress. 	<ul style="list-style-type: none"> • Establish optics and photonics courses, general education curriculum, modules, remote learning and other online resources. Stackable 1-year certificates. • Recruit fifteen students for each cohort of the academic program. • Expose the participants to professional development, internships and entrepreneurship experiences. • Graduation of cohorts - Dissemination of results Reporting. • Produce a document including the full syllabus and internship opportunities by six months. • 90% placement rate for graduates. 	<ul style="list-style-type: none"> • Prepare a workforce that is capable to fill necessary positions that go unfilled in the field of lasers, photonics and fiber optics by training TAA eligible, veterans, and other adults. • Fifty-four (54) graduates at the end of the three-year period of performance. • Decrease unemployment in PR. • Increase the prosperity of the people of PR. • Increase the number of workers who attain an industry-recognized credential in lasers, photonics and fiber optics through stackable, latticed and transferable educational training. • Increase the percentage of adults with a post-secondary credential by 2020. • Increase the number and quality of knowledge workers to compete in the global economy.

Appendix B: Theory of Change Model



Appendix C: New Horizons: Puerto Rico Lasers and Photonics Career Pathways Certificate Program

COURSE	CREDITS
Term I	
OPSC 100 Mathematics for Optics and Photonics	3
ENGL 103 Introductory English Language	3
OPSC 101 Fundamentals of Light and Lasers	5
Term II	
ENMA 101 Introduction to Entrepreneurship	3
OPSC 102 Lasers and Applications I	4
OPSC 110 Electronics for Optics and Photonics I	5
Term III	
OPSC 120 Technical Internship	5
Term IV	
OPSC 103 Lasers and Applications II	4
OPSC 104 Photonic Enabled Technologies	3
OPSC 111 Electronics for Optics and Photonics II	5
TOTAL	40

Appendix D: New Horizons Training Schedule for Each Cohort

2016 March-May

PT1 - Cohort 1

Course	Title	CRN	Credits	Mon	Tue	Wed	Thur	Fri	Sat	Starts	Ends	Instructor	Room
ENGL 103	Introductory English Language Course - Intermediate Level		3		Class		Class			8:00 PM	10:30 PM	Garay	Salón Conf. Escuela Asuntos Ambientales
OPSC 100	Mathematics for Optics and Photonics	31212	3		Class		Class			3:00 PM	5:30 PM	Friedman	Salón Conf. Escuela Asuntos Ambientales
OPSC 101	Fundamentals of Light and Lasers	31213	5		Class		Class			5:30 PM	8:00 PM	Díaz	Salón Conf. Escuela Asuntos Ambientales
OPSC 101L	Fundamentals of Light and Lasers - Lab		-	Lab		Lab						Saltares	

2016 August - October

PT1 - Cohort 2

Course	Title	CRN	Credits	Mon	Tue	Wed	Thur	Fri	Sat	Starts	Ends	Instructor	Room
ENGL 103	Introductory English Language Course - Intermediate Level	28262 F45 F	3					Class		13:00	16:00	Garay	Salón Conf. Escuela Asuntos Ambientales
OPSC 100	Mathematics for Optics and Photonics	27226	3	Class		Class				15:00	17:20	Gina Ortiz	Salón Conf. Escuela Asuntos Ambientales
OPSC 101	Fundamentals of Light and Lasers	27227	5	Class		Class				17:30	19:50	Friedman	Salón Conf. Escuela Asuntos Ambientales
OPSC 101L	Fundamentals of Light and Lasers - Lab	27228	-		Lab					13:00	18:00	Friedman	Barceloneta

PT2 - Cohort 1

Course	Title	CRN	Credits	Mon	Tue	Wed	Thur	Fri	Sat	Starts	Ends	Instructor	Room
ENMA 101	Introduction to Entrepreneurship	28021	3		Class		Class			20:00	22:20	Gordillo	
OPSC 102	Laser Systems and Applications I	27229	4		Class		Class			17:30	19:50	Diaz	
OPSC 102	Laser Systems and Applications I	27230					Lab			9:00	12:00	Diaz	
OPSC 110	Electronics for Optics and Photonics I	27232	5		Class		Class			15:00	17:20	Diaz	
OPSC 110	Electronics for Optics and Photonics I	27233			Lab					9:00	13:00	Diaz	

2016 October - December

PT2 - Cohort 2

Course	Title	CRN	Credits	Mon	Tue	Wed	Thur	Fri	Sat	Starts	Ends	Instructor	Room
ENMA 101	Introduction to Entrepreneurship	29485	3	Class		Class				20:00	22:20	R. Gordillo	
OPSC 102	Laser Systems and Applications I	27271	4	Class		Class				17:30	19:50	J. Friedman	
OPSC 102	Laser Systems and Applications I LAB	27272			Lab							J. Friedman	
OPSC 110	Electronics for Optics and Photonics I	27273	5	Class		Class				15:00	17:20	A. Diaz	
OPSC 110	Electronics for Optics and Photonics I LAB	27274			Lab							A. Diaz	

2017 January - March

PT1 - Cohort 3

Course	Title	CRN	Credits	Mon	Tue	Wed	Thur	Fri	Sat	Starts	Ends	Instructor	Room
ENGL 103	Introductory English Language Course - Intermediate Level		3	Class		Class				20:00	22:30		
OPSC 100	Mathematics for Optics and Photonics	32670	3	Class		Class				15:00	17:30	Díaz	
OPSC 101	Fundamentals of Light and Lasers	32671	5	Class		Class				17:30	20:00	Díaz	

OPSC 101	Fundamentals of Light and Lasers - Lab	32672	-					Lab					Rivera
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PT4 - Cohorts 1 and 2

Course	Title	CRN	Credits	Mon	Tue	Wed	Thur	Fri	Sat	Starts	Ends	Instructor	Room
OPSC 103	Laser Systems and Applications II	32673	4		Class		Class			19:25	21:00	Friedman	
OPSC 103	Laser Systems and Applications II - Lab	32674		Lab					Lab alternate	12:30	15:30	Friedman / Rivera	
OPSC 104	Photonics-Enabled Technologies	32675	3		Class		Class			17:30	19:05	Friedman / Jiménez / Salazar / Díaz	
OPSC 104	Photonics-Enabled Technologies Lab	32905		Lab						16:00	19:00	Friedman / Jiménez / Salazar / Díaz / Rivera	
OPSC 111	Electronics for Optics and Photonics II	32791	5		Class		Class			14:30	16:50	Díaz	
OPSC 111	Electronics for Optics and Photonics II - Lab	32792	-	Lab					Lab alternate	9:00	12:00	Rivera	

2017 March - May

PT1 - Cohort 4

Course	Title	CRN	Credits	Mon	Tue	Wed	Thur	Fri	Sat	Starts	Ends	Instructor	Room
ENGL 103	Introductory English Language Course - Intermediate Level		3		Class		Class						
OPSC 100	Mathematics for Optics and Photonics	34711	3		Class		Class			10:00	12:00	Friedman	
OPSC 101	Fundamentals of Light and Lasers	34712	5		Class		Class			12:30	3:00	Diaz	
OPSC 101	Fundamentals of Light and Lasers - Lab	34713	-			Lab				12:00	5:00	F. Rivera	

PT2 - Cohort 3

Course	Title	CRN	Credits	Mon	Tue	Wed	Thur	Fri	Sat	Starts	Ends	Instructor	Room
ENMA 101	Introduction to Entrepreneurship	34743	3		Class		Class			3:30	5:30	Gordillo	
OPSC 102	Laser Systems and Applications I	32665	4		Class		Class			12:30	3:00	Friedman	
OPSC 102	Laser Systems and Applications I - LAB	32666	-	Lab								Friedman	
OPSC 110	Electronics for Optics and Photonics I	32667	5		Class		Class			9:30	12:00	Diaz	
OPSC 110	Electronics for Optics and Photonics I - LAB	32668	-	Lab								F. Rivera	

PT3 - Cohort 1&2

Course	Title	CRN	Credits	Mon	Tue	Wed	Thur	Fri	Sat	Starts	Ends	Instructor	Room
OPSC 120	Internship	32669	5									Gina Ortiz	

2017 Aug-Oct

PT2 - Cohort 4

Course	Title	CRN	Credits	Mon	Tue	Wed	Thur	Fri	Sat	Starts	Ends	Instructor	Room
ENMA 101	Introduction to Entrepreneurship	32470	3		Class		Class			15:10	17:30	Gordillo	
OPSC 102	Laser Systems and Applications I	31370	4		Class		Class			12:30	14:50	Friedman	
OPSC 102	Laser Systems and Applications I - LAB	31371	-	Lab									
OPSC 110	Electronics for Optics and Photonics I	31372	5		Class		Class			9:40	12:00	Diaz	
OPSC 110	Electronics for Optics and Photonics I - LAB	31373	-	Lab									

PT3 - Cohort 3

Course	Title	CRN	Credits	Mon	Tue	Wed	Thur	Fri	Sat	Starts	Ends	Instructor	Room
OPSC 120	Internship	31380	5									Diaz	

2017 PT123 Nov 2017- Jan 2018

PT3 - Cohort 4

Course	Title	CRN	Credits	Mon	Tue	Wed	Thur	Fri	Sat	Starts	Ends	Instructor	Room
OPSC 120	Internship	33089	5									Diaz	

2018 PT122 Jan-Mar 2018

PT4 - Cohorts 3&4

Course	Title	CRN	Credits	Mon	Tue	Wed	Thur	Fri	Sat	Starts	Ends	Instructor	Room
OPSC 103	Laser Systems and Applications II	32673	4		Class		Class			12:30	14:10	J. S. Friedman	Salón Conf. Esc. Asuntos Ambientales
OPSC 103	Laser Systems and Applications II - Lab	32674 34929 (nuevo)					Lab			17:00	19:30	J. S. Friedman	MS211
OPSC 111	Electronics for Optics and Photonics II	34206	5		Class		Class			14:30	16:50	A. Díaz	Salón Conf. Esc. Asuntos Ambientales
OPSC 111	Electronics for Optics and Photonics II - Lab	34207	-		Lab					17:00	19:30	A. Díaz	MS211

2018 PT123 Mar-May 2018

PT4 - Cohorts 3&4

Course	Title	CRN	Credits	Mon	Tue	Wed	Thur	Fri	Sat	Starts	Ends	Instructor	Room
OPSC 104	Photonics-Enabled Technologies	32675	3		Class		Class			16:30	18:05	Diaz	
OPSC 104	Photonics-Enabled Technologies Lab	34205											
ENMA 101	Introduction to Entrepreneurship	35910	3									Gordillo	

Appendix E: Student Grades

STUDENT								
ID	OPSC100	OPSC101	OPSC102	OPSC103	OPSC 104	OPSC 110	OPSC 111	OPSC 120
S01235728 TC	A	A	A	A	A	A	A	P
S01207733 C	A	B	B	A	A	A	B	P
S01236358 A	B	A	A	A	A	A	A	P
S01230205 A	B	B	A	A	B	A	A	P
S00914553 C	B	B	D	B	B	B	B	P
S01200591 C	A	A	B	A	A	A	A	P
S01297516 B	A	B	C	A	A	A	A	P
S01236366 TC	A	A	A	A	A	TC	TC	P

Appendix F: Student Recruitment Activities

Activity Name	Description	Date	Place
"La Ruta del Empleo"	Job Fair DTRH	1/27/2016	Universidad del Este, Arecibo
"La Ruta del Empleo"	Job Fair DTRH	2/12/2016	Canteras, San Juan
"La Ruta del Empleo"	Job Fair DTRH	2/18/2016	Juncos
Orientation	Orientation activity for the Certificate in Photonics & Lasers Technical Specialist	2/24/2016	Muñiz Souffront Amphitheater, Universidad Metropolitana, Cupey
Open House	Open House	2/25/2016	PRPI Laboratories, Barceloneta
Job Fair	Fair of Employment, Education and Health	4/5/2016	Brisas del Turabo Housing Project, Caguas
"La Ruta del Empleo"	Job Fair DTRH	4/7/2016	Roberto Clemente Coliseum, San Juan
Orientation	Orientation to Participants of the Service of Transition of the US Army	4/12/2016	Ft. Buchanan, Guaynabo
Orientation	Participants of TAPI (Industry)	5/27/2016	Guayama
Visit to the Unemployment Office	Information desk to provide orientation.	6/16/2016	Arecibo
Visit to the Unemployment Office	Information desk to provide orientation.	6/21/2016	Bayamón
Job fair	Job Fair aimed at military participants and their families	6/23/2016	Ft. Buchanan, Guaynabo
Visit to the Unemployment Office	Information desk to provide orientation.	6/29/2016	Caguas
Visit to the Unemployment Office	Information desk to provide orientation.	6/30/2016	San Juan
Photonics & Lasers Expo	First Exhibition of Photonics & Lasers	8/6/2016	PRPI Laboratories, Barceloneta
Job Fair	Fair of Services and Employment	8/24/2016	Bo. Maysonet, Dorado
Visit to the Unemployment Office	Information desk to provide orientation.	8/31/2016	Aguadilla

Visit to the Unemployment Office	Information desk to provide orientation.	9/13/2016	Bayamón
Visit to the Unemployment Office	Information desk to provide orientation.	9/14/2016	Caguas
PRST Forward Innovation Center		9/17/2016	Sheraton Hotel, San Juan
Visit to the Unemployment Office	Information desk to provide orientation.	9/20/2016	San Juan
Visit to the Unemployment Office	Information desk to provide orientation.	9/21/2016	Arecibo
PRPI Roadshow	Orientation Activity	10/6/2016	Universidad Metropolitana, Aguadilla
PRPI Roadshow	Orientation Activity	10/12/2016	Universidad Metropolitana, Cupey
Science Day	Information table for High School students	10/14/2016	Universidad Metropolitana, Cupey
Photonics & Lasers Expo	Exhibition of Photonics and Lasers	10/15/2016	PRPI Laboratories, Barceloneta
ZIKA Job Fair	Job Fair DTRH	11/10/2016	Roberto Clemente Coliseum, San Juan
Visit to the Unemployment Office	Information desk to provide orientation.	11/14/2016	San Juan
Visit to the Unemployment Office	Information desk to provide orientation.	2/6/2017	Arecibo
Visit to the Unemployment Office	Information desk to provide orientation.	2/12/2017	Bayamón
Visit to the Unemployment Office	Information desk to provide orientation.	2/14/2017	San Juan

Appendix G: Student Retention Activities

Activity Name	Description	Date	Place
Internship Training	Workshop: Resume and Employment Interview (first cohort of students)	8/10/2016	School of Environmental Affairs
Blackboard Training	Blackboard Platform Workshop	8/31/2016	School of Environmental Affairs
Tutouring	Coordinated tutoring service for students	9/27/2016	Universidad del Turabo, Barceloneta
Tutouring	Coordinated tutoring service for students	9/28/2016	Learning Zone, Universidad Metropolitana Cupey
Internship Training	Workshop: Resume and Employment Interview (second cohort of students)	11/2/2016	School of Environmental Affairs
<i>Study Group</i>	Coordinated study group for students	11/15/2016	PRPI Laboratories, Barceloneta
Talk: The Emerging Technologies of Photonics and Lasers Applicable to Entrepreneurship	Discussion of different ideas of Entrepreneurship in Photonics.	11/22/2016	PRPI Laboratories, Barceloneta
<i>Study Group</i>	Coordinated study group for students	12/5/2016	Conference Room, School of Environmental Affairs
<i>Study Group</i>	Coordinated study group for students	12/19/2016	Conference Room, School of Environmental Affairs
Valentine's Day Lunch	A lunch coordinated with students from all cohorts to follow up on their courses.	2/14/2017	Gazebos of the Institution
<i>Career Opportunities in Photonics & Lasers</i>	Presentation of the representatives of industries and discussion with the students.	2/24/2017	PRPI Laboratories, Barceloneta
Professional Development Workshop	Workshop on Conflict Management, presented by one of the Counselors of the Institution.	3/2/2017	UMET Sports Complex
Internship Training	Workshop: Resume and Employment Interview (third and fourth cohort of students)	5/4/2017	Conference Room, School of Environmental Affairs

Professional Development Workshop	Workshop on "Soft Skills" presented by the Activities Coordinator.	5/11/2017	Conference Room, School of Environmental Affairs
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Appendix E: Student Baseline Survey

Previous Education	Number of Students
High School Graduate	3
2 nd year College Graduate	2
4 th year College Graduate	3
Age	
25	2
30	2
40	1
55	1
56 or more	2
Race	
White	0
Black	0
Hispanic	8
Asian	0
Other	0
Gender	
Female	1
Male	7
Employment Status	
Employed	4
Unemployed	4
Receiving Public Assistance	
Yes	0
No	8
Annual Salary Wage of Previous Employment	
\$18,000	1
\$24,000	1
\$28,800	1
\$48,000	1
Hourly Salary Wage of Previous Employment	
\$40	1
Did not provide information	1
Without previous employment	2
Veterans	
0	

Appendix F: Student Nine-Month Survey

Cuestionario de seguimiento sobre Empleabilidad – 9 meses Follow – up Employability Questionnaire – 9 months	
<i>Lugar de Internado</i> Industry Name	PRPI, Liberty, Visional Technology, Arecibo Observatory
<i>Localización</i> Location	Norte, Hatillo, Bayamón North, Hatillo, Bayamón
<i>¿Cómo describe la experiencia del Internado?</i> How do you describe the internship experience?	Muy buena experiencia de mucho aprendizaje/ Fue una experiencia muy provechosa/ Interesante/ Una experiencia de aprendizaje dándole más énfasis al campo de la metrología/ Aprendí conceptos y vocabulario respecto a esta industria y a cómo utilizar las máquinas de medición y calibración./ Excelente, una experiencia única. Very good experience with a lot of learning / It was a very rewarding experience/ Interesting / A learning experience that gave more emphasis to the field of metrology / I learned concepts and vocabulary about this industry and how to use measuring and calibration machines. / Excellent, a unique experience.
<i>¿Cuáles destrezas adquirió al finalizar la experiencia de Internado?</i> What skills did you acquired with the experience of Internship?	Alineamiento de láser, más conocimiento sobre electrónica, conocimiento de arduino/ Trabajar con la instalación de sistema electrónicos de cable y teléfono/ Conocimiento del funcionamiento de Liberty Cable Vision/ La destreza de analizar medidas y sus dimensiones/ Destreza de cómo utilizar máquinas de mediciones y como cada detalle en cada pieza creada juega un papel importante en saber si cumple con las especificaciones./ Aprendí sobre los detalles del role del chopper óptico para uno de los lasers del LIDAR y la arquitectura de los microprocesadores de amtel. Laser alignment, more knowledge about electronics, knowledge of arduino / Working with the installation of electronic cable and telephone systems / Knowledge of the operation of Liberty Cable Vision / The skill of analyzing measurements and their dimensions / The skill of how to use measurement

	<p>machines and how each detail in each piece created plays an important role in knowing if it meets the specifications. / I learned about the details of the role of the optical chopper for one of the LIDAR lasers and the architecture of amtel microprocessors.</p>	
<p><i>¿Alguna tarea que se le haya dificultado realizar? ¿A qué se debió?</i> Any task that was difficult to perform? Why?</p>	<p>Ninguna/ Como hacer reportes finales de medición y la dificultad es que la meteorología es campo aparte a lo que el peso mayor en lo que estudié que son los rayos láseres. / Hubo limitaciones técnicas del equipo que cuya resolución consumió más tiempo de lo anticipado. En específico la exactitud del reloj interno del dispositivo del optical chopper. None / How to make final measurement reports and the difficulty is that the meteorology is a field apart from what the major weight in what I studied are lasers. / There were technical limitations of the equipment whose resolution consumed more time than anticipated. In specific the accuracy of the internal clock of the optical chopper device.</p>	
<p><i>¿Le fue ofrecida una oportunidad de empleo en el escenario de Internado? ¿Cumplió con sus expectativas, las superó o fue menos de lo que esperaba?</i> Did you receive an offer of employment following the Internship experience? Did the internship meet your expectations, exceed them, or was it less than you expected?</p>	<p>Cumpli con todas las expectativas y no tuve oferta de empleo ya que fue en los mismos laboratorios de la universidad/ No fue ofrecida una oportunidad de empleo/ No/ Esperaba algo diferente en cuestión de tareas asignadas./ No I met all the expectations and I did not have an offer of employment because it was in the same laboratories at the university. /No employment opportunity was offered./ No/ I was not expecting something different in terms of assigned tasks./ No</p>	
<p><i>¿Aceptó la oferta de empleo?</i> Did you accept the job offer?</p>	<p>Sí/ Yes</p>	<p>0</p>
	<p>No</p>	<p>5</p>
<p><i>De no haber recibido alguna oferta de empleo, ¿ha realizado alguna búsqueda? ¿Dónde?</i> If you have not received an offer of employment, have you made any search? Where?</p>	<p>No/ Si he visto ofertas de empleo pero debido a mis estudios no he aplicado para alguna/ Clasificados/ Si he realizado búsqueda fuera de Puerto Rico./ No No / If I have seen job offers but due to my studies I have not applied for any / Classifieds / If I have made a search outside of Puerto Rico./ No</p>	

<p><i>¿Con cuánta frecuencia?</i> How often?</p>	<p>Ninguna/ Cero/ A menudo/ 1 vez cada semana la realidad es que estoy trabajando en otra área. / N/A None / Zero / Often / Once a week, the truth is that I am working in another area./ N/A</p>	
<p><i>¿Revisó las ofertas de empleo facilitadas a través del proyecto New Horizons?</i> Did you review the job offers provided by New Horizons project?</p>	Si/ Yes	2
	No	3
<p><i>¿Se encuentra empleado en un escenario relacionado al campo de la Fotónica?</i> Are you employed in a work related to the field of Photonics?</p>	Si/ Yes	
	No	5
<p><i>¿Está considerando desarrollar un plan de negocio propio en el campo de la Fotónica?</i> Are you considering developing your own business plan in the field of Photonics?</p>	Si/ Yes	1
	No	4
<p><i>La instrucción del curso</i> Course Intruction</p>	Muy insatisfecho/ Very dissatisfied	
	Insatisfecho/ Dissatisfied	
	Satisfecho/ Satisfied	3
	Muy Satisfecho/ Very satisfied	2
<p><i>La experiencia en los laboratorios</i> Laboratory experience</p>	Muy insatisfecho/ Very dissatisfied	
	Insatisfecho/ Dissatisfied	
	Satisfecho/ Satisfied	2
	Muy satisfecho/ Very satisfied	3
<p><i>Tutoría</i> Tutoring</p>	Muy insatisfecho/ Very dissatisfied	
	Insatisfecho/ Dissatisfied	1
	Satisfecho/ Satisfied	4
	Muy satisfecho/ Very satisfied	

<i>Asesoramiento académico</i> Academic Advising	Muy insatisfecho/ Very dissatisfied	
	Insatisfecho/ Dissatisfied	
	Satisfecho/ Satisfied	4
	Muy satisfecho/ Very satisfied	1
<i>Resume y preparación para la búsqueda de empleo</i> Resume and job searching preparation	Muy insatisfecho/ Very dissatisfied	
	Insatisfecho/ Dissatisfied	2
	Satisfecho/ Satisfied	3
	Muy satisfecho/ Very satisfied	
<i>Asistencia en la colocación en empleo</i> Job placement assistance	Muy insatisfecho/ Very dissatisfied	
	Insatisfecho/ Dissatisfied	1
	Satisfecho/ Satisfied	3
	Muy satisfecho/ Very satisfied	1
<i>Asistencia educativa adicional y orientación</i> Further education assistance and guidance	Muy insatisfecho/ Very dissatisfied	
	Insatisfecho/ Dissatisfied	1
	Satisfecho/ Satisfied	4
	Muy satisfecho/ Very satisfied	
GPA	Muy insatisfecho/ Very dissatisfied	1
	Insatisfecho/ Dissatisfied	
	Satisfecho/ Satisfied	3
	Muy satisfecho/ Very satisfied	1
<i>¿Adquirió conocimiento técnico de su internado?</i> Gained technical knowledge from internship	Sí/ Yes	5
	No	0
<i>¿Adquirió conocimiento sobre negocios de su internado?</i> Gained business knowledge from internship	Sí/ Yes	1
	No	4
<i>¿Tuvo un ambiente de trabajo agradable?</i> Pleasant work environment	Sí / Yes	5
	No	0

¿Le interesa adquirir más conocimiento y/o entrenamiento? I want to get more training and knowledge	Sí/ Yes	5
	No	0
¿Desea tomar más certificaciones? I want to take more certifications	Sí/ Yes	5
	No	0
El programa, ¿le ayudó a salir adelante en su carrera? The training helped me get ahead in my career	Sí/ Yes	3
	No	2
La capacitación en el programa, ¿le ayudó a realizar su trabajo? The training helped me perform my job	Sí/ Yes	2
	No	3
El curso en fotónica, ¿le ayudó a encontrar un empleo? The training helped me find a job	Sí/ Yes	1
	No	4
El nivel de satisfacción general sobre el programa es Overall satisfaction from training	Muy insatisfecho/ Very dissatisfied	1
	Insatisfecho/ Dissatisfied	0
	Satisfecho/ Satisfied	3
	Muy satisfecho/ Very satisfied	1
Se encuentra usted Are you?	Empleado a tiempo parcial/ Employed part time	1
	Empleado a tiempo completo/ Employed full time	2
	Desempleado/ Unemployed	2
	Retirado/ Retired	0
	Estudiando/ Studying	0
De ser empleado a tiempo parcial o completo, ¿cuál es su salario? Desired Wages	\$15,000 – \$25,000	2
	\$26,000 – \$35,000	1
	\$36,000 – \$45,000	1
	\$50,000 o más	1
¿Cuál sector de la industria le ha empleado? Industry sector employed	Electrónica/ Electronics	1
	Gobierno Federal/ FEMA	1

	Telefonía, Cable TV/ Telephone Company, Cable TV	1
	Software Development	1
	Ninguno/ None	1

Appendix G: Student Twelve-Month Survey

Cuestionario de seguimiento sobre Empleabilidad – 12 meses		
Follow – up Employability Questionnaire – 12 months		
¿Le interesa adquirir más conocimiento y/o entrenamiento? I want to get more training and knowledge	Sí/ Yes	6
	No	0
¿Desea tomar más certificaciones? I want to take more certifications	Sí/ Yes	6
	No	0
El programa, ¿le ayudó a salir adelante en su carrera? The training helped me get ahead in my career	Sí/ Yes	3
	No	3
La capacitación en el programa, ¿le ayudó a realizar su trabajo? The training helped me perform my job	Sí/ Yes	4
	No	2
El curso en fotónica, ¿le ayudó a encontrar un empleo? The training helped me find a job	Sí/ Yes	1
	No	5
El nivel de satisfacción general sobre el programa es Overall satisfaction from training	Muy insatisfecho/ Very dissatisfied	1
	Insatisfecho/ Dissatisfied	0
	Satisfecho/ Satisfied	2
	Muy satisfecho/ Very satisfied	3
Se encuentra usted Are you?	Empleado a tiempo parcial/ Employed part time	1
	Empleado a tiempo completo/ Employed full time	3
	Desempleado/ Unemployed	2
	Retirado/ Retired	0
	Estudiando / Studying	0
De ser empleado a tiempo parcial o completo, ¿cuál es su salario? Desired Wages	\$15,000 – \$25,000	3
	\$26,000 – \$35,000	1
	\$36,000 – \$45,000	1
	\$50,000 o más	1
¿Cuál sector de la industria le ha empleado? Industry sector employed	Electrónica/ Electronics	1

	Gobierno Federal/ FEMA	1
	Software Development	1
	Nonprofit company	1
	Ninguno/ None	2