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EXTRACURRICULAR OPPORTUNITIES SUPPORTING ENHANCED WORKFORCE THROUGH CERTIFICATE ATTAINMENT



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through Certificate Attainment**

Synopsis:

The UHD project targets security training of emerging and current workforce populations especially those underrepresented. These efforts support a highly skilled workforce able to quickly build and transfer these critical security proficiencies into the Houston workforce. Certification within the areas of security will form one of the most important outcomes of success. Key population targets for this proposal center around emerging workforce comprised of current college undergraduates.

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Abstract

The UHD project targets security training of emerging and current workforce populations, especially those underrepresented. These efforts support a highly skilled workforce able to quickly build and transfer these critical security proficiencies into the Houston workforce. Certification within the areas of security will form one of the most important outcomes of success. Key population targets for this proposal center around emerging workforce comprised of current college undergraduates readying to enter the workforce and continuing workforce already in the industry.

Keywords: STEM/Tech certifications, co-curricular offerings, undergraduate support

Workforce Training and Expectations

The challenge for higher education institutions and programs continues to be addressing skills gaps of entering freshmen or entering reskilling non-traditional students already in the workforce. With the post-COVID era upon us many employers recognize that the pace of technological changes and the critical, core skills needed within the workplace are also revolving ever quicker (Li, 2022). As a result, there are now a multitude of avenues a person could take to advance their career which directly connect to any profession. Certifications are generally modular, connected to specific fields, and likely to increase opportunities for higher pay, movement upward in the corporate workplace, and possibly better pay. More employers represent a growing trend for alternative certificate preparation programs to be embedded within university coursework, thus benefitting future employees (Hartman & Andzulis, 2018).

What is a certification? Organizations offer specialized knowledge and/or skills needed for particular jobs. When an individual has completed this educational unit of study or completed an internship or time on the job, a certificate is earned. Generally, certification means meeting a specific standard of knowledge and taking/passing a test over the same module of learning. Not all occupations offer, nor recognize certifications. But for those that do certifications offer avenues for increased knowledge, competency, and in some instances promotion or wage increases. Some of the most in-demand certifications include data science, cloud architecture, analytics, cybersecurity, technology solutions, and artificial intelligence (Indeed.com, 2024). Certifications offer talent mobility and a mechanism to learning which does not involve formal education tracks (such as a college degree or “seat time”). Certifications formalize time on the job experiences and are available to anyone seeking to utilize experiences as learning. Post-COVID reality sees cutting edge skills taking the forefront in many industries and workers report certificates are a primarily vehicle to “upskilling” themselves through certifications. The online nature of learning (LinkedIn Learning and others) has exploded to the benefit of workers young and older. Additionally, the low unemployment rates of post-COVID provide industry with the challenge to look within their company ranks for filling opening with more qualified candidates

rather than looking externally. Certificates provide the current workforce mechanisms for flexibility in upskilling/reskilling and increasing worker qualifications for movement upward within the same employer environment. Workplace environments are now likely to develop internal talent mobility policies and programs. Yet, the current workforce seems not to be waiting for these internal programs to emerge, but rather are seeking to upskill their talents through pursuing certification programs (CompTIA, 2023). While certificates offer an avenue for upskilling, the value assigned to certifications can differ. Some values assigned include career-related benefits such as job opportunities, salaries, and possible promotions, while others span the emotional realm to include a sense of pride, accomplishment and increased confidence. Other values assigned to certifications include positive regard workplace peers (Carroll, 2023). There arises a need for data sharing between the certification industry, workforce, and academia (ACTE, 2017). When reviewing certifications at the high school level by career and technology program offerings, there seems to be a disconnect as these certifications relate to entrance into the high education spectrum. Additionally, it appears that high school students who do achieve a certification and continue into higher education appear to pursue a college major that is not aligned with previously gained credentials (Giani, 2023). However, potential employers are now exacting more than just degrees from college graduates. Employers desire to see evidence of technical skills on their resume and in the way of certificate acquisition. Beyond this, employers are using skill assessments to measure competencies in the recruitment and hiring process (Hartman & Andzulis, 2018). Today, a clear crossroads between individuals entering the workforce and education, formal and informal, continues to unfold (Johnson, Lower, & Rudman, 2016). Government and academia (high schools, community colleges, and universities) have awoken to witness immense spending in offering alternative pathways into industry with certifications leading the way.

Credentialing - Online Testing Only

Higher education and COVID have moved learners forward in the use of online learning and testing. More learners are equipped with a common level of computing machine that meets a level of technicality that was not available pre-COVID. In this regard online learning presents increases accessibility to all learners as well as an environment requiring a level of competency on the part of learners to use a variety of online products. Moreover, academic training assists companies and higher education institutions to deliver not only training but also on-demand online environments (Williams, 2018). A popular online testing service, CompTIA (n.d.), provides individual testing through a remote proctoring service. Testers must review and agree to all testing policies and procedures prior to being allowed to test. Policies are related to computer system requirements (such as must have a camera and designated OS, etc), minimum age of allowable tester, minimum computer system requirements, and a strong internet signal. An actual system test must be conducted on the computer system to be used and must be passed for the tester to use this system. Further, an ID and phone must be available set out of arm's length after check-in (CompTIA, n.d.).

Recognizing the hardware and internet requirements can be seen as delimiting for many users. Also, age restrictions and ID (usually a driver's license) become barriers to assisting underrepresented individuals to use these services. As certification credentialing broadens, employers must ensure a balanced and equitable opportunity for all potential employees.

The Workforce Development Program

The University of Houston-Downtown's Scholars Academy applied for a Texas Governor's Texas Talent Connection call for proposal. This call supports a year-long project which provides certificate training and testing, soft skill development, and industry-sponsored interactions for 105 students of which 45 are undergraduates, 15 are community college students, and 40 pre-college students. The grant award runs one year with Saturday sessions in virtual and face-to-face for up to 10 Saturdays. The Saturday sessions are followed by a three-week intensive, daily from 9am to 4pm session for all participants. In toto those trying to certify will have a five-month training and testing period.

The Gulf Coast Workforce Board suggests the following industry areas be the focus of this proposal: software development, Software quality assurance, as well as on the oil and gas, financial, biotechnical, cybersecurity, and food security industries. UHD proposes cultivation of an array of trainings for security proficiencies facing Houston now and in the future. These security arenas include: 1) cybersecurity focusing on mobile, cloud, hardware/software, and IoT; 2) engineering SCADA and hardware; 3) robotic and artificial intelligence security; 4) chemical security; 5) drone security; 6) DNA security -biometrics security; 7) virological disease security; and 8) mathematic algorithms and security. A prominent feature of this proposal includes certifications across each of the targeted security arenas supported and payment for the testing needed to acquire the security certificate/s. Certification exams will be accessed through CompTIA- Pearson VUE, Vertiport-Pearson VUE, and other testing agencies. Funding will ensure certificate completion.

This project will accomplish its goals and objectives through security training of emerging and current workforce populations. Key population targets for this proposal center around emerging workforce comprised of current college undergraduate's workforce, and continuing workforce already in the industry. Key partnerships with Houston industries (public - Baker Ripley; private - Blue Lance, Ltd.), the Greater Houston Partnership (over 1000 members). Entering collegiate from school districts in and around Houston representing vast numbers of underrepresented, the next emerging workforce will be welcomed into the training. Finally, Houston's Gulf Coast Workforce Board (GCWB) will assist the project in referrals for participants qualifying for the program and interested in certifications. GCWB will also provide communication and other career skills, such as employment searches, resume development, and career advancement.

Goals for this award center around 1) providing broad, but deep exposure to all security areas through applied, hands-on training and deep exposure within five specialized security areas; 2) gaining real time onsite exposure to industry security and needs; and 3) develop communication and team skills needed in industry employment.

The outcomes consist of personal experiential growth in our focal areas, certifications at higher levels, applications to internships across appropriate industries, increased confidence on the part of all participants to 1) remain in STEM; 2) apply to STEM Houston-based industries for employment; 3) recommend others to this program in subsequent years.

Specialized Areas Targeting Security

The UHD Cyber and Other Securities Training Center will offer you an intensive, 1/2 year training program focusing on workforce training and STEM research lab skill development associated with: 1) cyber security, 2) mobile, cloud, hardware/software and IoT securities, 3) engineering SCADA and hardware securities, 4) robotic and artificial intelligence security, 5) chemical security, 6) drone security, 7) Bioformatics disease/other security, and 8) development/enhancement of algorithms associated with programming security.

A prominent feature of this training program includes the expectation that certifications across each targeted security arena will be accessible to participants ready to test for certification. Additionally, the program will support the cost of certification testing, upon instructor recommendation.

Need for the Program

Houston has experienced one of the largest population increases in the nation & Texas during the past decade. As the energy, chemical, medical, financial, and data science capital of the world, Houston/Harris County offers career opportunities in food, computer hardware/SCADA, robotic, chemical, drone, DNA/healthcare/biometric, and pathogenic security. A recent INDEED.com search of cybersecurity jobs indicated over 336 unfilled jobs identified within a 25-mile radius of Houston. A recent review of the US Census employment characteristics of Harris County found that married-couple families had both husband and wife in the labor force 51.9% of the time. Single parent families led by female head of household were in the labor force 53.7%. Among single parent families regardless of head of household found 22.6% were not in the labor force at all (American Factfinder). With a median household of \$49,977, a poverty rate of 16.3, and a level of persons living below the poverty level at 19.2%, this densely populated Houston community demonstrates levels of poverty connected to levels of unemployment, even while Houston holds a level of unemployment rate of 3.7%. Unemployment and race in Harris County indicate unemployment rates rising even higher than the overall rate. Among college-aged minorities and whites, current rates of unemployment increase three and four times the overall levels. Much training/education is needed to positively influence these impacting factors for minorities or the underrepresented for Houston's future. A recent study from the Texas Comptroller's Office (King, 2019) indicates a gender gap in cybersecurity as well as other technology fields. There remains a need to attract and retain highly diverse labor pools for Texas. Cybersecurity Ventures was cited in this same article as indicating over one million cybersecurity jobs unfilled worldwide currently and anticipates over 3.5 million by 2021.

Texas and US changing demographics comprising the workforce. These demographics coupled with the surge in cybersecurity crimes of stolen confidential information and intellectual property reported by McAfee (Feb 2018) at two-thirds of the world population and Accenture reports and average of 130 security breaches per company per year (2017). Both factors demand future/current workers be trained to address the growing need. The education targeted by this proposal focuses on 1) practical training to remove skill & knowledge gaps in cyber and other security areas and cultivating proficiencies for employment; 2) providing support of current college emerging workforce while training for new security SOC jobs; 3) hands-on practical experiences with cutting edge computer and informational technologies; 4) certificate acquisition

as part of the training program acts to leverage experience with competency for immediate entrance into the workforce. UHD is a minority-serving and Hispanic-serving federally designated institution attracting underrepresented populations coming from four historical wards, representing the most diverse populations and minority populations across Houston.

Technology and the UHD Tracer Fire Simulation Lab

Current cyber and other security programs presented by UHD will be improved through acquisition of several aspects of the security training. For example, setting up of the Trace Fire Simulation Lab will allow for hands-on network and cloud security work within a safe environment. FIRE stands for Forensic Incident Response Exercise. This type of combined simulation was developed by Sandia National Laboratories to assist all types of responders in cybersecurity. Analysts and operators can develop proficiencies in critical skill areas through the Tracer Fire lab. Further, this lab along with the certification programs will allow industries within Houston and the Greater Houston Partnership to arrange for hands-on learning or refresher experiences as well as re-certification. Further, the robotic/AI/drone security aspects of the program are cutting edge security concerns which will move those industries using these technologies to gain certification/re-certifications to remain top notch keeping security high. With the Texas Medical Center just four miles from UHD the biometrics, pathogenic, and food security portions of this project will provide highly needed training in keeping food quantities safe as well as individual privacy concerns of privacy theft. Rayome (2019) reports the importance of scenario planning thinking informed from the military. Winder (2019) writes about cybersecurity in 10 years focusing on the need for more cyber security defense systems and AI needed in the decision-making process. A new generation of cyber experts needs to be cultivated to develop these needed systems.

Additionally, technologies such as online training for cybersecurity and LinkedIn Learning provided materials for students. Further, PhDs created their own materials for each specialty program such as Microsoft Excel tutorials, ARC GIS practice sessions and OSHA training modules through chemistry labs.

Program Training Hours

The Saturday sessions yield 10 Saturdays, half virtual through Zoom meetings and half through face-to-face sessions, each eight hours in length, and this amount of training equals 80 hours of training pre-empting the intensive three-week daily sessions yield 120 hours of training. All training equals 200 training hours for each participant will earn. The training sessions include March through July 2023 (See Table 1.).

Table 1. Training Schedule.

Month	Dates	Month	Dates
March	4, 25	June	3, 10, 17, 24
April	15, 29		
May	13, 27		
July	10-14; 17-21; 24-28		

Certificates Offered and Certificates Earned

Eight PhDs offered training sessions in a variety of security areas as part of this program. From cybersecurity novice levels preparation for data+ security to ARC GIS certifications, over 85 students participated gaining 85 certifications (See Table 2).

Table 2. Earned Certifications.

TTC PhD Mentor	Certificates Completed 1 st)	Additional Certificates Completed
Yilmaz	AZURE FUNDAMENTALS	Data +; Security +
Yuan	Cybersecurity	
Zhang	Web Development -WordPress	Coursera Front end
Standlee	ArcGIS	Food Safety
Jiang	OSHA 10-hr	OSHA-30 hr
Nakamura	Excel	Excel Specialist
Feng	IT Fundamentals	
Parker	SoftSkills	

Additionally, a combination of four-year public university undergraduates, community college undergraduates, and pre-college students participated in all training offered through this program (Table 3.). Table 3 demonstrates the successes of the program in terms of number of students testing and achieving certifications.

Table 3. Number of Participants and Certificates Gained.

Status	Participants	Certificates Gained
HS Precollege	13	16
Community College	10	1
Undergraduate	61	67
Workforce	1	1

Final Commentary by Program Participants

Several participants were asked to provide comments regarding their experience in the program and of achieving certifications. Pamela, Hispanic senior biological and physical science major shared: “ This project about cybersecurity has strengthened and broadened my career opportunities as I look toward existing university”. Another junior mathematics major, Garrett shared: “I am enjoying the program so far and am looking forward to having a more well-rounded resume in the near future as I gain certifications.” Another male, African American, senior shared: The TTC program has been a great experience because I have been exposed to a variety of disciplines in addition to what I have already studied at university.? Another male, white, graduating senior worked on several certificates such as data+, one of the more difficult certifications and another one named IT Fundamentals.”

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