NIST Request For Information:

Growing and Sustaining the Nation's Cybersecurity Workforce

Aug 2, 2017

Submitted by

LifeJourney, LLC

9256 Bendix Rd, Columbia, Maryland 21045

Rick Geritz, Founder and CEO

Table of Contents

Forward

LifeJourney, an online interactive learning experience focused on cyber education, is pleased to provide our feedback to the **NIST Request For Information** - Strengthening the the Cybersecurity of Federal Networks and Critical Infrastructure: Workforce Development. Creating a robust cyber workforce in the US to meet the security needs of today and tomorrow is critical to our national and economic security. We recognize the importance of a trained cyber workforce and have developed the resources, tools, methodologies and platform to support this effort. We believe it is critical to have a holistic approach to the cyber workforce challenge. This means starting early in the education system to increase awareness of cyber careers, to inspire students to follow cyber careers and grow their cyber skill levels, and ensure that teachers are prepared to teach cyber in the classroom. Our comments herein reflect our thinking on how to close the current cyber workforce gap and to maintain our nation's cyber technology and innovation leadership well into the future.

1) Executive Overview

Experts agree that our world today is facing a critical and tragic shortfall in the pipeline of adequately prepared graduates to meet the growing cyber threats in industry. By 2020 there will be more than 1.5 million open cybersecurity jobs in the U.S. alone.

Our current educational strategies embrace structured curricula of computer science, engineering and mathematics in which cyber security skill set acquisition is not at the forefront of high school curricula. The world of cyber presents problems that students will *never* be confronted with in the classroom. There is no textbook or syllabus that teaches students about cyber skills. This is not to say that classical approaches are wrong, but rather that today's world has changed. Cybersecurity itself needs to be in our schools' curricula just as much as is science, technology, engineering and science. Sadly, it is not.

> *The LifeJourney model is a highly-scalable cyber security career platform that converts the nation's cyber security leaders into a cyber skills pathway and development. Mentor skills continually update and grow a master Cyber Skills Table, which then conveys a multi-year career journey to guide the user. The platform connects teachers and parents relative to that student's career aspirations, skills and abilities, and education roadmap. The platform then connects to best of breed competitions, certifications and curricula into an integrated always-updating system.*

LifeJourney does the following:

1) When an cybersecurity industry expert mentor is reverse engineered, the core career information is extracted and used to create a **Skills Table** that represents the DNA of that career;
2) The system then **maps** that Skills Table against what is taught in high schools and universities to identify a Skills Gap that can be addressed and minimized with additional tools (applications) in the OS.
3) The API framework connects to best of breed cyber competitions, certifications and non traditional learning tools to provide a complete experience.

The **Skills Table is the brain** embodied within the Day of Cyber platform. Once instantiated**,** the Skills Table literally brings the platform to life in the classroom. Whenever a new cyber mentor is added to the LifeJourney system, the Skills Table gets updated and the overall model grows to address the rapidly evolving needs of the cyber education community in an ever-widening manner.

By having industry's leading cybersecurity companies, *and their hiring groups*, define the cyber skills they need, a real-time acceleration of workforce capabilities is experienced. Skills can be developed now in a **hands-on** and **self-taught** way facilitated by industry expert mentors leveraged in a massively-scalable manner, instead of just following the classical path of a multi-year formal education. New and dynamically created/updated tools such a the CyberIQ Challenges paves the way for universities and employers to identify skills gaps in direct, tangible ways ... and then act on it!

LifeJourney technology is scalable mentorship.

We must construct cyber education tools and methodologies that allow students to more quickly find their passions and develop their cyber skills, irrespective of age and traditional education constructs. We have demonstrated the ability to do this very thing with new approaches utilizing hands-on experiential learning tools, teacher-empowered cyber education methodologies, and *at-scale* mentor-based guidance in the cyber education space.

We propose that the **NSA Day of Cyber**, along with several other powerfully-related modules, is a way to provide widespread and easily-adopted cybersecurity awareness, motivation, inspiration and training for students of all types, teachers at all levels, and education institutions touching the more than 40 million users who have the potential of becoming our country's Next Cyber Generation. By providing such a leveragable set of interrelated components within a cyber education framework, or "cyber education operating system" as we will show, our nation will be able to incorporate additional cyber education modules from multiple vendors as they become available.

In this Request For Information ...

- We show how such a proven **Cyber Education OS** can accelerate the growth and maturity of our nation's cyber education system *at scale*, while providing our educators and institutions the flexibility to implement these tools in myriad ways within America's classrooms.
- We illustrate how the **LifeJourney Cyber Education OS** has the proven capability of quickly evolving and assessing student cyber skills development using real-life cyber scenarios, guided interactively by a virtual mentors based on actual expert employees in the cybersecurity industry. These LifeJourney Mentors are leveraged virtually to tens of millions of users — students and teachers alike — to inspire, inform and instruct on cyber tools and solution methodologies.
- We demonstrate how the **NSA Day of Cyber**, along with its attendant suite of OS components, is able to address the cyber education needs of students, educator competencies and administrators from every societal dimension, and simultaneously *evolve* with the industry as new players, new techniques and new technologies arise in the cybersecurity fabric of our daily lives.

These efforts can great help our country bootstrap and accelerate the entry of its young graduates to the cybersecurity workforce and lift our capabilities ranking on the world stage. These efforts can help fill the projected 1.5 million open cyber jobs that are so direly needed yet are currently unfillable. These efforts constitute today's "space race". And when successful, these efforts will result in us creating America's Next Cyber Generation.

The LifeJourney Team

2) Background and Supporting Information

The **NSA Day of Cyber** is an interactive, self-guided, and fully-automated cloud-based cyberscience awareness program that enables students to test-drive cyber careers and live a day in the life of seven leading NSA cyber professionals. More than 5 million students across the U.S. currently registered in the NSA Day of Cyber, regardless of means, are continuing to have the opportunity to participate in the NSA Day of Cyber for free.

Since August 2015, the **National Security Agency** (NSA) has partnered with LifeJourney on a national initiative called the **NSA Day of Cyber**, designed to raise the awareness and the "national IQ" for STEM and CyberSecurity education paths. NSA is sponsoring the program to introduce and inspire millions of students in middle school, high school, college and university to pursue STEM and Cyber careers and build the skills that will open up their future and connect them to this in-demand digital workforce.

> *"Cybersecurity is an issue that touches virtually every segment of the public and private sector,"*
> *D. Christopher Olexia, Chief, External Recruiting at NSA.*

Olexia continues, "Corporate espionage, data leakage and loss, privacy and related issues impact many businesses. This has created a growing need for trained and certified cybersecurity workers. We are hopeful that the 'Day of Cyber' program will ignite the interest of students across the U.S. to pursue careers in cybersecurity."

The Cyber Hierarchy of Needs

In 1943 Maslow first presented a motivational theory comprised of a five-tier model of human needs, often depicted as hierarchical levels within a pyramid. He stated that people are motivated to achieve certain needs and that some needs take precedence over others. For example, our most basic need is for physical survival, and this will be the first thing that motivates our behaviour. Once that need is fulfilled, the next level up is what motivates us.

Curiously, a similar type of hierarchical "needs structure" can be considered as being present within today's nascent system of providing cyber education. As illustrated below in Figure 1, one first becomes exposed to, and driven by society's pervasive use of cyber. One then climbs the pyramid toward more mature uses of cyber, and ultimately in some cases, seeking out training, expertise and specialization on the path toward career fulfillment.

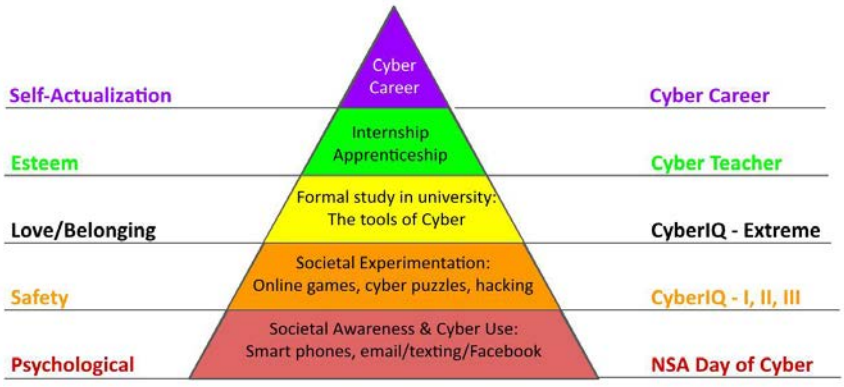


FIGURE 1: The Cyber Hierarchy of Needs

The Lifejourney cyber education components — the NSA Day of Cyber, CyberIQ, Cyber University, and Cyber Teacher — stack up quite seamlessly against this Cyber Hierarchy of Needs model. Students of any age are able to gain the initial cyber awareness, exposure and *cyber lingua*, and then evolve up through that Needs pyramid, culminating in their cultivation of expertise and specialization to be part of the Next Cyber Generation.

Of course, cyber solutions from other vendors should also plug into this *needs hierarchy* and provide additional dimensions of refinement and curation of the cyber skills needed in today's cyber society. In fact, collaboration is necessary, as many varying needs can be met with multi-vendor participation. Thus it is essential that other solutions work seamlessly with the LifeJourney platforms, for this is a powerful way that such a cyber education "platform" is able to keep pace with a rapidly evolving cyber industry. Examples of such other plug-ins are the NIST Cyber Workforce Framework, cyber programs from leading universities and CAEs, and active training components from SANS, Cisco, CompTIA and CSTA, just to name a few.

The point, however, is that for us to succeed in collectively creating a lasting Next Cyber Generation, our nation must cultivate an interactive and interchangeable collection of hands-on training and evaluation modules as the basis of an effective and long-lasting cyber education solution.

The Cyber Education Operating System

LifeJourney is a platform containing drivers, services, scheduling and an interoperable application framework required by nearly any cyber education software has been constructed — and has been operational for over two years with millions of student and teacher users.

Based on the proven and extensible LifeJourney **Day of Cyber** platform, this Cyber Education OS has played an important role of "cyber awareness, inspiration and instruction" for tens of thousand middle schools, high schools, colleges and universities throughout the United States, and in a growing number of other countries.

The architecture of the Day of Cyber platform is organized with common functions required by cyber education apps being available and coordinated by a supporting structure of drivers. In this way the specialized cyber education services such as registration, reporting, navigation, user profile, dashboards, flow control, and media handling are provided for all applications running in the OS. Similarly, as in standard operating systems, common computer services of cloud network support, user interface, secure access control and user login/logout are also provided.

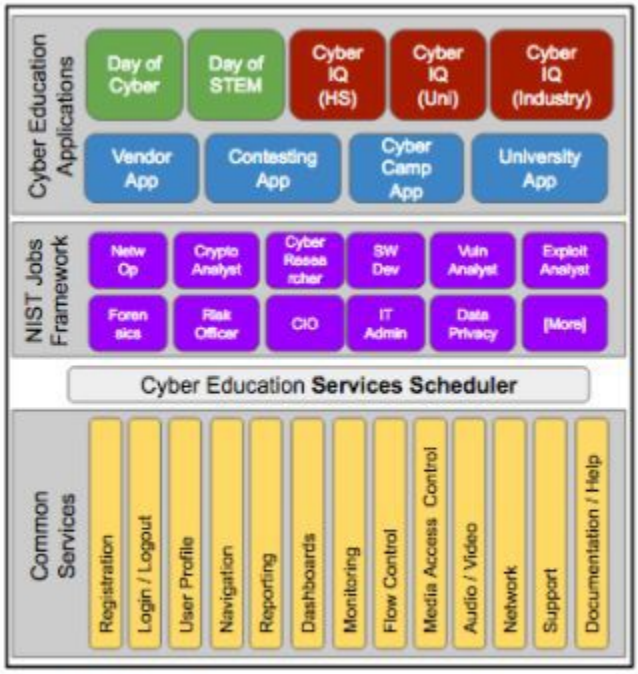


FIGURE 2: Cyber Education Operating System

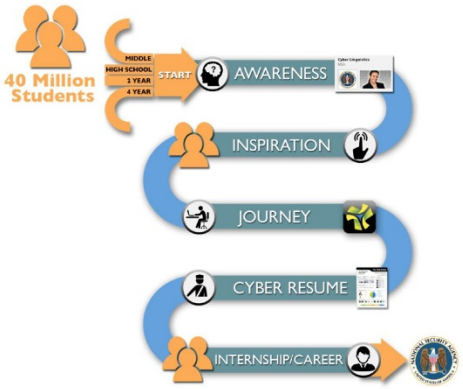
The all-important **cyber education applications** — the software programs that inspire, inform and instruct — run on the Cyber Education OS and utilize those drivers and services provided beneath. A conceptual model of the "Cyber Education Operating System" is shown below in Figure 2 to illustrate how these, and other cyber education applications can plug in to extend the overall model for multi-vendor / multi-institution use.

Day of Cyber ... The primary application on the Cyber Education Operating System

Cyber education is relatively new with the proliferation of computers and cloud-based technology today. It is also relatively unique, with fast-changing technology and industry tools, which makes it difficult for established school curricula to keep pace and remain relevant. The Day of Cyber was designed specifically to address this uniqueness and to bring cyber relevancy into the classroom for teachers and students alike.

The **NSA Day of Cyber** is an online career simulation and mentorship platform that helps students find their passion, and enables organizations to dramatically extend the reach of their community initiatives. LifeJourney enables a *single mentor to touch the lives of millions of students*, inspire them about their future, and provide the

sustaining motivation necessary to transform future generations. LifeJourney helps students discover their passion, test-drive future career opportunities, gain exposure to the skills they'll need to achieve their dreams, and help them better answer the age-old question, "What do you want to be when you grow up?"

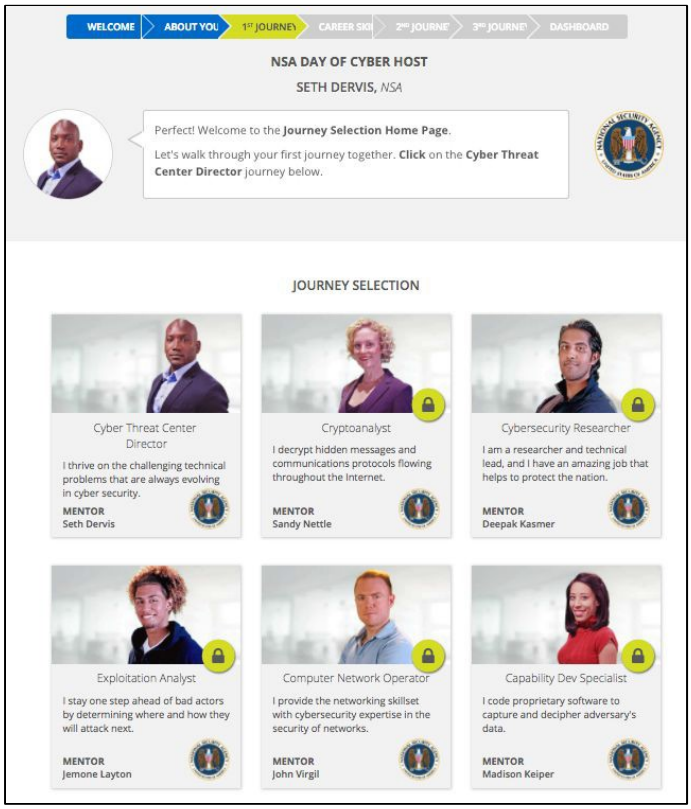


Within the Day of Cyber, a student is able to "experience a day in the life" of **expert mentors from the NSA**, thus giving the student a chance to see and experience what a *subject matter expert* (the NSA Mentor) routinely does, the tools normally used, and the skills notably demonstrated while performing in the specific cybersecurity career role being explored.

As such, the corresponding collection of LifeJourney capabilities can be depicted as residing under an overarching umbrella called "**LifeJourney Ideation**", with its primary modules being represented as supporting the platform.

These LifeJourney primary modules are unique and powerful in the industry, and have been designed to:

1) Inspire and motivate a STEM-generation of students to achieve better scores in the global classroom;
2) Be scalable to be used to engage and motivate more than 40 million students across America;
3) Provide a platform for engaging America's top corporate leadership in the educational success of our youth, while simultaneously allowing them to invest in and cultivate an environment to grow tomorrow's technology workforce; and
4) Provide an awareness in our nation's youth regarding the wealth of available STEM-technology jobs, and the pathways to achieve internships and employment, thus enabling them to answer the questions "What do you want to be when you grow up?"



Cyber Resume

One of the outputs of the LifeJourney system for users is the **Cyber Resume**, which reflects analytics on a student's career tendencies and captures performance, interest and aptitude indicators, such as mentor selection, cyber skills roadmap and career preferences, and award, badge and certificate achievements.

The resume Identifies and tracks core hard skills, soft skills and certifications required for the favorite mentor/career, the recommended college/university courses that can prepare students for their chosen mentor's career, and a roadmap of training a student will needs in order to potentially gain future internships or full-time jobs in the chosen field**.**

The Cyber Resume is a dynamic and continuous representation of these dimensions and attributes as a result of the student's career exploration. It starts from the very first time that a student embarks on a journey, and continues throughout the numerous follow-on combinations of industry-sponsored Field Trips. Cyber Resumes

have been effectively used during job search activities, as it represents a real-time reflection of acquired cyber training and skills accumulation. It becomes the student's passport to future economic success in industry, while simultaneously serving as an overarching guide through the maze of technologies and competing educational pathways.

Teachers, parents and potential employers are able to see and take action on the ever-changing montage of a student's evolving cyber maturity. It indicates trends in class performance when viewed in aggregate, and teachers can tailor subsequent instruction to strengthen needed areas. Parents are able to see a dimension of their child's interests and capabilities that they might not have previously been aware of. Employers are able to see authoritative evidence of a student's performance and achievement (e.g., via certifications received).

FIGURE 2: The Cyber Resume
… A live, evolving summary of accumulated student progress

The Student Dashboard

Students also have an activity dashboard in which they are able to more deeply explore the mentor backgrounds and skills, including videos, the interactive story Q&A, resources presented by the mentors, the cyber dictionary, and more. Of special interest to most students is the Beginner Cyber Challenge field trip in which they answer stimulating technology questions relating to cyber tools and skills. Other online field trips are also available (e.g., Crypto Challenge character substitution puzzles, and various links to the NSA internships website) that students can work on prior to them earning their Completion Certificate.

It's All About Empowering Teachers in Cyber

Creating the Cyber Generation starts with teachers, the most influential element in shaping and guiding a student's educational path. Research shows that a single teacher can make a personal impact on 100 students, which means helping teachers provides an exponential path to the cyber generation.

One of the most important aspects of creating a Cyber Generation is elevating the technical relevance of teachers in the classroom.

The Day of Cyber is integrated with the student classroom experience as a co-curricular element of their instruction. Accordingly, participating teachers also track student progress through an Instructor's Dashboard.

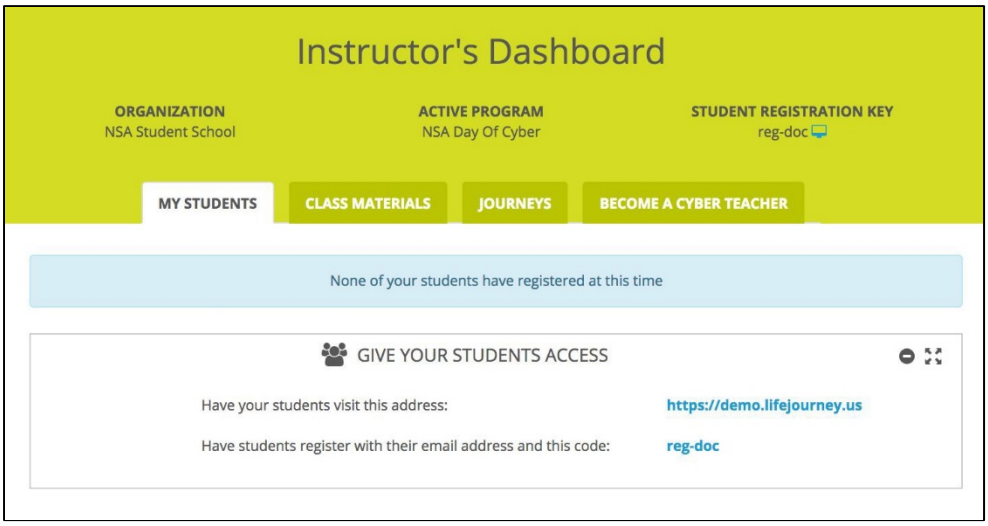


FIGURE 3: Instructor Dashboard enables teachers to monitor and report on student progress

While engaged in the program, teachers have direct access to numerous instructional cyber resources and references, such as LifeJourney lesson plans, detailed course guides and industry data designed to integrate into their existing math, computer science, technology, and career guidance classes.

Within their dashboard, teachers can monitor each student's progress and generate reports on overall class participation. They may also preview all journeys available to the students, and use any of many helpful Lesson Plans available there.

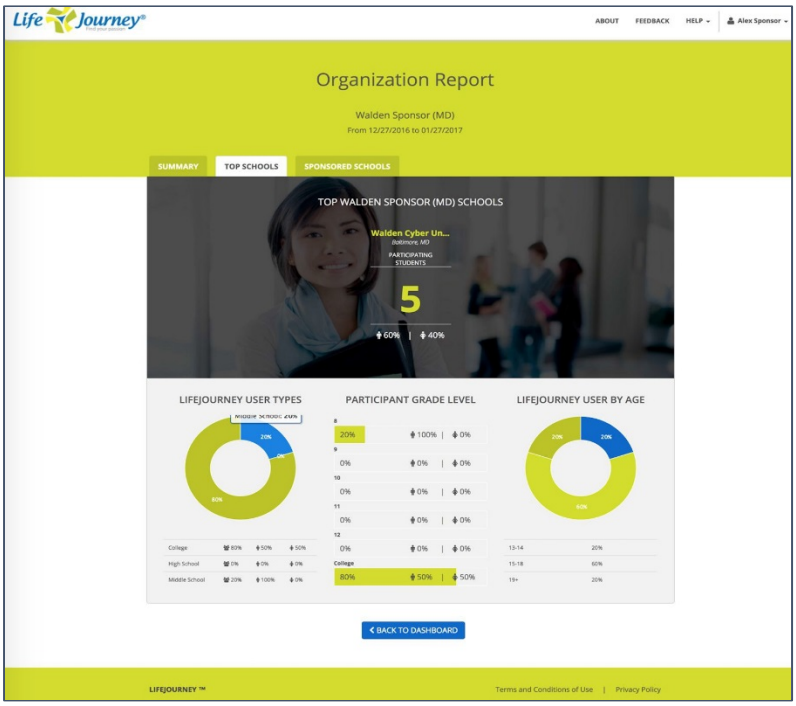


FIGURE 4: Reporting Capabilities from the Instructor Dashboard

A specific journey called "Cyber Teacher" has been designed exclusively for teachers to enable them to better understand how they can introduce cyber careers into their lessons. This journey, and corresponding instruction, guides teachers relative to how to run the Day of Cyber and how to effectively incorporate the cyber material and resources within their own syllabus. In effect, they become **career counselors** to their students by providing new cyber concepts, content and roadmaps to their future cyber careers.

The CyberIQ

The CISO CyberIQ Challenge is a powerful set of applications running on the Cyber Education OS. They were designed to enable high school, college, university and industry players to connect directly with the cyber generation and help inspire them to make a highly visible corporate impact on the cyber community. The CyberIQ Challenge provides a unique opportunity to provide real problems and simulates hand-on experience to better prepare students for life after university.

This important component of the Cyber Education OS addresses key strategic goals:

- Identifies and reaches cyber students, teachers and adult workers on an unprecedented scale. The CISO CyberIQ Challenge provides 24/7 virtual recruiting engines so corporate HR and recruiting departments will see results far exceeding the quantity and quality of conventional cyber recruiting methods.

- Participating companies are highly visible in the cyber communities of students, educational institutions, industry and governments. Using LifeJourney's proven platform, the company's image, inspiration and message is projected with a fresh and relevant community presence.

The CyberIQ Challenge allows users to determine where their cyber capabilities are and continue to build them to the point where they can plug into specific and meaningful careers in the cyber industry.

The core engine of the **Cyber IQ Challenge** consists of a set of 200 real-life "cyber problems" typically seen in every facet of society today. The challenges are designed to connect the everyday world of users to the cyber world. Students use their innate abilities to solve these problems individually through clues and experimentation with online tools of the cyber trade. While working through the problems, students are experiencing *hard skills* through their research and discovery of solutions on their own. They encounter the tools and techniques used by cyber professionals, and evolve their innate *soft skills* like grit, tenacity, communication and decision-making … all of which help determine their *aptitude for problem solving*. The Cyber IQ Challenge is a way that students may encounter many of these real-life problems and apply creativity and ingenuity in solving them.

The CyberIQ Challenge has been demonstrated to be a measurable cyber skills development technique for classroom and corporate HR use. The resultant rating a user achieves — the Cyber Aptitude — indicates his/her ability to solve cyber problems on their own without having prior instruction. One's natural *soft skills* of grit, tenacity, perseverance, research and curiosity all combine with the *hard skills* of cyber technology to enable the student to dig in and solve real-life cyber problems on a par with students having more exposure and experience.

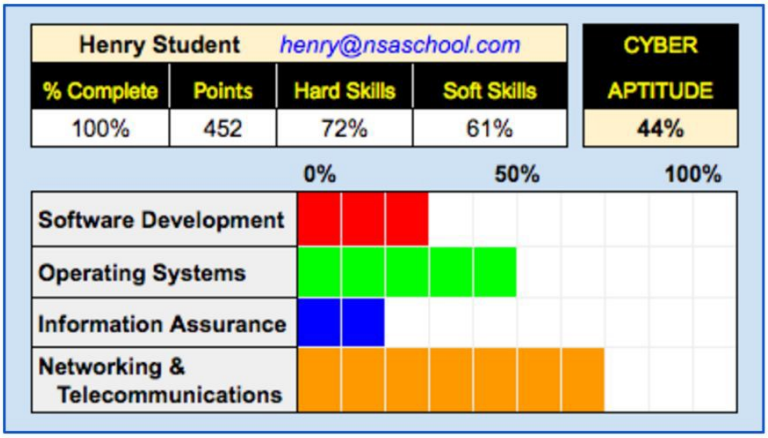


FIGURE5: CyberIQ Dashboard

Cyber Connects to Existing Curricula

Teachers are able to use cyber challenges to illustrate and amplify the course material being taught in traditional STEM classrooms. Direct hands-on involvement of students in solving real industry cyber security problems allows

class materials to literally come to life. In essence, the CyberIQ Challenge becomes a powerful teaching tool for educators in the classroom.

The challenges presented to students in the Cyber IQ Challenge provide fertile ground to convert what is being taught in the classroom into the *how*. For example, this hand-on learning tool shows *how* passwords are hidden from others, *how* hackers take over other people's computers, and *how* data is sent from one phone to another over a network. Again, the hard skills associated with these types of scenarios are what educators are able to bring into the classic courses like computer science, mathematics and technology.

Experience has shown that students really enjoy taking a self-empowered, self-driven path to their cyber skills development. By nature, students in cyber greatly enjoy solving puzzles, working with data sets, and working on loosely-defined problems that require Internet research.

CyberIQ Challenge Organization

The CyberIQ Challenge is organized as multiple sequentially-administered modules based on degree of question/topic difficulty and the average time needed to complete. Questions within these easy, medium, hard and extreme modules (as illustrated below) may be shuffled to best meet the intended audience and usage. Thus specific CyberIQ Challenge modules may be constructed for educators in high school or university, or as tools for employers to evaluate incoming or existing employees.

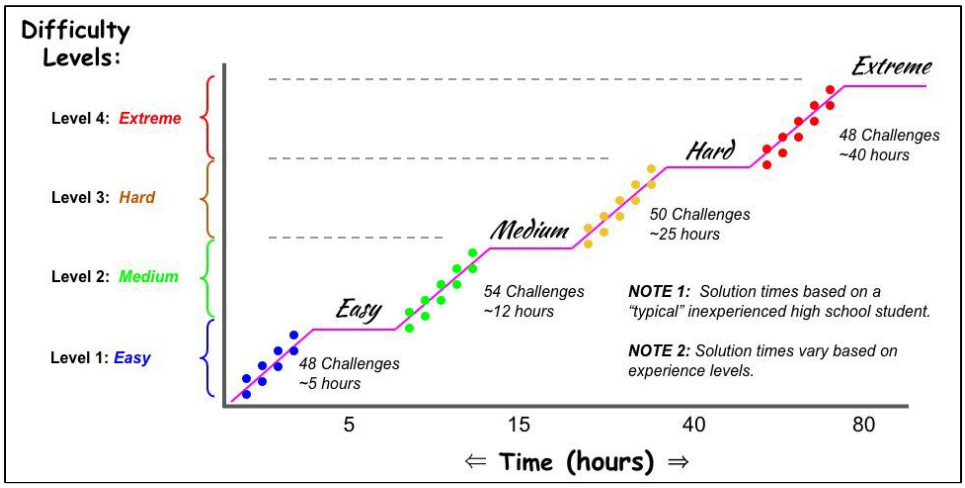


FIGURE 6: CyberIQ Modules

Cyber Achievement Equivalencies

The Cyber Aptitude rating that students achieve within the CyberIQ Challenge modules suggests an *education equivalency* relative to students and workforce professionals who have taken a more traditional cyber education pathway, as illustrated below in Figure 7.

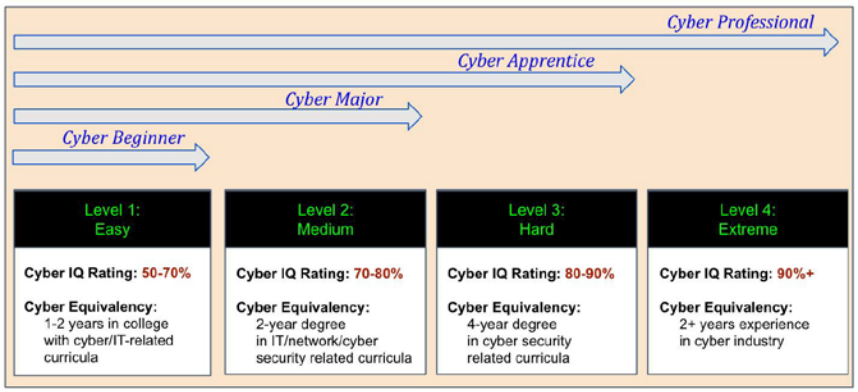


FIGURE 7: Cyber Achievement Equivalency

For example, a Cyber Aptitude of 90%-or-better may be considered *equivalent* (in cybersecurity terms) to having a degree in computer science or technology, having earned some certifications and working in a cybersecurity job for two years. Lower levels of achievement have correspondingly lower equivalencies.

The CyberIQ Challenge provides an effective way for school systems to introduce cyber skills into existing course curricula. By presenting students with hands-on, project-based learning opportunities, teachers can bring current course materials to life by relating them to real-life cyber situations in industry. Further, and most important, teachers are better able to motivate and prepare students for the lucrative cyber job market awaiting them after graduation.

Cyber University Program

Cybersecurity has become the most visible and pressing educational issue for our nation, impacting every aspect of our economy from healthcare, mobile, to everyday financial transactions. It has given birth to a rapidly growing digital jobs market and an unprecedented opportunity for the future generation - the cyber generation. The Forbes article which covers the more than 1 Million job openings in 2016, **outlines the opportunity for universities to dramatically grow their student base**. Our ability to inspire students to pursue the key skills needed to drive our country's cyber security future needs is of extreme importance to our nation and to our communities.

The **Cyber University Program** was released as a component of the LifeJourney Cyber Education OS in December 2016. Since then, participating universities have been able to leverage more than 5 million students currently registered in the LifeJourney NSA Day of Cyber to grow their enrollment into cyber related programs.

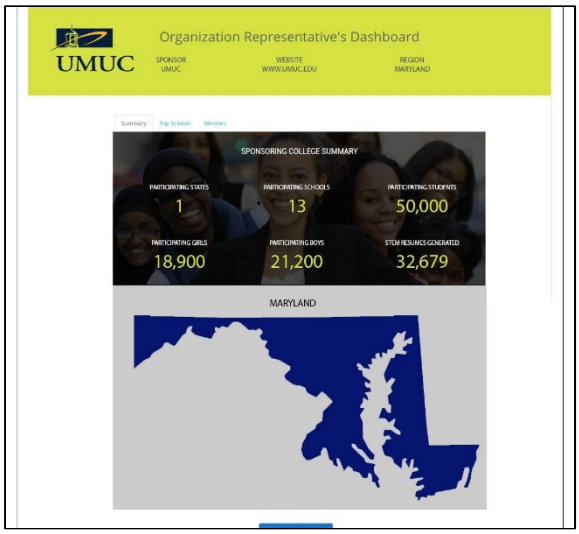
Cyber Universities are able to create a unique visibility of their cyber programs for schools and students within their network of high schools and colleges. Their *university-branded Day of Cyber* provides them a powerful new cyber student recruitment engine, a strong cyber student retention capability, and a scalable branding tool for universities to grow their Cyber programs and expand the base of teachers that directly support their programs.

Reporting Tools

Specially-constructed dashboards enable Cyber Universities to measure and report on program effectiveness, assess performance, and gauge the demographic reach of their program.

The Cyber University Dashboard provides an astounding view of effectiveness of their cyber reach into their education communities:

- Sponsored students by school, city, that have begun their university—linked cybersecurity journey;
- Ranking of the cybersecurity Day of Cyber Mentors and careers that the students select as the most interesting and inspiring.
- Metrics that can be rolled up by schools, city, students, gender, age and career interest.
- Teacher Analytics
- Number of teachers who completed the Cyber Teacher certificate



- Number of teachers who have received their certificate with the university logo
- City, State, School of each sponsored Cyber Teacher
- Number of students who have run the NSA Day of Cyber as part of the Cyber Teacher Certificate program

Cyber Course Mappings

Connecting student cyber Interests to corresponding cyber-related programs is a powerful way for Cyber Universities to connect incoming student population, as well as the "cyber students" in their subordinate school network, with the wealth of cyber-related program opportunities available at the university.

The custom "mapping" of student cyber interests, as collected, curated and reported on within the Day of Cyber platform, identifies the specific courses in university programs that *relate to the skills required* in the journeys explored by the students.

This Course Mapping tool, shown below in Figure 8, has proven success in enhancing university enrollment and in use as a tool for the Cyber Teacher and guidance counselors working with students and parents.

FIGURE 8: Cyber University courses mapped to related Day of Cyber careers
(See larger image in Appendix B)

Cyber Teacher Professional Development Certificate Program

Growing and developing the ranks of teachers, professors and instructors who are capable of effectively training the Next Cyber Generation is a hugely important imperative for increasing the ranks of cyber-ready graduates into industry. **Cyber Teacher** is a turn-key, CSTA-accredited certificate program that allows teachers from every level of the country's education system to gain the training, resources and motivation to leverage their respective course specialties with respect to cyber security.

In this program, teachers in middle schools, high schools, colleges and universities may independently pursue cyber training in order to more effectively relate their course material to current, real-life cybersecurity skills, tools and situations encountered in industry.

The Cyber Teacher program directly addresses an educator's need to bootstrap into *cyber awareness* for the skills, tool and methodologies that our students will encounter upon entry to cyber industry workforce. Armed with this

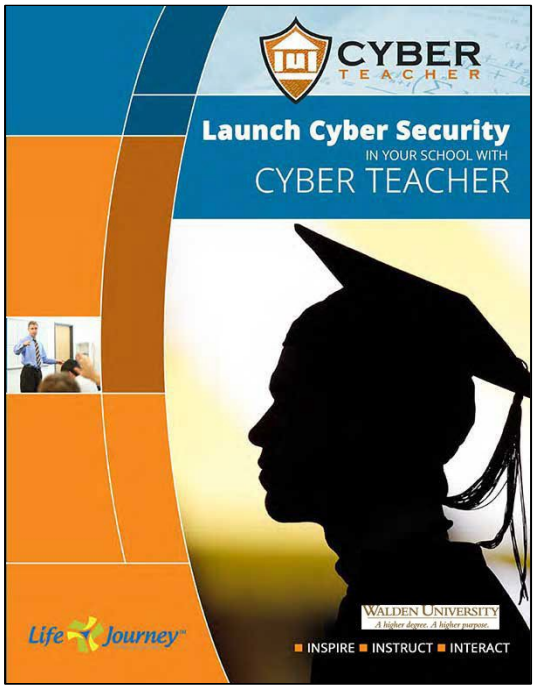
foundational understanding, teachers are better able to translate cyber industry needs into teaching instruments within their math, science, computer, IT and career placement classroom settings.

Cyber Teacher Scholarships

Educators across America are able to participate in the Cyber Teacher program via **Cyber Teacher Scholarships** that are generously sponsored by LifeJourney partners and universities participating in the Cyber University program.

These Cyber Teacher Scholarships drive solid *cyber pillars* into the bedrock of the nation's education system by providing access to the cyber technology, knowledge, experience and tools that educators need when bringing cyber into their classrooms.

Cyber Universities sponsor Cyber Teachers for their own institution as well as for teachers in their feeder network of high schools and Community Colleges. These scholarships provide the universities with another powerful way to contribute to solving the nation's cyber skills crisis — by fortifying their teaching community with the awareness and tools needed to inspire and guide students to pursue tomorrow's emerging, challenging, in-demand and high-paying careers in cybersecurity.



The **professional development aspect** of the Cyber Teacher program involves completion of CompTIA's Fundamentals of Cyber online adaptive learning course to teach teachers the basics of cyber, and three hands-on use cases in the Day of Cyber product that instruct on the operational aspects of bringing cyber into the classroom … and infusing the syllabus material with cyber relevancy from industry.

Upon completion of the PD program, teachers receive a Cyber teacher Certificate signed by university leadership and the Computer Science Teachers Association, with an endorsement for CEU clock-hours. The educators become members of the **Cyber Teacher Association** and take part in "America's Cyber Educators" Digital Publication and an invitation to the National Awards and Recognition Ceremony at the CSTA Conference.

Additionally, Cyber Teacher graduates gain access to year-round cyber skills and teaching materials exclusively provided within the LifeJourney platform. These resources and tools enable them to powerfully connect real-life workforce situations and problems seen in the cyber industry. The **Cyber Skills Lesson Guide** shown below in Figure 9, illustrates the type of quality cyber instructional material available to Cyber Teachers for use throughout the school year.

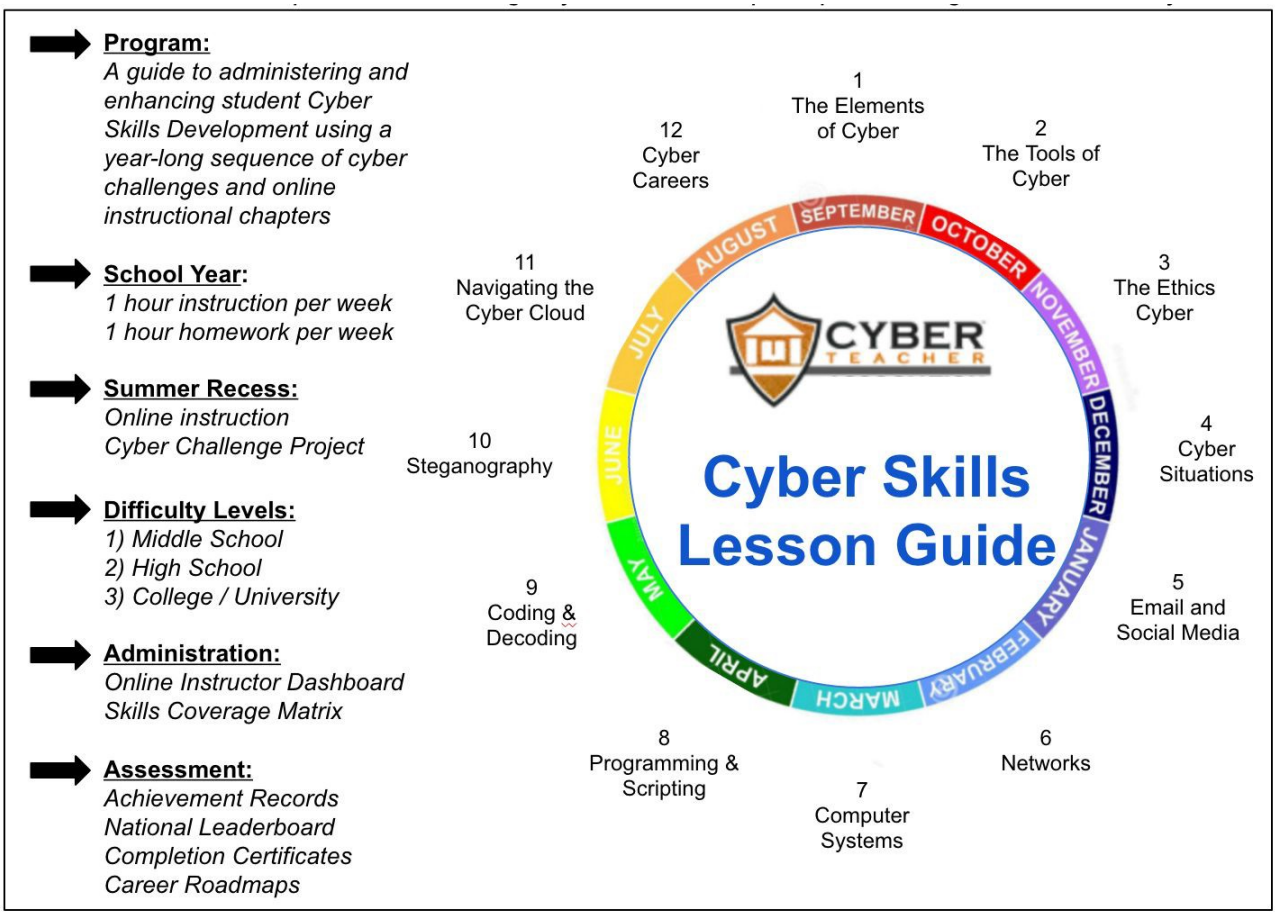


FIGURE 9: Cyber Skills Lesson Guide (cover page)
Enables Cyber Teachers to emphasize & leverage cyber skills and principles throughout the school year

3) Summary

Cybersecurity truly is the most visible and pressing educational issue for our nation today, impacting every aspect of our society, from everyday life in the marketplace, transportation, and critical infrastructure. It has given birth to a rapidly growing digital jobs market and an unprecedented opportunity for the future generation - the **Next Cyber Generation**. Our ability to inspire students to pursue the key skills needed to fill the huge cyber workforce shortage and drive our country's cybersecurity future needs is of extreme importance to our nation and to our communities.

> *The objective is about providing people the skills that employers need. Achieving that objective on a national scale to the country is the mission.*

In this document we have detailed an existing, proven, extensible and interoperable platform of complementary "education applications" (programs) that directly address the cyber education needs of our country. These applications are embodied in the **LifeJourney Cyber Education Operating System** in such a manner that each Cyber Education Application is able to work cooperatively within an established framework of cyber and education resources, and evolve in step with the fast-changing cybersecurity industry. The Cyber Education OS was developed to allow **vendor interoperability**, such that feature modules from other education partners can seamlessly plug in to provide additional cyber education functional dimensions.

LifeJourney technology is scalable mentorship. *The technology reverse engineers the skills journey of the nation's top cyber leaders from government and industry and creates a master Skills Table. That table is mapped against*

the nation's High Schools, Community Colleges and Universities providing a direct pathway for the user … to achieve his/her own dreams, and to address America's cybersecurity workforce shortage needs.

The highly scalable platform then connects (via an API framework) to those who teach, instruct, certify or complete the education path with students.

The importance of this approach is that LifeJourney Mentors provide an ever-evolving Skills Table mapped to the dynamic needs of the country's cyber education system.

Wide-ranging **partners and users of the Day of Cyber** (and other components in the Cyber Education Operating System) come from the cyber industry, cyber education and training organizations, and enjoy a deep participation within our nation's public and private education system: middles schools, high schools, 2- and 4-yr colleges and universities. The user population of the Day of Cyber platform also includes special interest groups such as Boy and Girl Scouts of America, Cyber Summer Camps and GenCyber Camps. Entire states (VA, DE) are endorsing and implementing the Day of Cyber platform within their regions. Over two years of documented participation exists from urban, metropolitan, and underserved communities. Home-schooled students, job-changing adults, retooling veterans and students from every walk of life today are prominently present in the more than 5 million person user base of the NSA Day of Cyber platform.

This unprecedented population of users, education institutions, and industry partners gives us the belief *and confidence* that the **LifeJourney Cyber Education OS is among the most powerful ways that America has** to rebuild its cyber workforce and retake its leadership position on the world's cybersecurity stage. As the Space Race was in the Kennedy era, no other time in history than ***now*** has it been more important to focus on, and invest in, America's cyber workforce.

No other platform, industry player or singular product has the farther-reaching tentacles into the cyber education system than LifeJourney, and its Cyber Education OS has the best opportunity to play a central role in rebuilding America's cyber workforce … the **Next Cyber Generation**.

About LifeJourney

LifeJourney™ is the leader in cybersecurity and STEM online career exploration and simulation. A web-based tool for the classroom that enables students to explore, discover and test-drive exciting careers of America's STEM and Cybersecurity leaders, and thus become informed and inspired to follow the related STEM pathways to achieve those futures. The LifeJourney experience enables teachers to directly connect what they are teaching in the classroom to what students learn through the tools and technologies of organizations defining the workforce needs of tomorrow. www.lifejourney.us.

APPENDIX A: Q & A

1. What current metrics and data exist for cybersecurity education, training, and workforce developments, and what improvements are needed in the collection, organization, and sharing of information about cybersecurity education, training, and workforce development programs?

LifeJourney is focused on creating the next generation of the cyber workforce. As such we are engaged across the education spectrum. To date our programs have reached a wide range of students, including:

- Over 5 million students and other users interested in cybersecurity have signed up to experience a "Cyber Journey", as reported by the NSA in CyberScoop.
- Current registration rates are tracking to total more than 1.4 million **students**, 16,000 **instructors** and 300,000 **schools** across the United States by the end of 2017.

2. Is there sufficient understanding and agreement about workforce categories, specialty areas, work roles, and knowledge/skills/abilities?

There is a sufficient understanding of the workforce categories as well as the skills and knowledge currently needed to be a successful cyber security professional. However, these categories and skills are dynamic. As technology changes and threat vectors evolve, so too must the knowledge and skill set. Government, academia and the private sector should work together to evaluate on a regular basis the changing skill set, roles and workforce categories needed to meet the threats of the future. NICE would have a natural role in convening such a group and monitoring the needs.

Further detail provided in Section 2, pp 3.

3. Are appropriate cybersecurity policies in place in your organization regarding workforce education and training efforts and are those policies regularly and consistently enforced?

While LifeJourney indeed has regularly enforced policies in place in its own workplace, as a vendor we provide partners, and educators with the tools to do the same in their organizations. Tools include capabilities to monitor, manage and report on progress and status of individuals in their local corpus of Day of Cyber users.

4. What types of knowledge or skills do employers need or value as they build their cybersecurity workforce? Are employer expectations realistic? Why or why not? Are these expectations in line with the knowledge and skills of the existing workforce or student pipeline? How do these types of knowledge and skills vary by role, industry, and sector, (*e.g.,* energy vs financial sectors)?

The cyber landscape continues to change. Employers need to know that their cyber workforce has the practical working knowledge to address new threats. They also have to have opportunities for training and continuing education. Online training is both flexible, can adapt to changing needs such as creating modules for specific sectors, but it can also reach a wide audience. Employers expectations are realistic. Education and training programs are adapting to cover the evolving threat and throughout the Cyber Education Operating System students are being properly prepared. While we are slowly building the pipeline for future cyber professionals, we must emphasize generating the interest in a cyber career at an early age and throughout the education system. And, we must also focus on building capacity behind what currently exists or we will continue to fall into the cycle of trying the close the gap in terms of numbers of professionals needed while the the goal line keeps moving further and further away.

5. Which are the most effective cybersecurity education, training, and workforce development programs being conducted in the United States today? What makes those programs effective? What are the goals for these programs and how are they successful in reaching their goals? Are there examples of effective/scalable cybersecurity, education, training, and workforce development programs?

There are a number of successful programs in place today related to cyber education programs at universities, with professional organizations and in the private sector. I would highlight again the NSA Day of Cyber that has signed up over 5 million participants to raise awareness and the overall cyber IQ among students across the countries at various levels of education. As a partner in this programs, we see the public -private partnership as a strong opportunity to promote cyber awareness and education. Given the growing workforce gap and the risk to our national security, we need bold programs that can reach wide audiences to inspire the next generation of cyber leaders. We strongly believe that scalable programs like the NSA Day of Cyber are necessary and should be seen as a model for future engagement by the government and in partnership with the private sector.

6. What are the greatest challenges and opportunities facing the Nation, employers, and workers in terms of cybersecurity education, training, and workforce development?

Use and the expansion of technology continues to grow. There is no end in sight. Unfortunately, the demand for cybersecurity professionals is severely outpacing the current ability of government and businesses to fill that need. This is a national security problem that must be addressed. We believe a comprehensive cybersecurity program from middle school through university must be in place to meet the growing demand for cyber professionals. This should be supplemented with a training program for current professionals, including those that are looking to enter the field of cybersecurity. The bottom line is that we must build interest starting at a young age and we must build capacity throughout the pipeline. Any program must be flexible and have the ability to scale to meet the growing demand. Ultimately, though success requires that we expand the number of educators capable of teaching cybersecurity. Professional development efforts like the LifeJourney's Cyber Teacher certification program are critical to building capacity and meeting demand.

7. How will advances in technology (*e.g.,* artificial intelligence, Internet of Things, etc.) or other factors affect the cybersecurity workforce needed in the future? How much do cybersecurity education, training, and workforce development programs need to adapt to prepare the workforce to protect modernized cyber physical systems (CPS)?

As technologies evolve and advance, new threats become present. Thus the cyber workforce most also evolve to maintain its effectiveness. This requires a dynamic education and training program. Online interactive training programs are preferable and can provide the flexibility to innovate around our cyber education system. They can complement hands-on training with new technologies. This approach can apply to training the current cyber workforce or in preparing our future cyber workforce. We need to start early and engage students as early as middle school to get them comfortable with new technologies and the proper security response to new risk vectors like the Internet of Things, and others.

8. What steps or programs should be continued, modified, discontinued, or introduced to grow and sustain the Nation's cybersecurity workforce, taking into account needs and trends? What steps should be taken:

i. At the Federal level?

At the federal level, we need more programs like the NSA Day of Cyber that can reach broad audiences. We need programs that highlight other areas of cyber protection in the critical infrastructure. And we need investment in our schools and teachers to build the capacity need to close the cyber workforce gap.

ii. At the state or local level, including school systems?

We believe that it is important to start engaging students early on in the learning cycle to raise awareness and generate interest in a cyber career path. Students need to know that a cyber career path exists and that there is a critical need. Regardless of the number of students who pursue a cyber career, we need to raise the overall cyber IQ in our nation.

Training "cyber teachers" to ensure that we can grow capacity is crucial.

iii. By the private sector, including employers?

Employers should invest in their current employees by providing training and continual education programs. They should also invest and work with education and training providers to identify and communicate their workforce needs. The private sector can support programs in schools to help grow the pipeline. They should consider providing mentors in a scalable way to help support students interested in pursuing a career in cyber.

iv. By education and training providers?

Education and training should partner with government and the private sector to ensure that their training programs are meeting the needs of employers and are evolving to prepare students and professionals to better protect against cyber threats.

v. By technology providers?

Technology providers have an important role to play as well. We believe that focusing on secure development practices including software assurance is critical. There will continue to be emerging risks as new technologies come online. There will be a rush to get new product to market without consideration for security. This mindset must change. We need to create a generation that innovates with security in mind.

APPENDIX B: Supporting Graphics

Mapping of University Courses to NSA Cyber Expert Mentors

CONTINUE YOUR JOURNEY

WALDEN UNIVERSITY
A higher degree. A higher purpose.

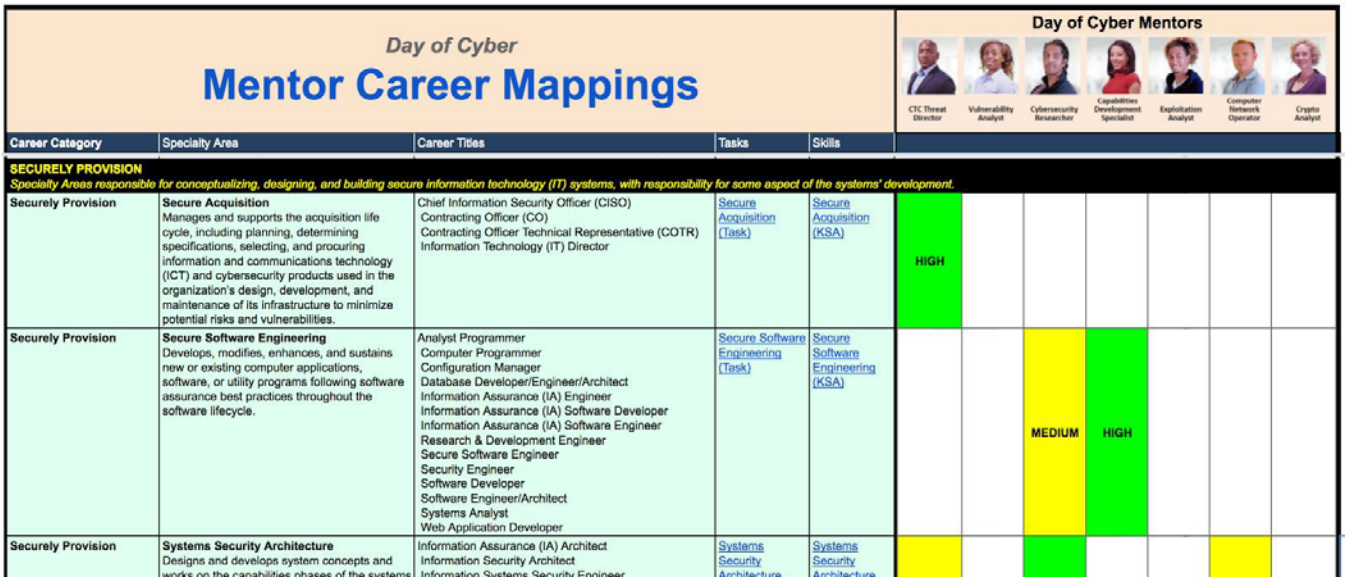
The world of information systems is advancing rapidly. With an online information technology degree from Walden, you can advance your career right along with it. Our information technology degree programs can prepare you with the technical skills and business acumen you need to design, develop, and manage IT systems within your organization and in your community. Walden is a proud sponsor of LifeJourney and NSA Day of Cyber. Click to explore our courses below that are mapped to the skills and careers of each of the mentors you met in the NSA Day of Cyber experience.

DAY OF CYBER

Bachelor of Information Technology
Cyber Security & Forensics

		CTC Threat Director	Vulnerability Analyst	Cybersecurity Researcher	Capabilities Development Specialist	Exploitation Analyst	Computer Network Operator	Crypto Analyst
Related Industry Titles:		IT Director Info Security Officer Operations Director Cyber Ops Planner	Incident Analyst Ethical Hacker Security Defense Tech Cyber Intel Analyst	Cyber R&D Engineer Security Architect Cyber Intelligence Mgr Cyber Knowledge Manager	Computer Programmer Secure Software Engineer Security Engineer Web Application Developer	Reverse Engineer Vulnerability Engineer Encryption Analyst Security Engineer	Security Network Admin Network Analyst Network Systems Eng Network Architect	Security Analyst Security Operator Linguistics Specialist Encryption Analyst
First Term Course								
Living and Learning in a Technological World	HMNT 1001	X	X	X	X	X	X	X
Core Courses								
IT Infrastructure	ITEC 1010	X	X	X			X	
Networking Fundamentals	ITEC 1020	X	X	X			X	
Introduction to Programming	ITEC 1030				X	X		X
Data Structures	ITEC 2010				X	X		X
IT Theory Fundamentals	ITEC 2020	X	X	X			X	X
Operating Systems Fundamentals and Administration	ITEC 2030	X		X	X		X	X
Systems Analysis	ITEC 2040	X		X			X	X
Systems Design	ITEC 2050			X	X			
Database Management Systems	ITEC 2060	X	X	X		X		X
Human-Computer Interaction	ITEC 2070	X	X	X	X	X		X
Web Programming	ITEC 2080		X		X			X
Mobile and Pervasive Technologies	ITEC 3010	X	X				X	X
Computer Security Fundamentals	ITEC 3020	X	X	X	X	X	X	X
IT Project Management	ITEC 3040				X		X	
Network Administration	ITEC 4010	X		X			X	
Statistical Concepts	STAT 3401	X				X		X
Systems Integration	ITEC 4030	X					X	

Mapping of NIST Cybersecurity Workforce Careers to NSA Mentors



Day of Cyber
Mentor Career Mappings

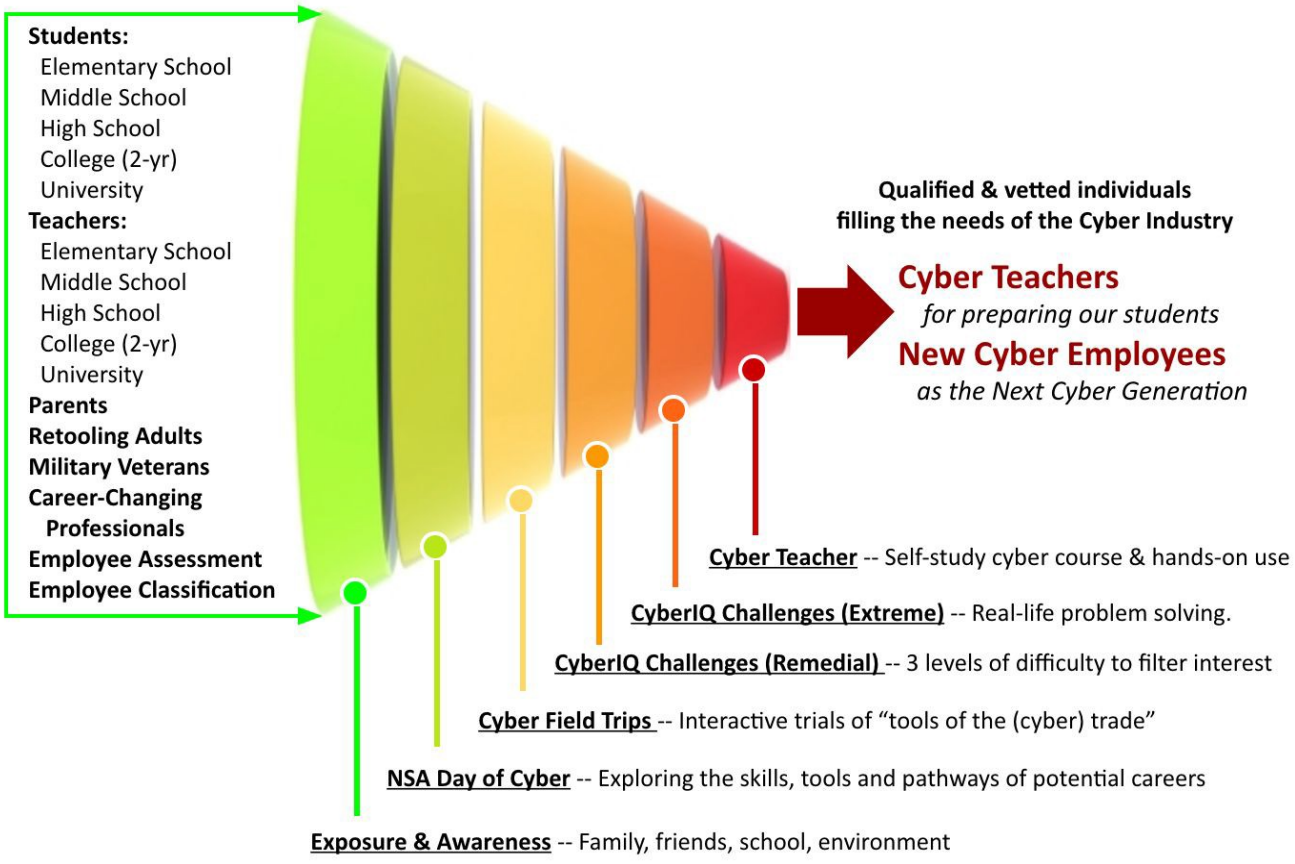
Day of Cyber Mentors

Career Category	Specialty Area	Career Titles	Tasks	Skills	CTC Threat Director	Vulnerability Analyst	Cybersecurity Researcher	Capabilities Development Specialist	Exploitation Analyst	Computer Network Operator	Crypto Analyst
SECURELY PROVISION *Specialty Areas responsible for conceptualizing, designing, and building secure information technology (IT) systems, with responsibility for some aspect of the systems' development.*											
Securely Provision	**Secure Acquisition** Manages and supports the acquisition life cycle, including planning, determining specifications, selecting, and procuring information and communications technology (ICT) and cybersecurity products used in the organization's design, development, and maintenance of its infrastructure to minimize potential risks and vulnerabilities.	Chief Information Security Officer (CISO) Contracting Officer (CO) Contracting Officer Technical Representative (COTR) Information Technology (IT) Director	Secure Acquisition (Task)	Secure Acquisition (KSA)	HIGH						
Securely Provision	**Secure Software Engineering** Develops, modifies, enhances, and sustains new or existing computer applications, software, or utility programs following software assurance best practices throughout the software lifecycle.	Analyst Programmer Computer Programmer Configuration Manager Database Developer/Engineer/Architect Information Assurance (IA) Engineer Information Assurance (IA) Software Developer Information Assurance (IA) Software Engineer Research & Development Engineer Secure Software Engineer Security Engineer Software Developer Software Engineer/Architect Systems Analyst Web Application Developer	Secure Software Engineering (Task)	Secure Software Engineering (KSA)			MEDIUM	HIGH			
Securely Provision	**Systems Security Architecture** Designs and develops system concepts and works on the capabilities phases of the systems	Information Assurance (IA) Architect Information Security Architect Information Systems Security Engineer	Systems Security Architecture	Systems Security Architecture							

Related Discussion:

Processing students to create the Next Cyber Generation

using the Cyber Education OS in the Education Process



Cyber University Dashboard

Reports provide unique visibility of Cyber Reach into University Education Network, showing participating population totals, gender mix, grade and age distribution, cyber mentor/career preferences, and more.