Encouraging Primary & Secondary School Teachers

Introduction

Cybersecurity is critical to the national security and economic prosperity of the U.S. By many accounts, there is a severe shortage of trained cybersecurity professionals to meet the current demand in industry, academia, and government. Cyberseek.org currently estimates the shortage at 285,000. Other studies provide estimates that range far higher. These estimates also assume a minimum of a 2 year degree in cybersecurity, a four year technical degree with a cybersecurity focus, and/or cybersecurity certifications such as CISSP, Certified Ethical Hacker, and Security+ to name a few.

Colleges, universities, and other post-secondary education can't solve the problem alone. They are already serving as many applicants as they can and the need for additional faculty at these levels is now becoming a demand. There are programs in place to grow the post-secondary education capacity. Yet even these measure are not projected to meet the growing demands of employers. As this new capability comes online, it is not clear there will be enough interested and qualified students to make effective use of it, thus creating a likely shortage of qualified students applying to participate in cybersecurity programs at the post-secondary level.

We have both an absolute shortage of students applying, and few of those applying are as prepared as they could be if there were but minimal involvement from primary and secondary educators. We need more students interested in, and prepared to pursue, post-secondary education in cybersecurity. This can only be accomplished by their teachers introducing them to cybersecurity concepts prior to post-secondary school.

To address this shortage will require primary and secondary school teachers to be more knowledgeable about cybersecurity and career opportunities in cybersecurity. We propose a multi-pronged approach:

1. Increase the cybersecurity resources available to teachers during their college experience as well as part of their continuing professional development.

2. Provide incentives for teachers to gain cybersecurity expertise and share it with their colleagues and students.

Increased Cybersecurity Teaching Resources

Teacher education programs need access to better materials and subject matter experts in order to provide new and existing teachers with the cybersecurity knowledge they need. We believe that a grant program which brings Education departments together with Computer Science/Computer Engineering departments for the purposes of creating and sharing materials for new and existing teachers is needed. Further these same teams should be encouraged to develop materials the teachers can use (and other existing teachers can use) in their primary and secondary school classrooms.

Quality and effective cybersecurity teaching resources developed with these grants should be made available to all primary and secondary educators via a mechanism such as a digital library. Keys to a successful digital library include: being easily accessible, a broad collection of quality and effective materials, robust search capabilities, and continual maintenance of materials and the library itself. While such a digital library should not be run by the federal government, the creation and maintenance of such a library could be seeded with an investment from the federal government.

Further, since the most effective learning often takes place through hand-on experiences, many schools with only rudimentary computer support would benefit from access to a remote virtual training environment or laboratory. While such a training environment should not be run by the federal government, the creation and maintenance could be seeded with an investment from the federal government.

Simply educating new teachers while they are in college is not sufficient. First, this would only reach new teachers and thus greatly limit the growth of informed teachers. Second, the rate of change in cyber security requires refreshing teachers after a few years. Thus, much of the cybersecurity material developed above must also be suitable for use in professional development environments in which existing teachers regularly participate outside of the university or college. Therefore, we recommend the above grant program include grants to create and maintain certificate and badging programs consistent with state guidelines for continuing teacher education and licensing.

Teacher Incentives

The demands upon primary and secondary school teachers is already extraordinary. Simply adding to their to-do list with additional tasks or giving them additional cybersecurity choices will not be enough to achieve the level of engagement that is required. Incentives aimed at individual teachers will be needed. Such incentives should reward both cybersecurity learning as well as passing on that learning to colleagues and students. Possible incentives may include:

- Subsidizing student tuition for cybersecurity-related courses in an Education program in order to make such electives more attractive
- Expanding the Scholarship for Service program to include teachers graduating with a cybersecurity certificate
- Creating free or low-cost cybersecurity-related professional development opportunities for existing teachers

- Forgiving portions of student loans for teachers that achieve cybersecurity-related achievements (e.g., coach winning Cyber Patriot team; earn cybersecurity-related certifications; winning competitive award for cybersecurity-related activities; running successful, cybersecurity-related professional development event in their school)
- Providing tax incentives for companies that offer paid summer positions, like internships, in cybersecurity-related jobs designed for teachers, to give them both deeper cybersecurity knowledge and, more importantly, information on careers in cybersecurity to share with their students.
- Encouraging federal government agencies and departments to offer paid summer positions, like internships, in cybersecurity-related jobs designed for teachers, to give them both deeper cybersecurity knowledge and, more importantly, information on careers in cybersecurity to share with their students.

Conclusion

We face a critical shortage of trained cybersecurity professionals. This shortage is affecting both government and the private sector. The demand for these professionals is growing much faster than the nation's capacity to train new professionals. To date, our efforts to address the problem have focused upon post-secondary and workplace training. These programs will run short of qualified entrants if we don't include primary and secondary school in the solution and that begins with developing a cadre of informed teachers in those schools. The federal government must invest its resources in this community.

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