

Proposed Cybersecurity Merit Badge for the Boy Scouts of America

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Badges in STEM Education

Badges are a part of a larger trend in “gamification” in a wide variety of fields, including education. Below is a sample of recent research on badges in education.

Educational badges have the potential to **increase interest** in a subject as well as **decrease negative motivations** (i.e. not wanting to look bad compared to other students), particularly for low-performing students [1]. However, these **effects can vary** based on multiple factors, and there is a complex interplay between **type of badges**, **skill levels of learners**, and different motivation outcomes.

Badges **can’t by themselves create value**, but they can **deepen engagement and interest** in something that already has intrinsic value. This is **most effective in the right social context**, where the social capital embodied by the badges is the reward that drives motivation [6].



Photo credit: Michael H. Dunn

Scouting is a prime example of just such a context. In fact, the **merit badge program** of the Boy Scouts of America (BSA) is held up by experts as a model of the positive impact badges can have [2, 6].

Scouts who complete science-based merit badges **retain content knowledge**, they report doing better in school, and many who go on to **science careers** credit Scouting with helping them get there [10, 11].

One university that conducted computing workshops for Boy Scouts, based on the Computer merit badge, found **increased positive attitudes** about computers across multiple dimensions [14].

Girl Scout STEM programs have also been incredibly successful, increasing girls’ **positive attitudes and interest** in STEM subjects and careers [8, 9]. **Earning badges** was one of the most widely-reported **positive experiences** in a survey of Girl Scout alumnae, as were **learning new skills** and **trying new things** (also things like fun, friendship, crafting, and camping) [7].

The **Girl Scouts of the USA** has recently announced that they will be introducing a series of age-appropriate **cybersecurity badges** to their programs, projected to start in the fall of 2018 [15].



Image credit: Girl Scouts of the USA, www.girlscouts.org




Image credit: Boy Scouts of America, scoutingwire.org/bsa-brand-center/scouting-logos/

Boy Scouts of America

The Boy Scouts of America (BSA) is **one of the largest youth organizations** in the United States, serving over 2.3 million current members, including over **800,000 boys aged 11 to 17** in their core Boy Scout program [3]. The BSA engages youth in **experiential learning**, emphasizing character, citizenship, outdoorsmanship, leadership, and life skills. Participants are exposed to a variety of hobbies, outdoor activities, technologies, and careers, along the way earning ranks, merit badges, and other awards, including the highest and most prestigious Boy Scout rank, Eagle Scout. Recent program expansions have focused heavily on **STEM activities and careers**. Related badges include **Digital Technology** (formerly Computers), **Programming**, and **Robotics** merit badges, and the **Cyber Chip**, a renewable badge on personal online safety.

Suggested Requirements

Below is a selection of suggested requirements to earn the badge sent to the BSA. Final requirements will be determined by a committee of BSA volunteers and cyber-security subject matter experts.



Knowledge. DEFINE/DESCRIBE THE FOLLOWING TERMS OR CONCEPTS:

Vulnerability	Exploit	C.I.A. triad	Authentication
Authorization	Virus	Worm	Trojan Horse
Ransomware	Botnet	Online scams	Encryption
PKI	Firewall	Antivirus	IDS/IPS
Multi-factor authentication	Mobile device security	Internet of Things	Critical Infrastructure

Ethics.

- Discuss what to do if you **discover a vulnerability** in your school’s computers or network, a public website, or a software product.

System Security. DO SIX OF THE FOLLOWING (INCLUDING BOTH MARKED WITH *):

- *Check for, download, and install the latest **updates** for your computer. Verify your computer is up-to-date.
- *Run a **virus scanner** on your computer. Review the results.
- Set or change an account **password** to one that is “strong.”
- Add a new, non-administrator user account and check that **permissions** are set correctly. Disable the guest account.
- Use two different methods to see what **programs or processes are running** on your computer.
- Use a command line interface to view your computer’s **open network connections**.
- Check the status of your computer’s **firewall**. Show how to turn it on if it isn’t already.
 - Identify one or more other **vulnerabilities** on your home computer or network, and take the necessary actions to **fix it**.

Network Security. DO TWO OF THE FOLLOWING:

- If your home has a **WiFi router**, verify that it has the highest available **security settings**. Set a **strong password**.
- Run a network **port scan** on your computer. Discuss what programs could be using the open ports and whether they are needed on your computer.
- Show the **available WiFi networks** nearby, and how to tell which ones are running with encryption. Show **how to connect** to a known, trusted network that uses a passphrase.

Cryptography. DO ONE OF THE FOLLOWING:

- Create an **encrypted** ZIP file.
- Create and share your own **PGP email key**. Get someone else’s public key and send them an email that has been digitally **encrypted**.
- Use a **hashing** algorithm to create a **checksum** for a file. Have someone change the file. Recreate the checksum, and compare it to the original value.

Careers. DO TWO OF THE FOLLOWING:

- Investigate **three careers** that involve cybersecurity. Pick one and find out what **education, training, and experience** are required for this profession. **Visit a business** or organization that does work in cybersecurity. Find out about different **work roles** and what they do.
- Discuss the role of **certifications** in cybersecurity. Find out about two of them.

Current Status of Effort

- Assembled team of experts from industry, academia, and education to **draft proposal** and initial set of **recommended requirements**
- Co-sponsored by the **Center for Cyber Safety and Education**, the **ISSA Education Foundation**, and **(ISC)²**



Image credits: Center for Cyber Safety and Education, iamcybersafe.org



ISSA Education Foundation, issaef.org



(ISC)², www.isc2.org

- Full proposal sent to BSA** national office on January 25, 2018
- Proposal **reviewed by committee** of BSA volunteers and program experts; initial decision by BSA expected in about **4-6 months**
- BSA just completed recent merit badge surge, expecting delay before any new badges are approved/introduced
- Full development of a new merit badge can take **up to 2 years** once approved
- Pilot program** event in Columbus, Ohio, demonstrated great potential: out of 31 participants, **94% reported they learned new things**, and **87% said they would likely attempt to earn the badge** if it were offered

Next Steps

- Gather support** from cybersecurity leaders and influencers within the BSA
- Follow-up** with BSA national staff, give presentation to committee if invited
- Solicit **corporate sponsorship** to defray costs of development, deployment



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Download the full proposal, plus a copy of this poster and full reference list, from mdunn.net/cybersecuritymeritbadge