Yubikeys as an Instrument for Security Education: Combating Apathy and the Lack of Computer Security Curricula in High Schools
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1. Internet + Phishing = ?
  - Lose your cash!
  - Lose your house!
  - Lose your business!
  - Lose your election!
  - Lose your Instagram?

2. Grim Statistics on Phishing
  - 76% of businesses victimized (2017, Wombat Security)
  - 95% of enterprise attacks due to spear phishing (SANS)
  - 2018 Verizon Data Breach Investigations Report (DBIR)
    - "Companies are nearly three times more likely to get breached by social attacks than via actual vulnerabilities, emphasizing the need for ongoing cybersecurity education"
  - 81% of breaches leveraged stolen and/or weak passwords (2017 Verizon DBIR)
    - "The common vein is the ability to use a single password to access thousands if not millions of user data"

3. One reason? Passwords
   - Hard to remember, hard to guess
   - Easy to remember, easy to guess

4. Reuse is Rampant
   - Top 10 passwords:
     1. 123456
     2. password
     3. 123456789
     4. 12345678
     5. 12345
     6. 111111
     7. 1234567890
     8. sunshine
     9. qwerty
     10. iloveyou

5. Broken Passwords Beget Broken Passwords
   - Dropbox employee’s password reuse led to theft of 60+ user credentials
   - 81% of breaches leveraged stolen and/or weak passwords (2017 Verizon DBIR)

6. 2-Factor Authentication (2FA) to the Rescue?
   - 2FA Might Be Secure, But It’s Not Useful: A Summative Usability Assessment of Google’s Two-Factor Authentication (2FA) Methods
   - For the privileged: Users must be able to afford a smart-phone
   - Hard to learn: Each site has its own version of 2FA for users to learn
   - Hard to use: Multiple applications must be accessed to use
   - And now….vulnerable to attack
   - Amnesty International reveals how 2FA is bypassed automatically

7. Security with Usability for only $20!
   - 2018 Top 10 passwords
   - Motivate the need for Yubikeys/U2F
   - Give participants Yubikeys
   - Have students use Google’s 2FA wizard to register key
   - Swap laptops and login using the registered key
   - Why Google accounts?
     - 93% of users prefer single sign-on via social login
     - Younger generation adopting social login quickly with 97.9% preferring Facebook and Google for it.

8. Yubikeys, WebAuthn, U2F to the Rescue?
   - 2FA Issues
   - US Computer Science Education: “The beauty of WebAuthn is that it eliminates the need for users to constantly type in their passwords, which negates the threat from common password-stealing methods like phishing and man-in-the-middle attacks.”

9. Deploy in CyberPDX
   - "CyberPDX: A Camp for Broadening Participation in Cybersecurity" (USENIX Security ASE 2017)
   - Career impacts
     - Interest in cybersecurity
     - Choice of courses in high school
     - Attending college
     - Choice of undergraduate major
     - Career choice
   - Security impacts
     - Percentage still using Yubikeys
     - Percentage successfully phished

10. A Yubikey curriculum
   - Career impacts
     - Greatly increased
     - Somewhat increased
     - No change
     - Somewhat decreased
     - Greatly decreased

11. Track Outcomes to Determine Impact
   - "I didn’t think I was good enough to pursue computer science, but…why wouldn’t I be good enough?...I think we’re all pretty confident because we see that it’s very simple to learn as long as you have patience in yourself and are not afraid to ask questions.”
   - Promising Practices for Engaging Adolescent Girls in Cybersecurity Education

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