TEACHING AUTHENTICATION IN HIGH SCHOOLS: CHALLENGES AND LESSONS LEARNED

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COMPUTER SECURITY CURRICULUM FOR SWISS HIGH SCHOOLS

- Asked to create prototype curriculum materials to integrate computer security content into Swiss high schools
- Initial focus on user authentication

DESIGN GOALS

1. Address gaps in adult knowledge and support lifelong security habits
2. Balance practical guidelines with theoretical underpinnings
3. Create materials appropriate for age and educational background
4. Emphasize student-led activities to avoid dependence on teachers

USER AUTHENTICATION CURRICULUM

- Five activities (available for download on the workshop website)
  - 30-45 min per activity
  - Groups of 2-4 students
- Round robin structure
- Emphasis on independence, interactivity, and hands-on activities
- Pilot-tested in four Zürich-area *gymnasien* (high schools)

1) CREATING GOOD PASSWORDS

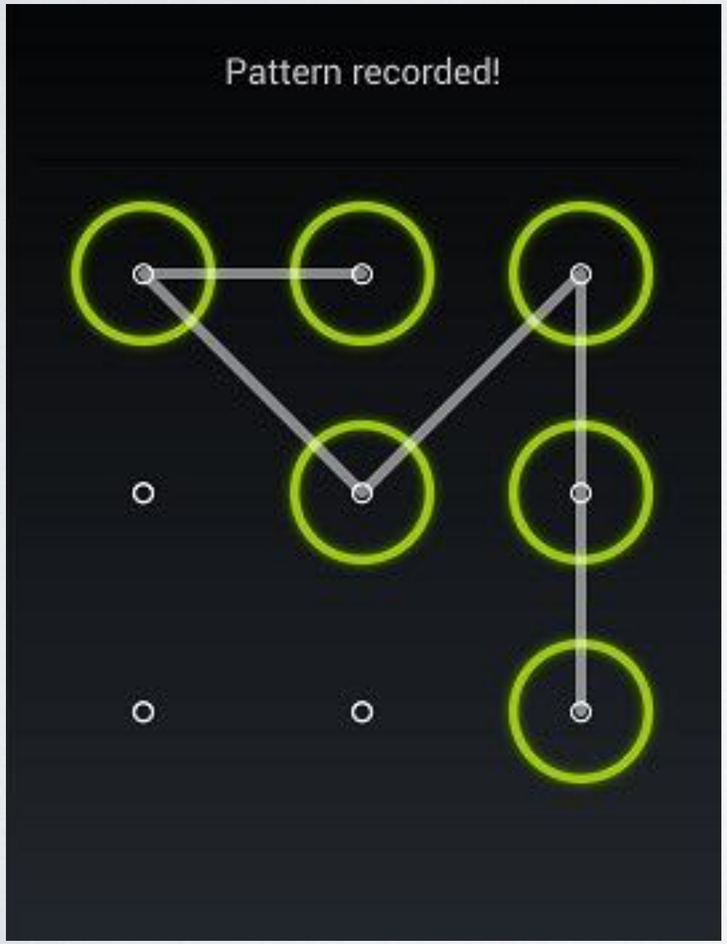
- What makes a good password?
- Students created passwords with different features to relate password structure and format to guessing time (as a measure of password strength)
- Goal was to connect password features with guessability

2) CRACKING PASSWORDS

- Students were given a list of hashed bank PINs and asked to guess the plaintext passwords
- Goal was to have students consider ways in which passwords could be guessed (brute force, dictionary attacks) and how to create guess-resistant passwords

Password	PIN
ABAC	
ADED	
BBAB	
BCCF	
BEBC	
CAAB	
CBBD	
CBDC	
CBFA	
CCFD	

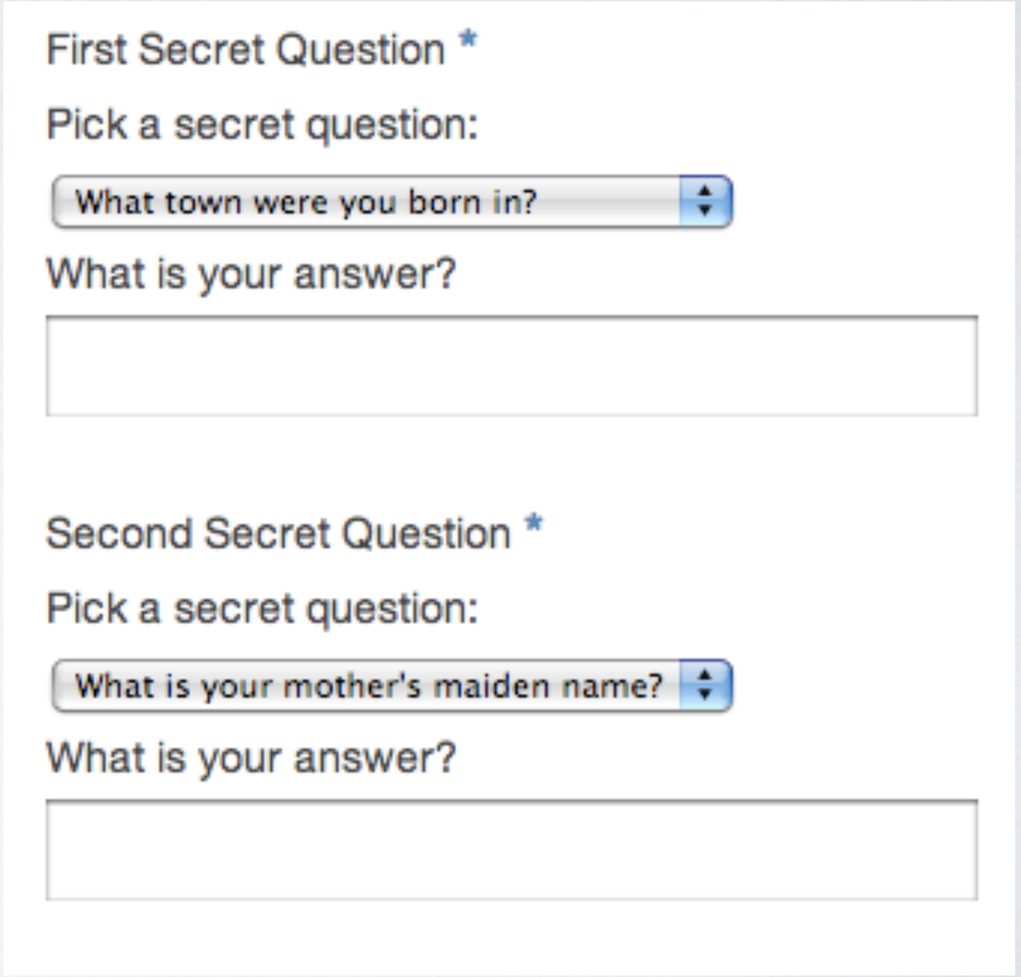
3) GRAPHICAL PASSWORDS



- Students created and recalled different types of graphical passwords
- Goal was to have students consider how the threat model changes in different systems
- Discussed shoulder surfing and assigning passwords

4) PERSONAL KNOWLEDGE QUESTIONS

- Students researched the answers to fake personal knowledge questions about celebrities
- Questions were designed to highlight typical problems with personal knowledge questions
- Students asked to relate these attacks to their own responses



5) BIOMETRICS

- Students used modelling silicone to create detailed models of their fingerprint, and used those models (dipped in graphite powder) to unlock their phone
- We used the fingerprint models to discuss issues relating to biometric authentication, including credential theft, revocation, and privacy

CHALLENGES OF TEACHING SECURITY

THE BLEEDING EDGE

- Technology is always changing!
- Presence of the adversary makes security unlikely ever to be a static topic
- How can we create extensible lessons that encourage students to apply concepts in the broader context?

WHEN TO TEACH SECURITY?

- Too early, or too late?
- Youth progress quickly from mediated online interactions to online independence
- Appropriate timing is influenced by changing technology, as well as environmental and socioeconomic factors

PRACTICAL VS. THEORETICAL

- How much technical background is needed to explain the practical takeaways of security education?
- Too much information overwhelms students, but too little leads them to form poor mental models

GIVING CLEAR ADVICE

- Creating straightforward security advice is difficult
  - Not all advice applies to all situations
- How can we effectively teach risk assessment for computer security?

TOO EASY … OR TOO HARD

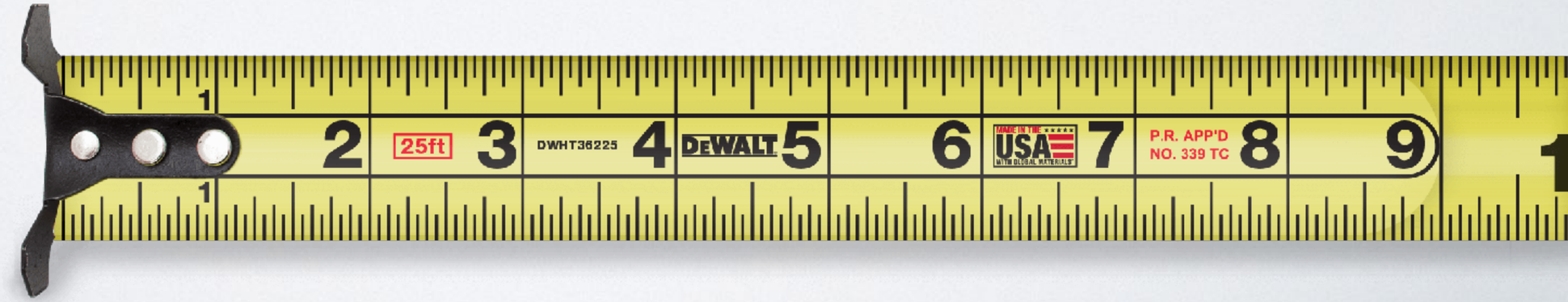
- Students lose engagement when the material is too simple or too complicated
- Finding an engaging balance between novelty, age- and grade-appropriateness is tricky

WHO SHOULD TEACH SECURITY?

- Teachers are (generally) not security experts, and it is unfair to ask them to be
- Security education materials need to be accompanied by a knowledgeable facilitator, or completely independent

MEASURING SUCCESS

- The goal of our authentication activities was to help users be more secure over their lifetimes
- How can we reliably measure the success of educational programs?



SECURITY ≅ COMPUTER SCIENCE

SEX EDUCATION ≅ BIOLOGY

HOW ARE THEY SIMILAR?

- Both relate to academic topics, but are not the primary application
- Both are attractive activities
- Both offer risk and reward
- Both carry probabilistic risks
- Age-relevant

A NEW APPROACH TO TEACHING SECURITY

- How can the approaches taken in sex education programs inform how we design security education programs?

THANK YOU

- Activities and worksheets available on the ASE '17 website
- Please contact me if you have questions, or to tell us about your experiences with these materials

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