valuing security by getting
[d0x3d!]

experiences with a network security board game

mark gondree
naval postgraduate school

zachary n j peterson
cal poly, san luis obispo
cybersecurity education

students not pursuing (or offered) CS in high school or college

of those that do, don’t pursue security

and, aren’t very diverse

67/1275 (5%) of CS PhDs pursued security
but, why?

causes are generally unknown

increasingly structured curricula

realities, perceptions & stigmas
a non-digital, computer security board game
to address the shortage of cybersecurity and other STEM professionals
used to easily incorporate security into any curriculum
[d0x3d!] is: accessible, collaborative, fun
bad guys have stolen your data, and hidden them in their network

you and your teammates take on the role of an elite hacking syndicate
each player assumes a [hacker] role
Their mission is to infiltrate the network, and as a team, recapture four digital assets:
- Authentication credentials
- Financial data
- Personally identifiable information
- Intellectual property
[game play]
on their turn, a player:

- **action** takes up to three actions
- **loot** draws two **loOt!** cards
- **patch** draws **patch!** cards
wireless router
primary DNS server
internet gateway
firewall
web server
client
secondary DNS server
client
SMTP server
VoIP server
single sign-on service
backup file server
NAT device
VLAN switch
wireless router
primary DNS server
internet gateway
firewall
web server
client
secondary DNS server
SMTP server
VoIP server
single sign-on service
backup file server
NAT device
VLAN switch
The image depicts a network diagram with various network components and devices. The central card reads "loot." The diagram includes cards for a wireless router, primary DNS server, internet gateway, web server, client, secondary DNS server, SMTP server, VoIP server, single sign-on service, backup file server, NAT device, and VLAN switch. The network diagram illustrates the connectivity and flow between these devices.
now it's the insider's turn
wireless router
primary DNS server
internet gateway
client
SMTP server
VoIP server
secondary DNS server
single sign-on service
backup file server
NAT device
VLAN switch
[patch]

[the insider]

{zero-day exploit} integer overflow
compromise any server

wireless router
primary DNS server
internet gateway

client
SMTP server
VoIP server

secondary DNS server
single sign-on service
backup file server
NAT device
VLAN switch
[goals]

intended for a young, non-CS audience

introduce security terminology & raise awareness

stimulate adversarial and analytical thinking

provide opportunities for discussion

be fun, informal and accessible
[design & development]

inspired by Forbidden Island

coop erative play

dynamic game board

meaningful mechanics, iconography & terminology

language neutral
digital assets are arbitrary, overly general

network is simplistic and misrepresents adjacency

we have used these limitations as opportunities for post-game discussions & curriculum modules
[observations]
cyberadventurers
[observations]
[observations]

what value did you take from the game?  
- Mildly interesting, 10
- Significantly interesting, 19

do you recommend we use the game next year?  
- Yes, 97%
- No, 3%
are games *experiments* or *lessons*?

Common Rule Exemption exists, but are games “normal educational practices?” Are after-school programs a “commonly accepted educational setting?”

**assessing activities at primary & secondary schools**

may require: institutional agreement, background checks, parent approval of materials

**assessing games involving the use of minors & military**

minors have special status and require consent; are college IRBs qualified to determine harm? Military students are also a vulnerable population, complicating participation
[status]
released open-source: download, print and remix
promotional & instructional videos
three follow-on exercises and curriculum modules
opportunities for a variety of student research

www.d0x3d.com
Source materials for [d0x3d!], a network security game.
Finally, my printed-at-home @dox3d set is ready for play. :-) pic.twitter.com/wdVW5hhO
[future work]

[d0x3d!] v2.0: new hacker roles, abilities, game board building assessment tools

online card creator

workshop
[th4nks!]