

Teaching and Learning Cybersecurity and AI Ethics in High School

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Z. Kilhoffer, et al., "How technical do you get? I'm an English teacher": Teaching and Learning Cybersecurity and AI Ethics in High School, in 2023 IEEE Symposium on Security and Privacy, 2023 pp. 536-553.

INTRODUCTION

AI and cybersecurity tech is fraught with ethical challenges. Teaching K-12 students cybersecurity and AI ethics ensures ethical development and use of tomorrow's tech.

We sought to understand how cybersecurity and AI ethics are currently taught in US high schools, and ought to be taught.

- **RQ1:** What topics do high school classes cover relating to cybersecurity and AI ethics?
- **RQ2:** What are the teaching strategies and resources used to cover these topics for high schoolers?
- **RQ3:** What challenges remain for teaching these topics to high schoolers?

AI and cybersecurity ethics?

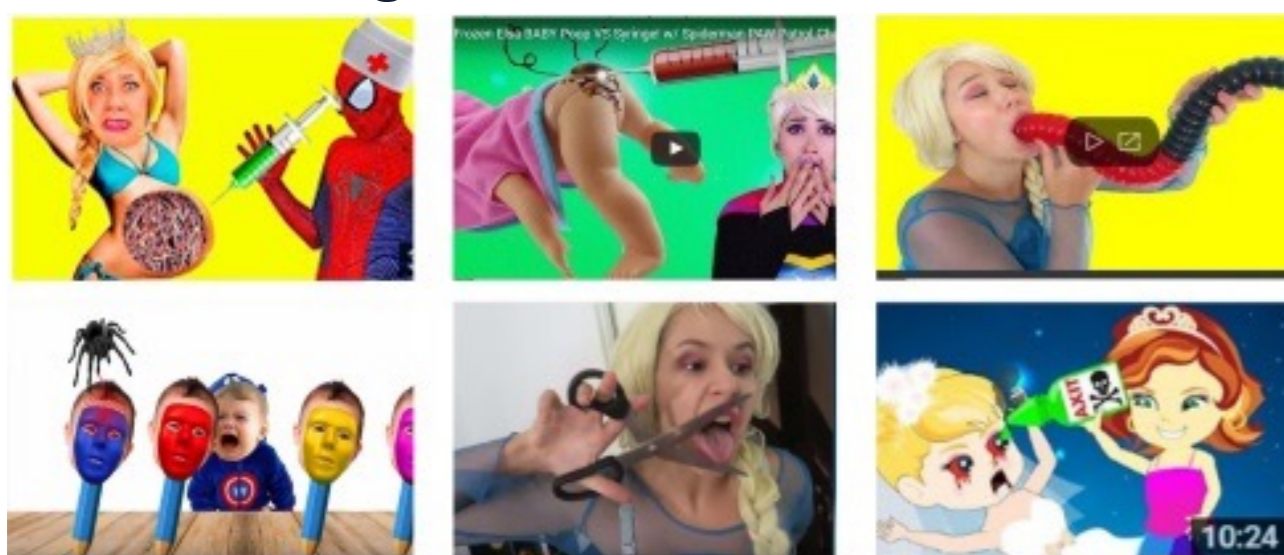
AI ethics often concern fairness, bias, transparency, privacy, and autonomy.

- **Ex:** Our YouTube Lab teaches how recommender systems, a type of AI, can show children inappropriate content from benign search queries.

Cybersecurity ethics often concern privacy, surveillance, hacking and hacktivism, and cyberwarfare.

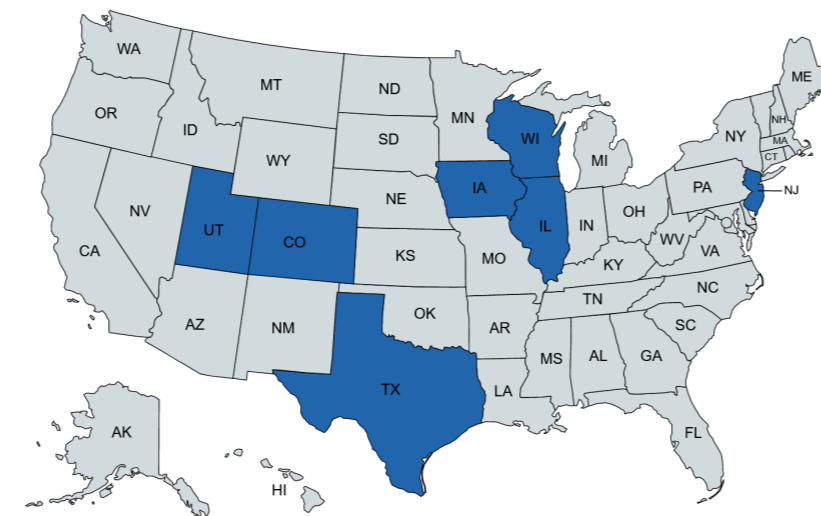
- **Ex:** Our Video Games Lab covers China's law restricting minors from gaming. Facial recognition aids enforcement.

Below: "Elsagate" screenshots



METHOD

- Semi-structured interviews
- 16 US high school teachers from 5 states
- 11 High school students from 4 states



RESULTS (RQ1 – topics taught)

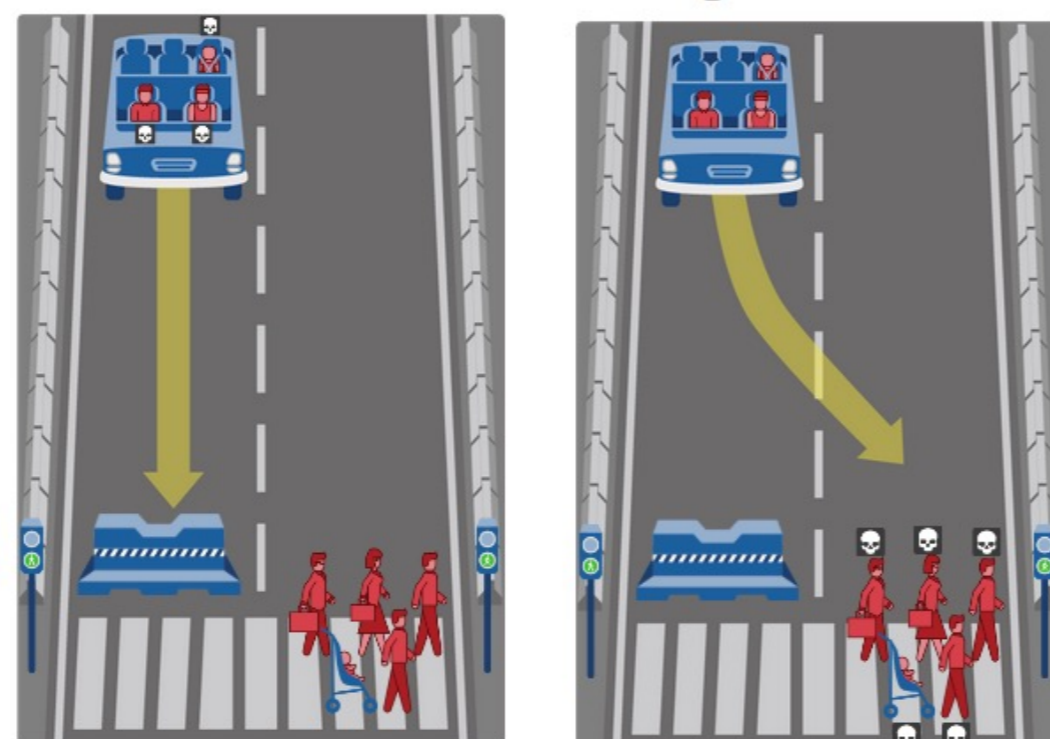
- AI/CS ethics often taught in non-technical classes (social studies, ELA)

Main topics covered

- Epistemic norms
- Privacy
- Digital citizenship
- Emerging technologies
- Ethical hacking
- Cybersecurity and the state
- Cyber hygiene

Self-driving cars frequently sparked discussion. Below, MIT's Moral Machine lets students be ethical agents.

What should the self-driving car do?



RESULTS (RQ2 teaching methods)

- Discussions
- Technical (with coding)
- Technical (without coding)
- Gamified approach
- Content creator approach
- Hands-off approach

I showed them Minority Report and I said 'Yeah, that seems extremely futuristic. But here's real predictive policing'. (Teacher 9)



RESULTS (RQ3 - challenges)

- Generational differences
- Student attitudes
- Parents and politics
- Curricula
- COVID-19 fallout
- Lack of qualified personnel
- Accessibility and inclusion

It's hard to take [teachers] seriously. [...] they just don't know the kinds of nuances about Snapchat safety, Discord safety, and Instagram problems. (Student 1)



Many teachers spoke of their students' apathy about issues like Russian election interference and surveillance.

CONCLUSIONS

- Teachers in multiple disciplines teach cybersecurity and AI ethics.
- Teachers leverage many strategies for cybersecurity and AI ethics education, and encounter diverse challenges.
- We need more and better quality cybersecurity/AI ethics instruction.

RECOMMENDATIONS

- Experts should develop more nifty tools
- Overhaul cyber hygiene
- Do it in any context
- Make a personal connection
- Show don't tell
- Consider technology-agnostic course material
- Work within their attention spans

ONGOING WORK

- **FNIRS study** - We use brain imaging to detect empathy changes in teens shown (un)ethical situations.
- **Labs** - 5 hands-on labs developed and distributed.

ACKNOWLEDGEMENTS

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