The Computational Action Process

The computational action process is:

- A curriculum and toolkit for middle and high school students
- Instead of “just coding,” students identify a meaningful problem they want to solve using A.I.
- Students aim to create socially responsible A.I. with lasting impact

Introduction

Students used the Computational Action toolkit to design socially responsible technology:

- Designing solutions based on an impact matrix to consider positives and negatives, as well as by sketching, wireframing, and testing
- Engaging in critical reflection scaffolded by the materials to make A.I. technologies less abstract and connecting students more deeply with their own goals

Impact Matrix

The impact matrix was developed as a tool to help students reason about the impact of technology solutions (both positive and negative) and understand ethical A.I.

In the present study, students observed example impact matrices for several contemporary technology issues involving A.I., such as social robots and screen monitoring for at-home schooling.

Quantitative Results

Paired Pre/Post: Quantitative data show no significant change in answers to questions “I want to include artificial intelligence (A.I.) in technology projects I create.” and “I am concerned about the use of artificial intelligence (A.I.) in technology.”

Unpaired Pre:

- From the pre-study survey, participants who identified as female agreed more strongly with having concerns about A.I. (Q15) than participants who identified as male (Female/Male: x̄=3.172,2.667; p=0.046; t(100)=2.02).
- Students from Lebanon more strongly agreed with having concerns about A.I. than students from the U.S. (US/Lebanon: x̄=2.73,3.6; p=0.039; U(69)=178.5)

Qualitative Results

Pre-workshop responses to “What does socially responsible technology in society mean to you?”

Themes:

- Promoting specific social benefits (10%)
- Promoting non-specific social benefits (41%)
- Preventing specific social harms (15%)
- Preventing non-specific social harms (7%)
- Using ethical considerations (10%)
- Don’t know (17%)

Post-workshop responses to “After this class, what does socially responsible technology now mean to you?”

Themes:

- Promoting specific social benefits (0%)
- Promoting non-specific social benefits (34%)
- Preventing specific social harms (9%)
- Preventing non-specific social harms (0%)
- Using ethical considerations (31%)
- Don’t know (25%)

The results of coded qualitative data in pre- and post-questionnaires show changes in how students approached the question: “What does socially responsible A.I. technology mean to you?” Before the intervention, many students (25%) described specific issues associated with specific technologies (cyberbullying, privacy, or environmental remedies) and wrote from the perspective of a technology user.

Post-intervention responses show that a larger number of respondents (31% vs. 10% of pre-responses) answered in terms of ethical and impact-based, user-centric considerations that could account for the benefits and harms of any A.I. or technology solution. (“With good impacts to your community, there can always be bad. That is why I have to be careful about what I do to impact my community in a good way” and “I think about the process.”)

Student reflections became more process-oriented; students began to see ethical and social considerations beyond single consumer applications and view themselves as evaluating technologies as designers and creators.

TEACHING MATERIALS AND TOOLKIT AVAILABLE AT: bit.ly/3JLz2tn