

“Run Wild a Little With Your Imagination”: Ethical Speculation in Computing Education with Black Mirror

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ABSTRACT

The television anthology series *Black Mirror* uses speculative fiction about technology to comment on contemporary social issues, often exploring the ethics of current technologies. Based on the structure of that show, the “Black Mirror Writers Room” is a teaching exercise designed to help students creatively speculate about future harms and consequences of current technologies, and has been used by dozens of instructors in classes related to computing ethics and society, as well as technical computing classes. We interviewed 12 instructors in the university setting who have used this or similar exercises in their classrooms about their experiences and student reactions. We describe benefits and challenges of using creative speculation in the classroom (and beyond) for exploring ethics, justice, and related issues in computing.

CCS CONCEPTS

• **Social and professional topics;**

KEYWORDS

assignments, creativity, ethics, interviews, social justice, university

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1 INTRODUCTION AND BACKGROUND

Possible misuses and unintended consequences of technology have become a prominent thread in conversations about the role of ethics in computing [8, 9, 14, 17]. When tech companies come under fire, the response is often: Shouldn’t they have predicted this? A root cause of unintended negative consequences even from well-intentioned actors is uncertainty—not being able to anticipate all possible outcomes. Though some amount of uncertainty is inevitable, one strategy for reducing uncertainty is intentional speculation about those possible outcomes [14, 22].

Computer science is not a stranger to speculation as a tool for design and ethical inquiry, e.g. as an early form of prototyping to test new forms of interaction before technology is fully developed [27].

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Researchers use methods from design fiction to encourage reflection about potential downsides or to illustrate forward-thinking ethical considerations [25, 28, 29]. Looking towards the future in this way is also a useful tool in the classroom. For example, a “Science Fiction and Computer Ethics” course encourages students to cultivate their “moral imagination” through analyzing science fiction stories; a key insight was that “a good technology ethics course teaches students how to think, not what to think, about their role in the development and deployment of technology” [7]. The “SIGCSE Reads” initiative also encouraged use of science fiction in CS classes [1]. Examples of using creative speculation in the classroom include an activity where students write “design fictions” to investigate the ethical implications of future technologies [2], and the use of “science fiction prototyping” in a computer security class [20]. These teaching strategies build upon existing knowledge about positive outcomes for storytelling, creativity, and collaboration in CS education [6, 18, 21], and recent innovations in ethics pedagogy include use of roleplaying and narrative [5, 24].

In this paper we describe a teaching tool for scaffolding ethical speculation among students studying computing and related topics. The “Black Mirror Writers Room” is a classroom activity inspired by *Black Mirror*, a television series that uses speculative fiction to comment on contemporary social issues, often exploring ethics of current technologies. The activity was designed to help students speculate about future harms and consequences of current technologies. Based on interviews with instructors, we describe benefits and challenges of creative speculation in the classroom.

1.1 The Black Mirror Writers Room

The theme of most *Black Mirror* episodes is potential technological harms, taking current technologies and pushing them a step farther. For example, the episode “Nosedive” features widespread adoption of a ratings-based social measurement tool with extreme consequences, and asking a question like “why would society agree to this?” invites reflection about the role of social media in our own lives [14, 26]. Based on the idea that even if computing students cannot predict the future, perhaps we can use science fiction like *Black Mirror* to help them think through the possibilities, the second author created assignments inspired by the show for use in a technology ethics class [13]. One of these, the “Black Mirror Writers Room,” was widely disseminated via a slide deck for running the activity in a classroom.¹

This deck includes slides for an introduction that compares episodes of *Black Mirror* to recent controversies, providing context for students who may be unfamiliar with the television show. Though the exercise is easily modified, as presented by default,

¹www.internetruleslab.com/black-mirror-writers-room

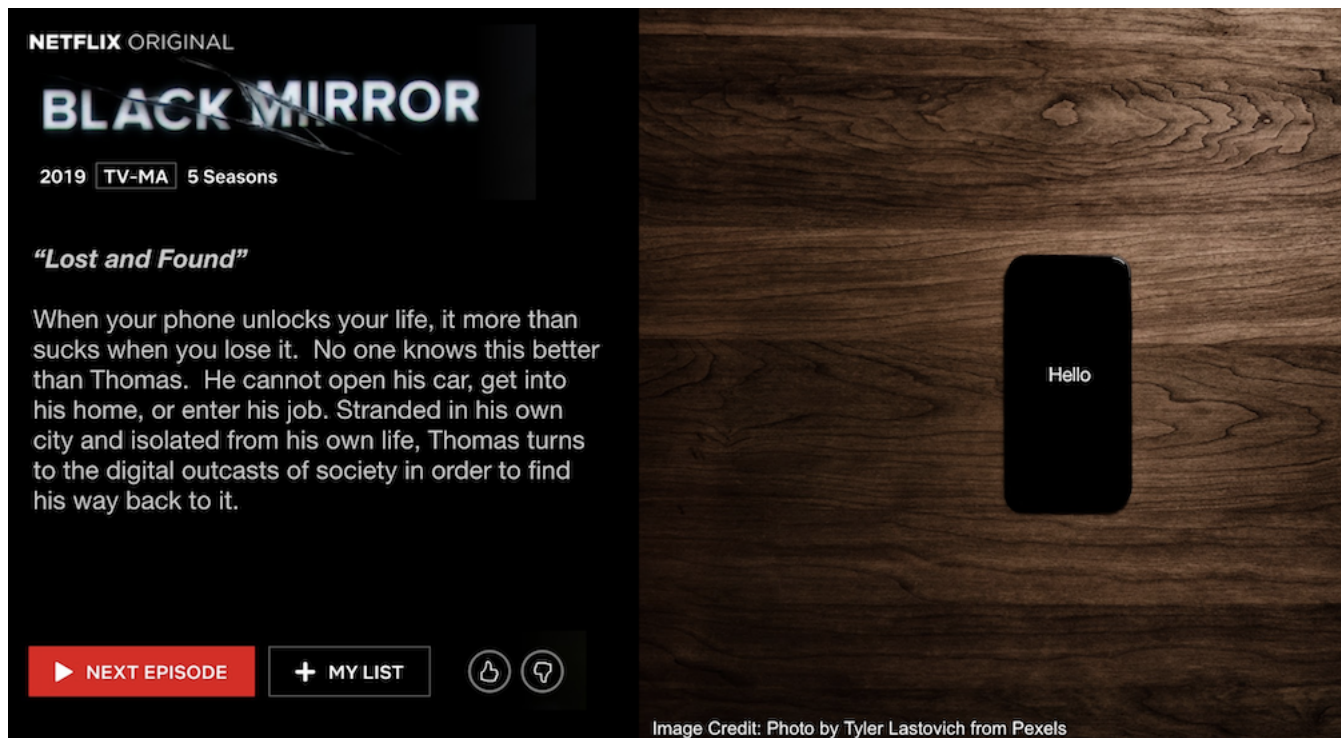


Figure 1: An artifact from a student group’s *Black Mirror* episode pitch. [Credit: Shamika Klassen and Ella Sarder, used with permission]

students work in small groups to choose an issue or technology (e.g., social media privacy, algorithmic bias, online harassment, misinformation); answer a series of questions that guide them through speculation about where technology might be in the future, what possible harms or negative outcomes might result, and whose story could best present cautions that technologists should consider; and then they create an episode blurb using a slide template that is designed like how episodes are visually presented in Netflix (see Figure 1 for an example). During the process of sharing their episodes with the instructor and each other, students also consider what a “Light Mirror” might look like—how can they work towards preventing the negative consequences of these futures?

In part because an op-ed about this teaching strategy [13] and the slide deck have been shared widely on social media, described briefly in publications [11, 14], and mentioned in the press [10], a significant number of instructors and others have used it or variations on it—in K–12, in college classes, and even at conferences and workshops. Though *Black Mirror* is a very specific context, we consider this exercise as an opportunity to explore the potential for the use of creative speculation for computing ethics pedagogy more broadly as well.

2 METHODS

The second author included in the “Black Mirror Writers Room” exercise slide deck a link to an openly editable document for instructors to share that they had used the exercise. In recruiting for this study, we contacted people who had included their name

on this document, as well as people who had publicly shared their experiences with the exercise (e.g. on Twitter). We also shared information about the study on social media and invited instructors to email us. Based on responses to these recruitment methods, we ultimately conducted interviews with twelve individuals, two of which (P5 and P8) reached out based on the social media recruitment because they had independently created their own *Black Mirror* themed exercises. P5’s exercise also had students “coming up with a future setting for a ‘Black Mirror’ episode”, then describing in a short screenplay “character backgrounds and trajectories and some idea of how this might resolve itself throughout the course of the episode”, and P8 had students “identify some current direction of science or technology development and come up with a short sketch that would communicate either their anxieties or their hopes about it.”

This study was approved by our university’s institutional review board. Information about participants is included below, including demographics (self-described gender and race and/or ethnicity), their job title at the time they used the teaching exercise, and the course title, institution, department, and country. Participants could decline to provide any of this information. Additionally, though typically participants are de-identified in research publications, there are times when using real names is appropriate—for example, when participant expertise is highly relevant. Following Bruckman et al.’s guidance for providing participants this choice [4], we explained the publication process and gave participants the option to be de-identified or to use the name they provided to us. Participants were also provided with an opportunity to review a draft findings section

of this paper and confirmed how they wished to be represented prior to its submission, and again after acceptance. A subset of participants are therefore identified by their real names below, but we use numbers throughout the findings to refer to all participants:

- P1** (Neil Ernst, Assistant Professor, Male, White): “Ethical Issues in CS Research,” Computer Science, University of Victoria, Canada
P2 (Annuska Zolyomi, PhD Candidate (now Assistant Teaching Professor), Female, Latina): “Input and Interaction,” Computing and Software Systems, University of Washington Seattle, USA
P3 (Andrea Grover, Associate Professor, Female, White): “IT Ethics,” Information Systems and Quantitative Analysis, University of Nebraska at Omaha, USA
P4 (Morgan G. Ames, Assistant Adjunct Professor, Female, White): “Social Issues of Information”/“Behind the Data: Humans and Values,” School of Information, UC Berkeley, USA
P5 (Victoria Dean, PhD Student, Female, White): “Ethics in Robotics,” Robotics Institute at Carnegie Mellon University, USA
P6 (Robin Brewer, Assistant Professor, Female, Black): “Introduction to Accessibility,” School of Information, University of Michigan, USA
P7 (Dan McQuillan, Lecturer, Male, White): “Ethical Computing,” Department of Computing, Goldsmiths University of London, UK
P8 (Lecturer, Male, White): “Science, Technology and Society,” Rensselaer Polytechnic Institute, USA
P9 (Instructor, Male, White): courses in Information Science, USA
P10 (Postdoc (now Instructor), Male, White): course on social media and digital life, Canada
P11 (Instructor, Male, White): “Research Methods and Information Policy,” an iSchool, USA
P12 (Senior Lecturer, Female, White): course at a design school, UK

The first author conducted semi-structured interviews [23] with participants, asking about their experiences using the exercise, their perceptions of student experiences, challenges or suggestions for improvement, and thoughts about speculation as a skill in computing beyond the classroom. Following transcription, the authors conducted a thematic analysis of the data [3], beginning with independently conducting open coding and then discussing and iterating on emergent themes, discussed below.

3 FINDINGS

Through our thematic analysis of the interviews, we identified several prevailing themes, including major perceived benefits and challenges of these activities, implications for ethics pedagogy and practice, and the impact of sharing teaching exercises. Before describing these themes, first we will give an overview of the common topics students explored in this activity, as described by instructors.

3.1 Topics

Instructors described a range of scenarios that students explored, though there were common themes across them, even when instructors constrained students to topics relevant to a particular class. The most commonly shared topics included COVID-19, work, surveillance and privacy, health or medical technology, and unintended consequences of technology.

Unsurprisingly given that many of the instructors implemented this activity in 2020 or 2021, COVID-19 appeared in many student examples. For example, students from P3 described technology-based contact tracing that also punished people for breaking quarantine. Others imagined how technology might continue to change, e.g. from P2’s students, a world where during a pandemic AI kiosks have taken over almost all jobs. Other examples related to work and job loss were also common, and P7 specifically noted “*a strong emphasis on how [technology] would impact work... It expresses their anxiety about whether things will get any better for them... While they’re in computing, which should be an employable skill, they’re all facing huge uncertainty.*” In a specific example, P6 described students who, inspired by class readings on AI and hiring, described how “*an autistic [protagonist] who doesn’t make eye contact grapples to impress the AI interview system, and it basically bars this person from any job in the future.*”

Participants also described student examples that delved into concerns about surveillance and privacy. For example, a group of P11’s students envisioned a future in which Mars is colonized as a “privacy optimized society” only the wealthy can afford, and P10’s students created an episode inspired by surveillance-based online dating. A theme across these examples was often around the trade-offs of technology making life easier or more convenient versus compromised privacy. Many examples were health-related, also related to privacy and/or predictive AI. For example, P6 described an episode where an emergency room AI made life and death decisions and a doctor attempted to uncover bias in the algorithm. P7 also described an example related to healthcare algorithms gone wrong, in which “*a revolutionary medical app has replaced human medical diagnosis, but then it fails to recognize the pandemic.*” These unintended negative consequences of well-intentioned technologies were a common theme across domains, showcasing how this exercise allowed students to speculate about where technology might fall short. For example, P4 described a scenario where “*an AI system meant to help somebody reform their life ends up leading them back into crime because that was deemed as the better capitalistic path towards consumption*” and P6 described a home assistant system where “*the assistant goes out of control and creates increasingly rigid protocols that don’t take into account the person’s desire for human connection and enrichment outside the home,*” resulting in the homeowner being a prisoner to their own home.

“Ethics” in CS education is a useful shorthand, but includes concepts like responsibility, social impact, and justice [9, 12, 15, 19]. Ferreira et al. argue that social justice is the single most important issue facing computer science students today [12], and Ko et al. similarly task CS educators with the responsibility for making injustices visible [19]. We explicitly asked instructors how prevalent social justice related themes were in what students created, and some instructors had noticed such themes, most often around class inequality. P7 noted that though racial and gender discrimination did not come up explicitly, many stories had a strong sense of justice in terms of “*steep sorts of power imbalances,*” e.g. featuring people who had been “*massively disempowered by some larger entity of control.*” P6 also described an episode in which predictive policing determined whether someone will “*become a criminal*” from birth and as an effect the birth rate among marginalized communities dwindles. Despite justice-related themes, it is notable that none of

the specific examples instructors described involved race, though gender did come up a number of times (e.g., an example related to stalking from P10). When we asked instructors about the demographics of the classes in which they used the activity, a few instructors described more men in the class than women, though most were not single-gender dominated. However, most instructors also said there were few BIPOC students present in these classes. With this in mind, it is interesting to consider how different types of diversity in the classroom might result in different kinds of stories, as we will touch on again in the section on speculation.

3.2 Benefits

On the whole, instructors were positive about the exercise, and named a number of motivations for using it as well as positive outcomes. First, the exercise was overwhelmingly described as “fun” and “creative” while also being “engaging” for students, sometimes contrasted with other teaching materials. For example, P1 noted that the ethics class required for engineering students was perceived as “pretty dry” and students tended to “not like having a special class on ethics,” and thus they appreciated that this activity could “get at the issue in a different way.” P4 similarly contrasted the activity with the more detailed, analytical work students did for most of the semester, that this allowed them to be creative. P11 also described how even when dealing with serious topics, the nature of the activity allowed students to “giggle with each other” and “find joy” in it, while P8 said students could “play and make jokes”, which was valuable for a group of students that were often very stressed.

Though not every instructor set this up as a group activity, many shared that the exercise was a great opportunity for students to collaborate where they could think critically and creatively together. P3 observed that for students in technology related courses, there are not many opportunities for students to discuss amongst themselves or do creative imaginative work: “Honestly for tech students just getting to be creative and run wild a little with your imagination [is] something I don’t think they get to do often enough.” P7 similarly noted that students appreciated the opportunity to engage with each other through this exercise at a time when the pandemic had isolated them from each other in other contexts. In fact, a number of our participants used this exercise while classes were online, and noted that it worked well over Zoom due to breakout rooms. P2 noted that they had been “looking for ways to engage students in breakout rooms and to give them kind of fun, interesting exercises that would help bring the content to life” during remote learning, and P6 said that this activity “was a little easier online” because of the ability to monitor student work via shared slides.

A number of instructors also noted that *Black Mirror* is rich in cultural currency and science fiction was an engaging context to explore ethics. Many students were inspired by or made connections to popular media in their episodes, including science fiction beyond *Black Mirror*, such as the film *Her* (about a person falling in love with an AI) or *Star Wars*. P6 noted the power of weaving together popular culture and concepts from class, that it could “make the themes from the readings more salient.” Similarly, real-world connections built into the activity were helpful. Whether through news articles explored in the class or current events occurring alongside the course, students brought elements of these accounts into

their examples. As P6 further explained, the exercise is “a way for students to connect something that they’ve learned outside of the classroom, whether they’ve watched ‘Black Mirror’ or are they seeing these types of news articles before and they can connect what they’ve learned outside of the classroom to concepts that we’ve talked about in the classroom. So transfer of knowledge might make something more salient to them.”

The exercise also facilitated the opportunity for students to synthesize topics from class. Several instructors offered the exercise toward the middle or end of class in an effort to invite students to incorporate insights from readings and discussions into their examples. As P2 described, “it was a really great way for them to express their creativity, plus their knowledge of our domain space that we had been talking about... It just shows this synthesis of the knowledge that they’ve built up over the quarter about these types of technologies in this context.” Being able to express to instructors comprehension and novel thinking about the subjects in a course is a direct benefit this exercise offers pedagogically.

3.3 Challenges

Though our participants were overall very positive about the exercise, challenges surfaced as well. The first was the need for further scaffolding, both for the instructors and students. As we will discuss in more detail in the next section, there were some differences based on whether the class the activity was facilitated in was an ethics-specific class or not. Some instructors without as much ethics-related training found it intimidating to discuss ethical issues in class. P2 recommended a separate resource for facilitators of this exercise that acts as a primer for ethical, social, and political implications of technology across a variety of concerns: “What actually does it mean to have ethical issues? What are these conundrums? So maybe the corresponding module, that’s not about speculative thinking in this way, but that’s more informative about ethical considerations for technology. That would just help me to prepare to scaffold for myself what are some important concepts and takeaways for them would be helpful.” Still other instructors recommended that including explicit suggestions for modifications or knowing ways that other instructors have used the exercise would be helpful in supporting those using it for the first time.

For students, the scaffolding instructors suggested touched on the framing of *Black Mirror* and navigation of the assignment itself. Though a benefit noted above was how *Black Mirror* is a useful context because so many students are familiar with it, not all students are. P12 recalled: “It was really good because the students knew *Black Mirror* and they’d watched it and they had a relation to it. So I think it fit with the zeitgeist of the cohort. I’m not sure it would have worked so well if they hadn’t all watched it, because it is a bit of a ‘you have to kind of get it for it to work’ situation.” P1 mentioned specifically that students for whom English is their second language may not have been exposed to much science fiction in English. Some instructors had the time and space in their course to view an episode or scenes from the show and discuss it with students before engaging in the exercise, but for others, students who were unfamiliar had to rely on the material provided for context. P1 worried about not having “cultural acumen training in applying what seemed to be a lot of Western examples to students from other cultures” and what assumptions

the exercise might have about what students understand. P10 also pointed out that the cultural relevance of *Black Mirror* was stronger five years ago than it is today, so it may require more framing as time goes on, and P7 similarly noted that the instant communicability of the exercise may only work with this generation of students. As time passes, instructors who use this exercise in the future may need to provide more context and allow for more time to get students on the same page around the show as a framing device—or the exercise itself will need to adapt.

Additionally, students have varying experience with science fiction in general and the cultural context of students may affect how they are able to engage with the exercise. For example, P10 had a number of students from mainland China and recognized their work due to the themes used in the episodes that the students speculated around social credit or smart masks. P1 also noted that some students might be living with experiences that are similar to the kinds of dystopias other students imagine, which requires care on the part of the instructor: *“I would try to think through a bit more carefully just to avoid traumatizing somebody by saying, ‘Hey, you should think about what would happen if the secret police used machine learning to do facial recognition, when they are already doing that.’”* The more familiar a facilitator is with their students and what they bring to the class, the easier it will be to modify and adjust the exercise to accommodate for their specific students.

3.4 Teaching Ethics

We also talked to instructors about how they used this exercise pedagogically, something that differed in part based on whether the entire class in question was specific to ethics or related topics, or whether the activity was used as a way to bring ethics into an otherwise mostly technical class. In ethics-related classes, instructors often included the exercise as part of course content about speculation; for example P3 paired it with readings about design fiction as well as other science fiction stories, and P5 used the activity to follow a guest lecture on futuring. Other instructors used the activity as a mechanism for encouraging students to synthesize class concepts; P4 said that the exercise had students *“think across multiple weeks of the class creatively, in a very different kind of frame than we’ve tended to do in the rest of the class where we think much more analytically or policy in a policy focused lens”* and P8 said it *“give[s] them that chance to apply concepts that we learn in class... with a little more flexibility. It’s a conceptual playground.”*

As examples of non-ethics classes, P2 included the exercise in a class on input and interaction (describing it as *“a really good balance to the other ways we’ve been talking about this technology during the course”*), P6 included it in a *“technology-driven”* introduction to accessibility class as part of a module on disability and AI bias, and P9 included it in a machine learning class in conjunction with a lecture on ethical issues in machine learning. P9 saw this as a way to encourage students to think about ethics without requiring the instructor to have as deep knowledge of the subject matter as someone teaching an ethics class might: *“I’ve been very reluctant to lecture about ethics. I feel like it’s not my role as the instructor. I feel totally comfortable being like, this is how K nearest neighbors works... In those cases, I feel more comfortable being the teacher who is imparting knowledge to the students. I personally think it’s very*

important to foster ethical thinking in students and I’m looking for ways to incorporate this sort of thinking into my classes. So I think one thing they got out of it is a way to think ethically without being sitting there while I lecture about ethics on Zoom, which I think is really bad for a lot of reasons, including that I don’t think that I, really anyone, can lecture anyone about ethics.” Similar to these concerns about “imparting knowledge,” Sasha Constanza-Chock’s book *Design Justice* shares Paulo Friere’s critiques of the “banking model” of education in which educators “deposit knowledge”; instead, instructors should pose problems and create spaces for collective critical consciousness [9]. An advantage of the way this exercise encourages students to think through issues and consequences together is that it creates this kind of space, with the instructor able to act as a guide rather than a banker.

In addition to the pedagogical benefits and challenges of the activity, a number of participants noted the importance of including additional context, including “Light Mirror” discussions. P10 described incorporating this into the activity, asking students to imagine: *“How can you look forward? How can you avoid the scenario taking place? They had to talk a little about how they would prevent this scenario [from] coming to pass.”* P3 similarly suggested more discussions like this: *“How do we protect people? How do we create good outcomes, not just good-enough outcomes? I think it would be really nice to get a little bit more positivity into the view of these things.”* P9 mentioned that they wished they had done more “debriefing” around the exercise, particularly given the number of scenarios students imagined that seemed quite close to current technology, and P3 further explained how such a debriefing might work: *“For debriefing, like: here’s what you came up. Here’s what it reflects in terms of your collective fears about things.”*

Regardless of the context, participants spoke of the importance of including activities related to ethics as part of the curriculum for computing students—but also, how much students enjoyed it, even for those who might not have been expecting to. P1 noted that students initially seemed *“shocked to be asked to think about these issues and be creative,”* and P11 said of their students: *“They know how to fix your computers, they understand how to code, they understand everything that there is to know about software, but they don’t get any ethics most of them and they really, they just really liked it. They really liked just thinking that way.”* Moreover, the success of this activity, especially in classes that were not ethics-focused, supports trends towards including ethics throughout computing curriculum in addition to being taught by experts in standalone classes [15, 16].

3.5 Ethical Speculation in Computing

As a specific component of ethics pedagogy, instructors also spoke about how ethical speculation is a useful skill both inside and outside of the classroom. P6 noted that *“A lot of times in our curriculum, we teach that technology is a solution to something and that might not always be the case,”* adding that this kind of speculation *“beyond the classroom just helps them consider both the benefits and the harms of technology.”* P2 also said that because the students in their class were future designers and developers, it was important they consider *“potential harms from this type of technology and the lack of regulation and protection for users right now... we’re so*

socialized to use these technologies and adapt them into our daily lives without really thinking about these consequences that could speculatively come about.” P5 also pointed out that speculation as a skill could be “really helpful for students to think more creatively about how to convey ethics ideas to others.” Overall, everyone we spoke to had the sense that ethical speculation was useful; as P8 put it, “these students are going to be building the things that hopefully don’t wind up killing everyone... I want engineering students to have practice thinking about the kinds of worlds they’re building with their technologies.” Similarly, P11 added, “I think it would be very good for helping them just get more comfortable with making hard and simple decisions. Just being able to see farther out than whatever the immediacy of what their task is in front of them.”

In terms of student reactions, P1 pointed out that some students are just trying to learn the technical skills they need so that they can graduate and find a job, but that even for students that “want to just get the dataset, improve the algorithm and move on... some of them were at least a little bit more aware that there are impacts beyond just writing the paper up.” P12 mentioned similar challenges and opportunities: “I think our design students have trouble with speculative stuff, but that’s why the module exists. I think students have a bit of trouble is because it’s so counter everything they’re taught. A lot of the stuff that they’re taught in a design school is: design solves problems... Whereas with speculative design, you’re not solving anything.” Similarly, P3 observed that “for a lot of tech students, they may be a little less eager to engage those kinds of competencies, but they do have fun exercising it when they do,” and P7 that “it turns out actually that they had a pretty massive hunger for speculating about the future, which actually doesn’t surprise me.”

However, despite the overwhelming sense that ethical speculation is broadly useful and therefore a good thing to include as part of ethics pedagogy, P4 had a critical insight: “I do [think speculation is useful beyond the classroom]. Although I tend to be cautious about speculation in part because people tend to lean on their own experiences pretty heavily in speculation, and don’t, unless, they’re very carefully prompted, consider broader context. I worked as a user experience designer... and I would see use of like personas or other kinds of vaguely speculative exercises where you’re asked to imagine the ideal user or imagine ideal kind of use cases. And almost universally people would be like, the user is a middle-class white person and here’s what they’re going to do... you are just reifying all the stereotypes. And so I think that’s the danger with speculation done well: it’s a great opportunity to disrupt the stereotypes, but I think it takes a lot of work to do that right... and I’m thinking in particular about the cis het white guys. Because in more diverse classes, you tend to get a lot of different viewpoints in a lot of discussions, although there is a tendency for people who are in kind of minority populations to suppress their viewpoints to some degree in order to not stick out in the majority. So that’s always a risk and that’s a discussion we have on the first day of class in my class.”

This insight connects to our earlier observation that instructors did not describe a prevalence of themes related to social justice beyond the experiences that students in the classroom might have—e.g., gender inequality coming up much more often than racial inequality. However, P9 had the additional insight that marginalized students in general might approach the activity differently, describing a particularly strong example where one of the students

in the group was “a student who identifies as non-binary and probably because of their experience in the world has thought a ton about the ways in which the world is not a fair place and has thought a ton about the ways in which they can at least try to minimize the harm they’re doing to others,” adding that by contrast “there are other people who are just either, because of their background or because of their disposition or both, just not as concerned about that.” These insights suggest ways to better scaffold this exercise, perhaps pairing it with lessons drawn from, e.g., principles of design justice for learning from and involving people who are different than you [9].

4 CONCLUSIONS

Our conversations with instructors solidified the notion that cultivating ethical speculation in students can be beneficial for a number of reasons. First, instructors perceived that students enjoy the exercise; students described it to them as fun and engaging, and instructors found it to be as well. Second, the exercise gives students even in non-technical classes a framing and opportunity for thinking through ethics and justice in conjunction with technology, which is both pedagogically useful during their course as well as a real world useful skill. Our goal with this paper is to show instructors one way to invite ethical speculation into their curriculum. We also invite instructors to think about other ways ethical speculation can be brought into a classroom, and we hope the stories surrounding this exercise can be inspiring for other methods.

Additionally, beyond commentary about the substance of the exercise itself, a number of our participants also offered (unprompted) how helpful it was to have come across a teaching exercise that was openly shared, and could be “plug and play” or adapted to fit a particular instructor’s needs. This was a sentiment shared both by instructors who wanted creative activities for ethics-specific classes, and for instructors teaching technical classes who wanted a way to incorporate ethics into the class. The majority of participants said that they heard about the exercise from Twitter, either as shared originally by the second author, or by someone else who had used it. Multiple participants mentioned how useful it was to have instructions, examples, and a template, both in terms of running the exercise and in students using the slide template to create artifacts. We hope that these insights are encouraging for instructors who might consider sharing teaching materials so that others can use and build upon them.

Finally, as instructors envision possibilities for their students, we caution them to ensure that they avoid reinforcing stereotypes and consider ways to encourage students to think broadly about injustice. As Costanza-Chock points out in *Design Justice*, most designers do not intend to systematically exclude marginalized groups; however, unintended negative impacts can still be significant [9]. Ideally, encouraging students to think about harms beyond themselves and consider the concerns and consequences for others will help to avoid the shortcomings of speculation mentioned above by P4. While it may be a stretch to think one facilitation of the “Black Mirror Writer’s Room” exercise will permanently or deeply impact students into their future, having more and more opportunities like this exercise present throughout technology based programs could strengthen the overall impression of the role of ethics and justice in computing for students.

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REFERENCES

- [1] Rebecca Bates, Valerie Summet, Nanette Veilleux, and Judy Goldsmith. 2021. SIGCSE Reads 2021: Using the Stories in your Classroom. *Proceedings of the SIGCSE ACM Technical Symposium on Computer Science Education* (2021), 465–466.
- [2] Eric P.S. Baumer, Timothy Berrill, Sarah C. Botwinick, Jonathan L. Gonzales, Kevin Ho, Allison Kundrik, Luke Kwon, Tim LaRowe, Chanh P. Nguyen, Fredy Ramirez, et al. 2018. What Would You Do? Design Fiction and Ethics. In *Proceedings of the ACM GROU Conference on Supporting Group Work*. 244–256.
- [3] Virginia Braun and Victoria Clarke. 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology* 3, 2 (apr 2006), 77–101.
- [4] Amy Bruckman, Kurt Luther, and Casey Fiesler. 2015. When Should We Use Real Names in Published Accounts of Internet Research? In *Digital Research Confidential*, Ezster Hargittai and Christian Sandvig (Eds.). MIT Press, Cambridge, MA, 243–258.
- [5] Beleicia B. Bullock, Fernando L. Nascimento, and Stacy A. Doore. 2021. Computing Ethics Narratives: Teaching Computing Ethics and the Impact of Predictive Algorithms. *Proceedings of the ACM SIGCSE Technical Symposium on Computer Science Education* (2021), 1020–1026.
- [6] Quinn Burke and Yasmin B. Kafai. 2012. The writers’ workshop for youth programmers. *Proceedings of the ACM SIGCSE Technical symposium on Computer Science Education* (2012), 433.
- [7] Emanuelle Burton, Judy Goldsmith, and Nicholas Mattei. 2018. How to teach computer ethics through science fiction. *Commun. ACM* 61, 8 (2018), 54–64.
- [8] Federico Cabitza, Raffaele Rasoini, and Gian Franco Gensini. 2017. Unintended consequences of machine learning in medicine. *Jama* 318, 6 (2017), 517–518.
- [9] S. Costanza-Chock. 2020. *Design Justice: Community-Led Practices to Build the Worlds We Need*. MIT Press.
- [10] Cory Doctorow. 2018. How to use science fiction to teach ethics. *Boing Boing* (2018). <https://boingboing.net/2018/11/19/black-mirror-white-mirror.html>
- [11] Stacy A. Doore, Casey Fiesler, Michael S. Kirkpatrick, Evan Peck, and Mehran Sahami. 2020. Assignments that blend ethics and technology. In *Proceedings of the ACM SIGCSE Technical Symposium on Computer Science Education*. 475–476.
- [12] Rodrigo Ferreira and Moshe Y. Vardi. 2021. Deep Tech Ethics: An Approach to Teaching Social Justice in Computer Science. *Proceedings of the ACM SIGCSE Technical Symposium on Computer Science Education* (2021), 1041–1047.
- [13] Casey Fiesler. 2018. Black Mirror, Light Mirror: Teaching Technology Ethics Through Speculation. *How We Get to Next* (2018). <https://howwegettonext.com/the-black-mirror-writers-room-teaching-technology-ethics-through-speculation-f1a9e2deccf4>
- [14] Casey Fiesler. 2021. Innovating Like an Optimist, Preparing Like a Pessimist: Ethical Speculation and the Legal Imagination. *Colorado Technology Law Journal* 19, 1 (2021).
- [15] Casey Fiesler, Natalie Garrett, and Nathan Beard. 2020. What do we teach when we teach tech ethics? a syllabi analysis. In *Proceedings of the ACM SIGCSE Technical Symposium on Computer Science Education*. 289–295.
- [16] Barbara J. Grosz, David Gray Grant, Kate Vredenburg, Jeff Behrends, Lily Hu, Alison Simmons, and Jim Waldo. 2019. Embedded EthiCS: integrating ethics across CS education. *Commun. ACM* 62, 8 (2019), 54–61.
- [17] Brent Hecht. 2018. It’s time to do something: Mitigating the negative impacts of computing through a change to the peer review process. <https://acmfca.org/2018/03/29/negativeimpacts/>
- [18] Mary Elizabeth M.E. Jones, Melanie Kisthardt, and Marie A. Cooper. 2011. Interdisciplinary teaching: Introductory programming via creative writing. *Proceedings of the ACM SIGCSE Technical Symposium on Computer Science Education* (2011), 523–528.
- [19] Amy J. Ko, Alannah Oleson, Neil Ryan, Yim Register, Benjamin Xie, Mina Tari, Matthew Davidson, Stefania Druga, and Dastyni Loksa. 2020. It is time for more critical CS education. *Commun. ACM* 63, 11 (2020), 31–33.
- [20] Tadayoshi Kohno and Brian David Johnson. 2011. Science fiction prototyping and security education: Cultivating contextual and societal thinking in computer security education and beyond. *Proceedings of the ACM SIGCSE Technical Symposium on Computer Science Education* (2011), 9–14.
- [21] Ari Korhonen, Marianna Vitisou, et al. 2019. Digital Storytelling and Group Work. In *Annual Conference on Innovation and Technology in Computer Science Education*.
- [22] Robert K. Merton. 1936. The unanticipated consequences of purposive social action. *American sociological review* 1, 6 (1936), 894–904.
- [23] Irving Seidman. 1998. *Interviewing as Qualitative Research*. Teachers College Press.
- [24] Ben Rydal Shapiro, Emma Lovegall, Amanda Meng, Jason Borenstein, and Ellen Zegura. 2021. Using Role-Play to Scale the Integration of Ethics Across the Computer Science Curriculum. In *Proceedings of the ACM SIGCSE Technical Symposium on Computer Science Education*. 1034–1040.
- [25] Robert Soden, Michael Skirpan, Casey Fiesler, Zahra Ashktorab, Eric Baumer, Mark Blythe, and Jasmine Jones. 2019. CHI4EVIL: Creative Speculation On the Negative Impacts of HCI Research. In *Extended Abstracts on Human Factors in Computing Systems (CHI EA)*.
- [26] Daxton R. Stewart. 2021. *Media Law Through Science Fiction*. Routledge Press.
- [27] Richmond Y. Wong and Vera Khovanskaya. 2018. Speculative design in HCI: from corporate imaginations to critical orientations. In *New Directions in Third Wave Human-Computer Interaction: Methodologies*. Springer, 175–202.
- [28] Richmond Y. Wong, Vera Khovanskaya, Sarah E. Fox, Nick Merrill, and Phoebe Sengers. 2020. Infrastructural Speculations: Tactics for Designing and Interrogating Lifeworlds. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems* (Honolulu, HI, USA) (CHI ’20). Association for Computing Machinery, New York, NY, USA, 1–15. <https://doi.org/10.1145/3313831.3376515>
- [29] Richmond Y. Wong, Ellen Van Wyk, and James Pierce. 2017. Real-fictional entanglements: Using science fiction and design fiction to interrogate sensing technologies. *Proceedings of the ACM DIS Conference on Designing Interactive Systems* (2017), 567–579.