

Game Development as Speculative Design: Teaching Data Science Ethics Using Decentralized Research Groups

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ABSTRACT

This exploratory study investigates the use of game development as a speculative activity to teach data science ethics incorporating the Directed Research Groups (DRG) format, that decentralizes classroom dynamics, emulates real-life working environments, and offers students creative choices driven by their own interests. This DRG focuses on creating a video game addressing an ethical issue in data science. Working in groups of peers from diverse backgrounds and education allows for multiple meanings to occur in a team-based learning environment. This enriches the students' engagement with the material and by creating video games that have an impact on these social issues, it also grounds their role as an active change agent for a future they envision.

KEYWORDS

Speculative education; data science ethics; video game development; project-based learning; higher education

INTRODUCTION

With the modern prevalence of data and the insights extracted, it is often overlooked that data science as a field is frequently layered on top of biased structures. A more nuanced understanding of this and its human impact is needed in computer science and data science education beyond technical skills (Aragon et al., 2022; Herman et al., 2020). Our project consists of University of Washington (UW) and University of North Texas (UNT) students working together in groups to develop video games that address ethical issues in data science. A decentralized model of education called a directed research group (DRG) is used. Finding solutions to complex problems involves applied knowledge and collaborating with colleagues spanning a variety of disciplines.

For this poster, we address the design of this course as a model of student engagement in the emerging field of human-centered data science and look at game development as a speculative learning process, imagining ways to investigate ethical issues. The research questions we seek to answer are:

- How does the directed research group model facilitate deeper student engagement with class content?
- What role does game development as a speculative exercise play in student engagement with class content?

BACKGROUND

The major components of the course are summarized below.

DRG Format

Ethical Games was developed to teach data science ethics in the DRG format to undergraduate and graduate students typically underrepresented in the field of data science. The DRG is a unique education model established at the University of Washington to reconfigure traditional roles in education through the formation of a shared community of practice that centers around scholarly research (Turns & Ramey, 2006; Larson et al., 2009). It addresses the urgent need for undergraduate research opportunities that contribute new intellectual knowledge into their field, a standard of education set by the Boyer Commission on Educating Undergraduates, the Council on Undergraduate Research, and the National Conference for Undergraduate Research (Hu et al., 2008). The format is similar to project-based learning (PBL) pedagogy, which takes the emphasis off of lectures and content transmission onto the interests and motivation of students as they navigate through self-selected projects. Applying knowledge to solve real-world problems enlists deeper learning compared to receiving information passively (Miller & Krajcik, 2019). While already understood and implemented in K-12 educational settings, PBL is not as researched, applied or supported in higher education, and especially not as a means to address diversity issues.

UNT, a Hispanic-serving institution seeking to solidify its role as a research university, partnered with UW in order to replicate this model. Starting in January 2022, students participated in multiple levels of engagement: a) individual assignments and readings, b) meeting with a group of peers to work on the group project of developing a video game addressing an ethical issue in data science or AI/machine learning and c) a weekly class time, where students, teachers, and student researchers meet together over Zoom and offered comments and feedback through a

shared Google Docs. The working groups provided built-in support from peers whose experience and education levels varied. More importantly, they served as the setting for group learning approach. Because students came from multiple disciplines in addition to spanning two universities, they worked through cultural and epistemological impasse(s) in order to produce a viable prototype of a videogame. Working through any impasse or disorientation is another vital component of deep learning that occurs in PBL (Webster et al., 2022). Throughout the course of group meetings, students could decide whether they wanted to pursue their individual project for game development or to work as a team developing one of their projects together. They were given the freedom to change to different groups and develop multiple projects until a decision had to be made to go forward. It was important to initially combine UW and UNT students because several of the UW students have participated in a DRG previously and understood the dynamics of working in self-directed groups.

It was important to provide students with opportunities for further work and research. This decentralized power in the classroom helps to develop student autonomy. Students chose to be in the class through a screening process and if they wanted to receive credit, they could choose the number of credit hours they wanted to register for. It was important to set the classroom culture to establish there was no set class hierarchy and that the students were expected to take ownership of the course and initiate any change. One student created a Slack channel for participants when they felt there was a lack of communication between students and another created an attendance spreadsheet to make the class sign in process more efficient. The second feature is the student as colleague model, which is most evident during the research phase of the course that we are currently in. Students work alongside the instructors and researchers to co-develop the hypothesis, research design and experimental procedure, so that they take a significant role in every phase of research (Hu et al., 2008). They were also encouraged and given opportunities to take the lead in research based on their interest and comfort level. Ultimately, this novel course modality and DRG format takes advantage of the shift toward online learning with its limitations and opens the door for cross-discipline and multiple-university collaboration for research, equipping the students with the ability to adapt and flourish in an ever-changing environment, a crucial skill in both academia and industry.

Teaching Using Game Development

Game development as a mode of learning blends well with the DRG format because it builds upon the students' already high motivation when they are able to decide on the ethical topic to address and the narrative elements of the game. Kafai notes that the greatest learning benefit is from the process of designing instructional games, not playing instructional games (2006). By changing the role of the student from consumer to producer (Kafai, 2006), it forces a series of decisions related to game mechanics and a deeper understanding of the ethical topic in order to produce optimal outcomes in players, such as a more critical attitude in using AI in mortgage loan approvals. Working through these ideas as a group also gives opportunities for collective meaning-making as each student contributes their own ideas and opinions. These activities reinforce the constructivist model of learning Piaget proposed where knowledge is determined by the act of "creation of novelty" and knowledge is determined by students and their creativity in learning about the ethical issues through game development (Mozelius, et al., 2013).

Game Development as Speculative Design

Higher education is ripe for change as it seeks to justify its importance in modern civilization. Staley takes this call to consider multiple possibilities in reimagining the purpose of the university through speculative design and how it might take on future forms as, "feasible utopias (p. 14, 2019)". Game development and the DRG model both seek to "unsettle the present (Staley, 2019)" as the first step of change. It invites us into the process of reimagining relationships between teaching and learning, and questions foundational concepts taken for granted, including systems of bias represented in both data and education (Bang et al., 2013). While the initial course consisted of lectures with case studies of the harms AI can cause, game development provides learning moments for students by allowing them to collectively address social issues such as digital privacy or misinformation in order to create a more just future. As Garcia et al. (2020) indicates, a speculative approach does more than identify and critique inequalities, but "invites in collective imagining and action (p. 21)".

METHODOLOGY

The instructors and student researchers are currently gathering research data from students using a qualitative approach to pre-course reflections, post-course reflections, and periodic surveys. A content analysis of the interviews will also be performed to find emerging themes and insights about the learning process. We will also look at the artifacts produced by the groups to take a deeper look at the level of engagement from students.

CONCLUSION

Preliminary results consistently indicate that students had a meaningful experience working in groups. We are currently in the second stage, where the students can participate in research, and there are several journal articles and conference presentations being developed with students. We intend to pursue funding to have the students design research around the student-developed games being played in the community they were intended for.

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