Responsibility and Care in AI/ML Education: A Collaborative Approach to Ethical Awareness

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ABSTRACT

The rapid growth of artificial intelligence (AI) and machine learning (ML) has led to significant innovations but also raised ethical concerns. Researchers and students designed an ethical online game in this study to spread awareness about making informed decisions when using AI and ML. Conducted within a directed research group (DRG) curricular method, the study engages students as co-researchers to develop a game, from developing ideas to playtesting the game in a class setting. The study employs a quantitative methodology to analyze a survey that 32 students, each with diverse backgrounds and knowledge in game development, conducted after each class session over three semesters. Findings indicate that self-reported engagement changes depending on the activities done in each session, with students feeling capable of contributing to research and game design.

KEYWORDS

Game-based learning; Data science ethics; Game design for learning; Student engagement; Active learning.

INTRODUCTION

The rapid development of artificial intelligence (AI) and machine learning (ML) has ushered in unprecedented innovations, including facial recognition for payments, advanced healthcare diagnostics, and enhanced labor efficiencies (Ramos, 2023; Kaur et al., 2024; Feiner, 2023). However, these advancements also raise significant ethical concerns, such as the potential to perpetuate biases, foster unethical behaviors, and threaten human rights (Ramos, 2023; Gratch & Fast, 2022). Given that traditional computer literacy courses do not adequately address ethical decision-making in AI/ML, researchers from two institutions collaborated on research to design an ethical online game, an educational game designed to enhance awareness of AI/ML ethics, with students in an online credit-based directed research group (DRG). This teaching method allows students to conduct authentic research as co-researchers with undergraduates, graduates, and faculty members as a core component of the curriculum (Rose et al., 2016; Larson et al., 2009; Turns & Ramey, 2006; Author, 2022).

RESEARCH QUESTIONS

To explore student engagement further, this study employs a quantitative methodology to address the following research questions:

RQ1. What are the patterns of student self-reported engagement over time in this DRG model?
RQ2. How do these patterns correlate with various course activities?

LITERATURE REVIEW

In the DRG model utilized in this study, the learning strategy hinges on active learning. This pedagogical approach is defined as "a classroom situation in which the instructor and instructional activities explicitly afford students agency for their learning" (Lombardi et al., 2021, p. 16). Such strategies aim to boost student engagement and class attendance (Kat et al., 2019; Deslauriers et al., 2019). This research incorporates principles of active learning and game design, both of which are grounded in constructivism. Constructivist learning theory posits that learning is an active process where individuals form new knowledge by connecting new ideas and experiences to their existing body of knowledge. (Bransford, 1998). Students in this project learned through a constructive process where they created knowledge through discussion and solved problems with peers to create an educational game.

METHODS

Students for this project were recruited at two institutions through convenience sampling and purposive sampling, where students voluntarily applied for the class, and the primary investigators (PIs) accepted the applicants based on their interests in data science, gaming, and research (Gill, 2020; Devasia, 2024). From January 2022 to May 2022 and August 2022 to May 2023, 32 students who were diverse in age, education level, geographical location, and race participated in the research.

The class, conducted online via Zoom, featured lectures, discussions, and group activities. Students had readings, individual assignments, and weekly sessions, collaborating in small groups about topics in ethics and bias in AI/ML.

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Small groups focused on specific game areas, co-creating collaboratively. Weekly large group sessions included updates and interdependent work. This structure enabled effective small group collaboration and facilitated overall game design co-creation. In Spring and Fall 2022 semesters, they explored sources of bias and game design for data ethics education. In Spring 2023 semester, they developed a game incorporating various biases, taking roles in design, programming, user experience, digital art, narrative, and research writing.

Researchers examined trends in student participants' self-reported engagement over three semesters (Spring and Fall 2022, and Spring 2023). Engagement was measured using a "mini-survey" of affective statements after each class session (Penuel et al., 2016). The "Post-Meeting Checklist" had one question about their role in the meeting with eight answer choices, allowing multiple selections. These positive choices reflected students' self-efficacy, a construct linked to academic achievement (Pajares, 1996). The survey was distributed via a Qualtrics form link.

We analyzed survey data from 28 class sessions spanning from January 2022 to May 2022 and August 2022 to May 2023. Descriptive statistics in Excel were used to analyze the 203 responses in the survey, and Tableau was used to visualize the result. As the survey allowed multiple answer choices, the co-occurrence of answer choices was analyzed with Python.

PRELIMINARY FINDINGS

Between January 2022 to May 2022 and August 2022 to May 2023, students selected an average of 3.7 answer choices per survey. Out of the responses, 131 indicated "Felt like I could contribute to the field of game design," while 129 expressed "Felt like I could contribute to research." These selections are consistent with the project's objective, which involved designing a game and engaging students in collaborative research with PIs.

In the spring semester of 2022, there was a noticeable increase in students feeling they could contribute to research. Course content during this period included topics directly related to the aims of this study, such as the technical and sociotechnical aspects of AI and ML, the distinction between recreational and educational games, diversity in AI and STEM, and game design methodologies.

In the following spring of 2023, the focus shifted towards collective game design. This shift is reflected in the most commonly chosen response, "Felt like I could contribute to the field of game design." Given that students assumed the role of researchers within the DRG model, "Felt like I could contribute to research" remained one of the top two responses for both the spring semesters of 2022 and 2023.

Considering that 85.9% of respondents selected multiple answer choices, we have analyzed the co-occurrence of these selections for both the spring semesters. With 56 possible combinations, the percentage differences in co-occurrences were marginal. Nonetheless, the consistent pairings across semesters suggest that the course engagement remained stable. The most significant difference between the two spring semesters was the pairing with "Changed my idea because I heard something new," which was more prevalent in spring 2022. This fits the semester's focus on exploring the fields of data science and serious games. In contrast, spring 2023 placed greater emphasis on collaborative game design than exploring new ideas.

To address the second research question, we calculated the ratio of the total participants present in each class session to the number of times each response was chosen. In spring 2022, "Felt like I could contribute to research" reached its highest points on February 17th, March 3rd, and April 7th. The class format on February 17th and March 3rd was modular learning, involving lectures and discussions on content. These sessions covered informal learning and connected learning—concepts central to student learning in this course—and game ideation, aligning with the research's purpose. Despite April 7th being a discussion class, it addressed research-related learning, focusing on game objectives and utilizing Construct 3, the game development software.

CONCLUSION

Initial findings show that students felt engaged in a DRG focused on developing a game to teach issues related to data science, reflecting the efficacy of co-designing games to address complex, intersectional issues such as data ethics. We encourage further exploration in ethical game design while emphasizing the diversity of the collaborative group. By engaging students as co-researchers and fostering a collaborative environment, we can effectively address complex societal challenges together in a generative way and prepare students to navigate the ethical issues related to AI/ML. The engagement remained consistent when course activities were more content-based and when the activities were creative and hands-on. Such self-reported affective data provides a window into how students construct their ideas around complex issues such as the ethics of information in its various uses and forms.

GENERATIVE AI USE

We confirm that we did not use generative AI tools/services to author this submission.

AUTHOR ATTRIBUTION

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