ASEE AMERICAN SOCIETY FOR ENGINEERING EDUCATION

Paper ID #39616

Work-in-Progress: Exploring Female Representation Issues In Computing by Writing Interactive Fiction

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An active member of ASEE for over 25 years, Dr. John K. Estell was elected in 2016 as a Fellow of ASEE in recognition of the breadth, richness, and quality of his contributions to the betterment of engineering education. Estell currently serves on the ASEE Board of Directors as the Vice President of Professional Interest Councils and as the Chair of Professional Interest Council III. He has held multiple ASEE leadership positions within the First-Year Programs (FPD) and Computers in Education (CoED) divisions, and with the Ad Hoc Committee on Interdivisional Cooperation, Interdivisional Town Hall Planning Committee, ASEE Active, and the Committee on Diversity, Equity, and Inclusion. Estell has received multiple ASEE Annual Conference Best Paper awards from the Computers in Education, First-Year Programs, and Design in Engineering Education Divisions. He has also been recognized by ASEE as the recipient of the 2005 Merl K. Miller Award and by the Kern Entrepreneurial Engineering Network (KEEN) with the 2018 ASEE Best Card Award. Estell received the First-Year Programs Division's Distinguished Service Award in 2019.

Estell currently serves as an ABET Commissioner and as a subcommittee chair on ABET's Accreditation Council Training Committee. He was previously a Member-At-Large on the Computing Accreditation Commission Executive Committee and a Program Evaluator for both computer engineering and computer science. Estell is well-known for his significant contributions on streamlining student outcomes assessment processes and has been an invited presenter at the ABET Symposium on multiple occasions. He was named an ABET Fellow in 2021. Estell is also a founding member and current Vice President of The Pledge of the Computing Professional, an organization dedicated to the promotion of ethics in the computing professions.

Estell is Professor of Computer Engineering and Computer Science at Ohio Northern University, where he currently teaches first-year programming and user interface design courses, and serves on the college's Capstone Design Committee. Much of his research involves design education pedagogy, including formative assessment of client-student interactions, modeling sources of engineering design constraints, and applying the entrepreneurial mindset to first-year programming projects through student engagement in educational software development. Estell earned his BS in Computer Science and Engineering degree from The University of Toledo and both his MS and PhD degrees in computer science from the University of Illinois at Urbana-Champaign.

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Introduction

Female representation has been - and continues to be - an issue within computing, including computer gaming. It spans the gamut from exclusion via being forced to play the role of a male protagonist,[1] to a "surface equity" where women are present but their gender is not acknowledged,[2] to where women are objectified in a hypersexualized manner.[3] Even software that at first glance appears benign can have underlying issues. As an example, for over 50 years *The Oregon Trail* computer game[4] has been used in social studies classrooms across the United States to teach about Westward Expansion, allowing students to outfit a wagon for a 2000-mile trek where players manage supplies, determine travel pace, *etc*. However, a player must first select a vocation from a list of choices (*e.g*., banker, carpenter, farmer) that are historically male occupations,[5] after which gameplay involves fast gratification aspects (*e.g*., shooting animals, arcade scoring) that appeal more to boys than girls[6] and highlights decision making in historically male domains (*e.g*., hunting, route selection, means of crossing a river).[2] Little thought was given to whom the American author Emerson Hough opined was the chief figure in this endeavor: the "gaunt and sad-faced woman sitting on the front seat of the wagon… her face hidden in the same ragged sunbonnet which had crossed the Appalachians and the Missouri long before… Who has written her story?"[7] Given that women are half the audience for software applications, it is essential they see themselves being positively represented by telling their story.

Methodology

This experiential research is based on the premise that gender stereotypes can be countered by having students create alternatives of *The Oregon Trail* game that present more realistic views of women's contribution to American Westward Expansion. This is being addressed through two initiatives. The first initiative is a term project in our second-semester introductory programming course where student teams are tasked with creating an alternative version of The Oregon Trail by writing it from the perspective of the women who undertook this dangerous journey. The second initiative is an elective course in Interactive Fiction offered jointly by both the computer science and English programs. In this course, students will write educational software while considering character, narrative, dialogue, and differing perspective in crafting historically-accurate fiction featuring a female protagonist. For both of these initiatives, the goals are to build students' storytelling abilities in software development, examine diversity issues within a familiar context, help develop greater social awareness, and appreciate the value gained from different perspectives. The lessons learned from these rollouts will also inform curricular changes that promote DEI awareness, as per proposed changes to the ABET Criteria.[8]

Introductory Programming Initiative

The alternative text-oriented Oregon Trail game was used as a culminating team-based term project for the Spring 2022 offering of Programming 2, our second-semester introductory programming course. As this was the authors' initial effort at incorporating diversity, equity, and inclusion (DEI) elements into this project, the requirements were kept simple. While the authors provided the simulation models for pace, health, weather, *etc*., used in the 1985 Apple II version of the game,[9] the students were asked to "write in a different voice" by using 13-year-old Hattie Campbell, from Kristiana Gregory's fictional 1847 Oregon Trail diary, "Across the Wide and Lonesome Prairie," as their female protagonist.[10] Several groups took inspiration from this book and used its diary entries to demonstrate progress within Hattie's journey. Several teams created artwork to engage students during the game. All teams participated in an end-of-term "App Fair" where they displayed a poster regarding their developed Oregon Trail application along with a laptop that allowed visitors to see and interact with the app. All teams met or exceeded the DEI requirements of the game by including Hattie and various elements of her life experiences in a meaningful way. However, while a rubric containing dimensions for diversity and inclusion was used by judges at the App Fair, the authors did not have appropriate tools for measuring the extent to which students might have learned about female representation in computer games. The students struggled with two elements: (1) engaging in storytelling and (2) writing text that is free of grammatical errors. While all teams had a plausible storyline, those that struggled tended to have weak narrative and/or repetitive story elements, such as using the same text for each river crossing, with only the river's name changed. The instructors believe the grammatical errors are partly due to students' overreliance on catching spelling and grammatical errors through use of autocorrect editing features that are non-existent in software development systems. Given the initial success of this effort, the project will be repeated in Programming 2 in its spring 2023 offering.

Interactive Fiction Initiative

Interactive Fiction is a computer-based literature form that allows the reader to actively participate in the story by inputting text commands, thereby shaping the plot. The genre evolved from the text-based adventure games created in the days of the mainframe, an example being Colossal Cave Adventure.[11] There are several development platforms available for writing Interactive Fiction, including Inform7, a programming language using natural language syntax where statements are in the form of complete sentences.[12] The authors decided that Interactive Fiction was a preferred approach for an in-depth DEI experience as the development of Interactive Fiction sharpens close reading and writing, promotes logical thinking, and reinforces design thinking and storytelling skills.[13] Additionally, the ability to program in English sentences presented an opportunity for a collaboration with Ohio Northern University's English Department, allowing for a team-teaching approach where an English professor provides content on such topical areas as character, narrative, dialogue, and point of view in crafting a piece of fiction while a Computer Science professor covers the programming aspects of the course. The course instructors are also working with Ohio Northern University's Chief Diversity and Inclusion Officer to develop DEI-oriented assessment tools that can be deployed to help measure beliefs regarding female representation in computer games, as well as exploring campus-wide collaborations during Women's History Month in March.[14]

Long-Term Goals and Conclusion

The long-term goals associated with this research are as follows. First, create greater DEI awareness within aspiring software developers.[15] Second, develop stronger communication skills in students through promoting the use of storytelling aspects of software application development.[16] Third, promote greater appreciation of general education coursework amongst engineering students.[17] The authors believe that these three goals, when eventually embedded throughout the curriculum, will better develop students into computing professionals who can deliver greater value, both to their organization and to society. The initial assessments resulting from the spring 2023 offerings of our Programming 2 and Interactive Fiction courses will be used to inform module, course, and potentially curricular design modifications that will better address the attainment of these goals. The authors feel confident moving forward with this project given the positive feedback received from students, alumni, and colleagues. The highly recognizable game, *The Oregon Trail*, left a profound impact on those who played it. While this project may not lead to meme-worthy recognition, the ability to tackle a complex and sensitive topic (DEI) through the lens of game development is a unique and deserving area of research.

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