



Piloting a JEDI (Justice, Ethics, Diversity and Inclusion) Technology Ethics Living and Learning Community

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Abstract

This academic year we are piloting a new Living and Learning Community (LLC) focused on Justice, Equity, Diversity and Inclusion (JEDI) Technology Ethics. Our LLC model at the University of Denver calls for students to live together on the same dorm floor, take a two-credit course together, and various co-curricular activities. For the course, students read articles and watch videos curated by the instructors. Students then engage in short writing exercises, small group discussions, and then full class presentations. Other active learning models such as design exercises are being utilized. Topics covered during the two quarters include racism/anti-racism, sexism/anti-sexism, social media, AI, robotics in policy, robotics in the military, privacy, genetic engineering, biomechanical augmentation, ethics, diversity in engineering and computer science, and infusing JEDI into engineering/computer science education. Students are exploring how recent and new technology is codifying systemic oppression based on race and gender. We have been using ethical models to explore decision making of hypothetical and real products/systems. Our curriculum is a work in progress; hence we are assessing the course on an on-going basis.

Introduction

Engineers and computing professionals make products and processes that shape our society. Because of this large societal impact, engineering and computing professional organizations such as ABET and ACM recommend or require ethics to be integrated into undergraduate educational programs. While integration of ethics is essential, given the recent and ongoing societal reckoning with racial justice and (in)equity issues, we argue that more of a specific focus on JEDI (Justice, Equity, Diversity, and Inclusion) is needed. In this paper we present an overview of, and initial results from, piloting a Living and Learning Community whose curricular topic is “JEDI Technology Ethics”. For this pilot year we had 10 students in our LLC. Seven were computer science majors, two were engineering majors, and one was a history major.

We note that this LLC is aligned with a broader JEDI effort in our school. One of our NSF funded projects, the multi-institutional Partnership For Equity (partnership4equity.org) project, is piloting and studying the infusion of DEI issues into the technical classroom. Publications from the project speak to successes and challenges of infusing DEI into the classroom (APRH18,ACRP+19,CaAF22,CAHB21,LGAN+22,LePa21,PARF15,RAPM+21,RPPA+21). Our hope is that the delivery of this JEDI Technology Ethics LLC will create a pipeline of “student ambassadors” who will be better prepared to make contributions when they are exposed to DEI material in their coursework and research. In addition to infusing DEI into coursework, our overall DEI efforts include faculty development and policy changes. This LLC provides another opportunity for faculty discussion, participation, and development.

Background

The idea of Living and Learning Communities (LLCs) is not a new idea in general college education nor specifically in engineering. A simple google search for “Engineering Living Learning Community” reveals that LLCs in large engineering programs are a common practice as well as several research papers describing LLC efforts within engineering and computing (FIEW16,HWBI+09mShSr09,SSMN+13,Pike99). The key idea behind an LLC is that students live together, usually on the same floor(s) of a dormitory, and that students are either pursuing the same academic majors/concentrations or are participating in a (often interdisciplinary) curricular program specifically created for the LLC. Studies have shown an increased sense of student belonging and/or academic success (EdMc02,Stas03,SSMN+13,SuFi08,Mart20). Our work shares the goals of increasing engagement, belonging, and persistence, but we add in the hope of building and enhancing a JEDI mindset.

LLC Specifics

At the University of Denver (DU) we have an umbrella organization for our LLCs. Before this year we had five LLCs: Innovation and Entrepreneurship, International, Social Justice, Wellness, and Environmental Sustainability. This year we are piloting a new JEDI Technology Ethics LLC. Our LLCs normally have 22 - 32 students depending on the dormitory in which they are housed. Students in an LLC take a year-long 2 credit per quarter LLC curriculum; thus there is a significant academic component as well as co-curricular and social-oriented activities. There is a scheduled 2-hour class each week for 30 weeks (10 weeks per quarter). We note that for this initial offering of our JEDI Technology Ethics LLC, we only have 2 quarters of the academic component. Each LLC has a faculty director who is in charge of the overall LLC, including development and teaching of the course curriculum. In some LLCs one of the three quarters may have an adjunct instructor for the quarter, and guest speakers are common. In addition to the faculty director, there is a program coordinator who helps propose and schedule co-curricular and social activities.

Course Content / Format

Our Living and Learning Community (LLC) course meets once a week for an hour and fifty minutes. To ensure thoughtful and respectful discussion on likely uncomfortable topics, we started the class with a discussion on ground rules. Perhaps because this course is not required and students self-selected into the LLC, all were very receptive to the ground rules and we have never experienced any issues with respect in our discussions. All but one of the students live together on the same dorm floor which we believe engendered additional respect among the students. After going over the ground rules, we all watched the TedX video by Ms. Boulamwini on algorithmic bias in facial recognition software. Each student was then asked to respond to various

questions, focusing on justice, equity, diversity, inclusion and ethics. This initial response was done individually and entered into canvas ensuring full participation. We then placed students in small groups (2-4 people) to discuss their answers. Lastly, each group then presented key responses to the class which led to a class-wide discussion.

This modified pair-share model was used for repeatedly throughout the course: a) individual reflection/response, b) small group discussion, and c) groups reporting to the whole class and class discussion. The model promotes inclusion by ensuring all have an opportunity to reflect and express opinions.

During our second class we formally introduced ethics frameworks. This introduction involved pre-reading and in-class exercises where consequentialist theories (utilitarian, egoistic, and common good), non-consequentialist theories (duty-based, rights, fairness/justice, and divine command), and agent-centered theories (virtue, and feminist) were discussed and used. This approach led to the subsequent use of three basic ethical frameworks: consequentialist, duty and virtue. We then asked the students to consider a new aerosolized vaccine which could be spread in the air in a specific geographic area. Based on the various ethical frameworks, they discussed whether this vaccine should be utilized. We had them argue both sides (pro and con).

In subsequent weeks, we discussed gender salary data/inequity (we had our engineering/science librarian first show the students how to use DU's research tools to ensure they had access to needed data/facts), impacts of social media, race and technology impact on financial equity, hidden data set bias, power and resources, and technological failures based on lack of diversity of design teams. Our lectures were almost always supplemented with relevant videos. For example, we used several from the Vox Explained series (gender pay inequality and race wealth inequality for examples), TED talks, and "The Social Dilemma". We also had the students design activities that could be used in future engineering and computer science courses to better infuse JEDI principles throughout our curriculum – as opposed to just impacting the relatively few students who opted into this LLC.

During the second and final 10 week quarter, we brought in several guest speakers. We had our Dean, Dr. Michelle Sabick, speak on JEDI-Ethics issues related to biomechanics. Professor Kerstin Herring spoke on robotics and policing. Professor Chris Reardon spoke on military robotics. We then brought in University of British Columbia Professor Dr. Elisabeth Ormandy to speak on the topics of animal research and genetic modification. Based on student feedback at the end of the first quarter that they felt we did not go into sufficient detail on most topics, we created a term project where students would choose a JEDI-ethics topic of their choice (either individually or in teams of 2) and produce a 6-10 page paper which describes the issue/problem (requiring that it have a technological aspect), details why there is an injustice/inequality issue, discusses who is or is likely to be impacted, references supporting papers, and provides some possible solutions. This last item on solutions was another common

comment from students after the first quarter. Students wanted to see more solutions. Don't we all!

ABET Context

Note that ethics is already a required component for any ABET accredited engineering program. As part of the old ABET a-k criterion, student outcome 'f' required 'an understanding of professional and ethical responsibility.' Starting in the 2019-20 accreditation cycle, this student outcome was replaced with SO4: 'an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.' On the computer science side, ABET student outcome 4 requires that students 'recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.' While both thus mention ethics, there is less explicitly stated about justice, equity, diversity and inclusion. Engineering student outcome 4, as stated above, implicitly covers some, and student outcome 5 covers functioning effectively on teams to create a collaborative and inclusive environment. And student outcome 2 promotes the ability to produce engineering solutions that consider public health, safety, and welfare while considering global, cultural, social, environmental, and economic factors. There is no such equivalent in the ABET computer science student outcomes.

Evaluation

At the end of the first quarter, we surveyed the students to find out which topics and classes were perceived to be of the most value to them. In this section we present a few results. Note that we had 11 survey responses and only 10 students, so, we can only conclude one of the students took the survey twice. We also note that these results are not statistically significant, but do provide some initial insight into student reactions to the material.

In the survey we asked students to rank seven class topics from "most important" to "least important", where 1 denotes most important and 7 denotes least important. We also asked students to rank the same 7 topics from "most useful to you" to "least useful to you". In the following table we show the mean scores and standard deviations. As can be seen the students found the general topics of racism and gender inequity to be more important than our formal ethical model, a course dedicated to exploring technology demographic data, and an open-ended assignment/class to devise a classroom assignment that infused DEI concepts into a technical class. We conjecture the "design a project" class may have suffered from being too open-ended and hence too high of an expectation placed on the students. In general, we see a correlation between "important" and "useful to you" with two notable exceptions. The students ranked the ethics presentation "useful to them" but not "important", and conversely the students ranked the racism in technology class as "important" but not particularly "useful" to them. We conjecture that the students ranked the racism in technology class

as less useful to them as they had already considered this topic, whereas the ethics course became more useful as they were not as familiar with the topic.

Topic	Mean "Important"	Std Deviation	Mean "Useful"	Std Deviation
Racism in face recognition software	3.22	1.99	3.30	2.05
Ethics presentation and application of ethics exercise	5.00	1.56	3.50	1.50
Gender demographics in technology	4.78	1.23	4.60	1.62
Gender pay inequity	3.56	1.07	3.80	1.25
Racial pay inequity and AI decision making financial impact	3.44	2.22	3.50	2.01
Racism in technology (the youtube video and exercises that covered automatic image cropping, health care decision automation, and the power of who gets to decide what gets made in tech)	2.56	1.50	3.80	2.18
Designing a lab/project that infuses racism/sexism awareness into the technical curriculum	5.44	2.22	5.50	2.20

The end of quarter survey for the first quarter also asked an open-ended question of, "During the quarter we focused on the intersection of technology with sexism and racism. Do you feel the class expanded your knowledge in these areas? If so, how so?"

The students' response are provided here verbatim:

- Yes, while I knew a lot about the issues, this class provided me with lots of specific examples.
- I do not feel that i learned anything new and everything was just review.
- It did expand my knowledge in these areas because I hadn't taken a class that solely focus on topics like these.
- Yes, I learned a lot more about how these issues exist and how technology can cause them. Although some of it was intuitive and as a class and we had limited diversity in class, some of our conversations were interesting.

- Yes because it brought to light how racism can be automated even with good intent or just simple neglect.
- It gave me statistics that I didn't have before, but honestly I did not learn anything new conceptually. I wish I learned more about ways to fix these issues.
- Yes. I feel more informed on systemic racism and sexism.
- not really? there were like use cases but most of it was fairly shallow. i enjoyed hearing the opinions of others.
- I feel like the class expanded my knowledge slightly. I had heard about most of the issues but not really gone in depth. The class forced me to go more in depth.
- I feel like I already knew about these issues. I'd say it reinforced my ideas, but didn't expand my knowledge.

In general, it appears that most students felt the course did expand their knowledge. In part based on these responses, we plan to refine the course next year by going into more depth.

Conclusions and Future Work

Based on student evaluations, assignments, and surveys, it appears students are finding the course to be valuable. The current quarter will end before the next paper submission deadline allowing us to add end-of-course survey results. In those surveys we plan to drill down more into how the LLC component did or did not enhance their learning and sense of belonging.

Initial results have affirmed our decision, and our school plans to continue offering this LLC next and subsequent years. For next year the LLC is being promoted from “pilot” to “regular offering” and, hence, we have begun recruiting as part of our normal LLC recruitment process. We plan to admit 22 students into our LLC next year. It is our hope that the JEDI Technology Ethics LLC “graduates” will become DEI ambassadors among their peers. The number of JEDI Technology Ethics LLC graduates will increase as we build out new cohorts over the next three years. We expect the deeper exposure to JEDI concepts will afford these students the confidence to speak up and engage in DEI issues as we expand infusion of DEI content into our technical curriculum over the next few years.

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