Towards a More Inclusive Curriculum: Opportunities for Broadening and Diversifying Computing Ethics Education

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Abstract

Computing ethics instruction is a vital aspect of the undergraduate computing curriculum. It has received greater focus in recent years driven in part by concerns about the societal impacts of computing technologies such as social media and artificial intelligence. The increased attention provides an opportunity, even an imperative, to examine and rethink common practices. To support our understanding of current practices in computing ethics education, we surveyed 318 computing educators in the United States (U.S.), including 56 who have never taught ethics. The survey included questions about ethics teaching methods and challenges the instructors confronted. We show that ethical frameworks are frequently taught yet teaching them is regarded as one of the least important learning outcomes, and that respondents largely do not consider author demographics when selecting readings for their ethics classes, which could limit the diversity in perspectives present in the course. We conclude with recommendations for improving teaching methods, materials selection, and deployment strategies in computing ethics education, and discuss their implications for promoting more inclusive computing ethics education curricula in the U.S.

CCS Concepts

• **Social and professional topics** → **Computing education**;

Keywords

CS ethics, ethics, computing education, equity, justice

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1 Introduction

Computing ethics conveys crucial information about what it means to be a computing professional. It has an overarching focus on the impact computing has on society and can include ethical theories like Utilitarianism as well as applied ethical topics like privacy and misinformation [11]. Computing technologies have an enormous societal impact; for example, in the first quarter of 2024 in the U.S. alone, there were deepfakes of U.S. President Biden encouraging New Hampshire voters to skip voting in the presidential primary [15], a new law in Florida restricting social media for children under 16 [31], and a lawsuit against Apple claiming the company created a smartphone monopoly [34]. As such, computing ethics education is foundational for computing students, many of whom go on to become employees in the technology sector.

Approximately once a decade, the major computing organizations the Association for Computing Machinery (ACM) and Computer Society of the Institute of Electrical and Electronics Engineers (IEEE-CS) jointly create curricula guidelines for computer science. The 2023 guidelines were also written jointly with the Association for Advancement of Artificial Intelligence (AAAI) [1]. The 2023 version of the ACM/IEEE-CS/AAAI Computer Science curricula guidelines reflect an acknowledgment of the profound impacts that computing can have on people's lives. The 2023 version renamed the ethics-related portion of the curriculum from "Social Issues and Professional Practice" to "Society, Ethics and Professionalism (SEP)" and, significantly, added topics in SEP to *every* substantive knowledge area, emphasizing the importance of ethics across the computing curriculum. About the change, the authors of the curricula guidelines write, "Given that the work of Computer Science graduates affects all aspects of everyday life, Computer Science as a discipline can no longer ignore or treat as incidental, social, ethical and professional issues" [1].

The new guidelines come at a time when ethical issues in computing are increasingly attracting public attention in areas such as AI and social media. Yet, a 2022 study found that in a survey of 128 students in computing or engineering programs, students' attitudes toward social responsibility "remain stagnant" as they proceed through college, rather than increase [8]. This insight is similar to findings from other research that shows engineering students' concern for public welfare declined during their undergraduate program [5]. Considering these findings, there is a need to critically review ethics curricula and pedagogical approaches.

The increased attention on ethics education provides an opportunity, even an imperative, to examine and rethink common practices. There are numerous opportunities for ethics education to evolve, from changes in the composition or preparation of instructors, to adjusting methods of teaching and content, to diversifying the authors and topics featured in the curriculum.

To improve the computing ethics curricula so that it better meets students' needs, we must first understand the current state of computing ethics education, including the perspectives of faculty who are key stakeholders in making change in the curriculum. Toward that goal, we surveyed computing educators on their perspectives toward teaching ethics. This leads us to ask the following research questions:

RQ1. How do computing educators think computing ethics content should be delivered? Who is best suited to teach ethics and with what methods?
RQ2. What do computing educators think should be included in the computing ethics curricula and how well do these topics support desired learning outcomes?
RQ3. What are the challenges computing educators face when teaching computing ethics? Do perceived challenges agree with experienced challenges, and what would help better prepare instructors?

Our study advances knowledge on the perceptions of U.S. computing faculty around ethics instruction relevant to the computing education research and practitioner communities. We conclude with remarks intended to provoke discussion into how computing ethics curricula can evolve to be more inclusive and more fitting for the needs of students as they continue their computing journey.

2 Related Work

There has been an increase in publications on the topic of computing ethics education in recent years [4]. This research includes, among other topics, examples of in-class ethics exercises and assessments [3, 16, 17, 27, 28], models for updating computing programs' curricula to include ethics [6, 10, 12, 24], and lessons learned from teaching ethics [9, 21, 23].

In particular, the interpretation of our results is informed by three papers: two that survey the landscape of computing ethics education from the faculty perspective. These include "What Do We Teach When We Teach Tech Ethics? A Syllabi Analysis" by Fiesler et al. which reviews 115 tech ethics syllabi [11] and "Incorporating Ethics in Computing Courses: Barriers, Support, and Perspectives from Educators" by Smith et al. which surveys 138 higher education computing instructors largely from the U.S. [29], and one systematic literature review by Brown et al. which reviews 100 publications on computing ethics education from the ACM [4]. Of relevance to our study, Fiesler et al. found that most common topics included in an analysis of syllabi were law and policy, privacy and surveillance, and philosophy. They also found that most courses were taught from within either the computer science department or information science department, but the most common degree held by those teaching the course was philosophy [11]. Smith et al. found that those who have a professional network of other educators teaching ethics were more likely to teach ethics themselves, that some respondents who did not teach ethics in their courses did not do so because of "university power dynamics" such as a lack of agency over course design, and that a barrier to including ethics in courses is that some respondents feel computing ethics is not relevant to their course [29]. Brown et al. found that, within prior ACM literature, discussions were a commonly used teaching method, guest lectures were used to incorporate ethics into non-ethics courses, and that a majority of papers mentioned at least one challenge to teaching ethics [4]. In the discussion, we compare our results to these three papers.

Our discussion centers the role equity plays in computing ethics education. In prior work, Vakil states that a justice-centered approach to ethics education would require centering ethics education around power structures rather than the microethics (personal decisions) that might be made by individuals [32]. In a related ACM viewpoints article, he and Higgs write, "In particular, the ways in which computational tools and technologies have multiple, complex, and profound implications for the lived experiences of nondominant communities have been largely ignored... Leaving these power imbalances unexamined precludes deep engagement with issues of equity" [33]. Further, a publication by Wong-Villacres et al. discusses the dominance of Global North ideas in research literature and curricula guidelines for computing ethics education. The authors write, "...[Influential computing curricula] reflect U.S.-European norms and values and do not clearly acknowledge the ethical paradox in assuming these should hold in the Global Souths." They argue that there are multiple ways of viewing ethical practices depending on culture and that teaching about ethics must be "localized" [37]. We discuss how our results can be viewed through a lens of broadening and diversifying computing ethics education in the U.S.

3 Method

We conducted a survey of undergraduate computing educators (faculty and instructors) in the U.S. to understand their perspectives on ethics education, including educators who have never taught ethics. The survey was conducted via Qualtrics between December 2022 - April 2023. We recruited participants through email lists available to the authors and our project's advisory board, such as lists for faculty at specific universities and lists targeting specific groups in computing. One of our goals was to oversample educators of color and educators who teach at Minority Serving Institutions (MSIs), although ultimately we did not obtain a sufficient sample size to perform statistically significant comparisons between those groups and white educators from non-MSIs. The recruitment email stated, "The aim is to better understand how ethics is and should be taught in the undergraduate computing curriculum," which could have led to a self-selection bias toward educators with an interest in computing ethics education.

We defined computing generally, including educators in computer science as well as other computing disciplines such as information systems or software engineering. Participants were encouraged to complete the survey through a gift card raffle. The study was approved by the authors' Institutional Review Board (IRB). Our data was analyzed through descriptive statistics.

3.1 The Survey

The survey included the following definition of computing ethics: "In this survey, we define ethics broadly to include responsible computing and societal implications of computing. For example, we define ethics to include topics such as algorithmic bias, privacy, and universal design." Participants were then asked if they have "ever taught an undergraduate computing course that had at least some coverage of ethics." The survey branched to show different questions to those who had and had not taught ethics, with a larger question set shown to those who had.

Questions for those who had experience teaching ethics included: how many times they had taught a course with ethics content, the topics covered, teaching methods used, a ranking of possible learning objectives, approaches to reading selection, and ethics resources that would be helpful. Those without experience teaching ethics were asked why they did not teach ethics. Questions for all participants included: how long they have taught undergraduate computing, why they believe others do not teach ethics, who they believe is best suited to teaching ethics, whether ethics should be taught as a standalone or integrated course, demographics questions, and space for additional comments. All questions reported in this paper were multiple choice (close ended). Questions were reviewed by our advisory board before sending the survey to participants.

3.2 Participants

318 participants responded to the survey; 82.4% (n=262) had experience teaching ethics prior; 17.6% (n=56) did not. A vast majority of respondents were white (72.1%, n=189) and not Hispanic or Latino (83.9%, n=219). Additional demographics are shown in Table 1.

Our data represent educators teaching both standalone and integrated ethics. Standalone ethics is a course specifically focused on ethics content; integrated ethics is a course with ethics content that is contained in, or integrated into, an otherwise non-ethics course. 27.5% of our respondents teach standalone ethics, 72.9% teach integrated ethics, and 5.7% teach ethics as a guest lecturer in another educator's course (participants could select all that apply). While we cannot argue this is fully representative of U.S.-based computing educators on the whole, our study presents the largest surveyed sample of computing educators focused on the topic of ethics education to date.

Because no question was required, not every question had the same number of respondents. We report out the response numbers on a per-question basis.

In the remaining sections, we provide results from our survey, examining course structure, course content, and challenges to including ethics. We then discuss implications from the data with a focus on broadening computing ethics education and compare our results to prior literature.

Category	Demographic	n (Percent)
Tenure-Track	Tenure-Track Faculty	160 (60.8%)
	Non-Tenure Track Faculty	77 (29.3%)
	Non-Faculty Instructor	26 (9.9%)
Age	18-34	32 (12.4%)
	35-54	124 (48.1%)
	55-74	96 (37.2%)
	75+	6 (2.3%)
Gender	Male	153 (58.6%)
	Female	90 (34.5%)
	Non-binary/Self-described	4 (1.5%)
	Prefer not to disclose	14 (5.4%)

Table 1: Selected participant demographics.

4 Results

4.1 Instruction Approach

We asked respondents whether ethics should be taught standalone, integrated into other courses, or both. Respondents most often (57.1%, n=153) selected that ethics should be taught in *both* a standalone course and integrated throughout the curriculum, with ethics taught at multiple touchpoints. 25.4% (n=68) thought ethics should be taught integrated into other technical courses and 13.8% (n=37) thought computing ethics should be taught only as a standalone course. Although teaching ethics as both a standalone course and integrated into the curriculum requires more time dedicated to ethics, participants still selected this option as the most preferred.

Additionally, we asked respondents who would be best to teach computing ethics, whether that be a computing educator or someone outside of the department. 72.4% (n=178) stated that they think a team from multiple disciplines would be best. This could look like a team of faculty from computing and another discipline, such as philosophy. The second-most common response (23.2%, n=57) was that computing faculty should teach computing ethics. The third and least preferred option (4.5%, n=11) was that only faculty from outside of computing should teach ethics.

At the course level, we asked participants with ethics teaching experience which teaching methods they used. The top six methods used were 81.5% (n=176) discussion, 80.1% (n=173) lecture, 55.6% (n=120) case studies, 42.6% (n=92) paper assignment involving ethical reflection, 36.7% (n=79) activities involving the application of one or more ethical theories, and 27.3% (n=59) debate.

Participants who chose more than one teaching method were asked to select which one they thought students found the most engaging. Discussion was selected the most often, with 39.1% (n=75) of participants selecting this as the most engaging. The second-most selected teaching method were case studies, with 17.7% (n=34) of participants selecting this as the most engaging. Notably, only 5.2% (n=10) of participants selected lecture as the most engaging method, despite it being the second-most used method.

4.2 Course Content and Learning Outcomes

Our survey also explored what ethics-related learning outcomes participants think are most important for computing students. Participants with experience teaching ethics were provided with a list of six learning outcomes and asked to rank them in order from most important (6) to least important (1). Figure 1 shows the mean scores for each learning outcome. We see that the most important learning outcome is the "awareness of potential positive and negative impacts of computing on society" but the least important outcome is "knowledge of ethical theories."

Figure 1: Mean rank of the given learning outcomes.

However, we also found that over half (56.8%, n=125) of respondents cover ethical frameworks / theories. The top five ethical frameworks selected were Utilitarianism (61.6%, n=77), Deontology (52.8%, n=66), Virtue Ethics (46.4%, n=58), Social Contract Theory (40.8%, n=51), and Moral Relativism (35.8%, n=46). Only 24% cover Ethics of Care (n=30) and 14.4% (n=18) cover Non-Western Ethical Views.

Breaking down the data based on responses to other questions, we found that 85.7% (n=54) of participants who primarily teach standalone ethics selected that they teach ethical theories, but only 51.8% (n=86) of participants who primarily teach integrated ethics selected that they teach them. Of those who teach ethical theories, only 35.2% (n=44) ranked knowledge of ethical theories as one of their top three learning outcomes.

In terms of applied ethics, the top five topics educators cover were bias, including algorithmic bias (70.3%, n=156); privacy / surveillance (64.4%, n=143); diversity, equity, and / or inclusion (56.6%, n=126); disinformation / misinformation (52.7%, n=117); and access to technology (51.8%, n=115). Cybersecurity was originally offered as a choice, but it was removed from this analysis due to not meeting our definition of ethics topics.

When asked about research ethics, 59.1% of participants stated that they cover research ethics in their course(s) (n=124). This did not appear to differ depending on if the instructor primarily taught using a standalone course or integrated ethics into their courses; 58.7% (n=63) of those who primarily taught ethics in a standalone course also taught research ethics, and 54.8% of those who primarily taught using the integrated ethics approach did so. The most popular topics include data management (34.8%, n=73), responsibilities of researchers to society (25.2%, n=53), human subjects research (24.8%, n=52), authorship and publication (22.4%, n=47), and conflicts of interest (22.4%, n=47).

Reading selection is an important aspect of course content at the university level. To gauge how participants consider selecting these readings, we asked those who have taught ethics to speculate on how they might select readings to construct a novel ethics syllabus. We asked them to what extent certain information might positively factor into their reading selections. The options were “not at all,” “somewhat,” “to a small degree,” and “to a large degree.”

Figure 2 shows the percent who responded to each option, including dotted lines to indicate the median clustering. We see a divide in what matters to participants in reading selection based on the median scores (at the 50% mark on the chart). The categories which represent the author’s personal demographics, including the author’s political views, location / region, race / ethnicity, gender, and sexual orientation matter less in reading selection and those that do not represent the author’s personal demographics, including the recency of the reading and the author’s field / discipline matter more.

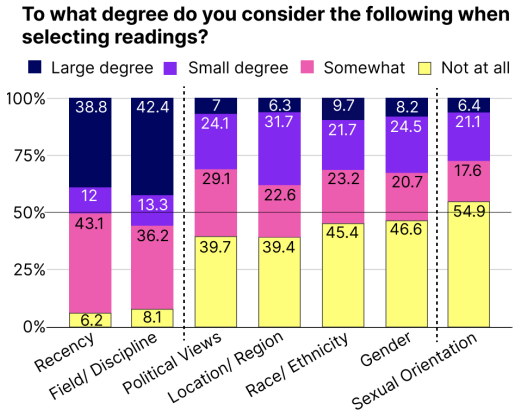

Figure 2: Percent who selected each option.

4.3 Challenges to Including Ethics

Participants did not include ethics in their courses for a variety of reasons. The most commonly selected were: "There is limited flexibility in course content" (56.5%, n=26), "Ethics should be covered in other courses" (45.7%, n=21), "My lack of familiarity with ethics" (32.6%, n=15), "Teaching ethics requires a substantial time commitment" (23.9%, n=11), and "Departmental culture; there are not sufficient rewards or incentives to teach ethics" (19.6%, n=9). Only 1 participant selected that ethics is not relevant to computing. Only 19.6% (n=9) selected both of the top two options, indicating that an educator usually does not hold both opinions simultaneously.

Additionally, we asked all respondents why they think their *colleagues* don’t teach ethics. Those who do not teach ethics ranked the responses in the same ordering as they ranked why they themselves do not teach ethics. However, respondents who do teach ethics ranked responses slightly differently. The top five responses for why they believe their colleagues don’t teach ethics were: "Their lack of familiarity with ethics" (51.5%, n=106), "There is limited flexibility in course content" (47.6%, n=98), "They don’t see ethics as important as technical content" (47.1%, n=97), "They think ethics should be covered in other courses" (43.7%, n=90), and "Teaching ethics requires a substantial time commitment" (39.3%, n=81). The largest difference between those who have experience teaching ethics and those who do not is “They don’t see ethics as important as technical content” (47.1% for those who teach ethics vs 28.6% for those who do not). This indicates that although respondents who do not teach ethics tend to report doing so more often for structural

reasons as opposed to believing ethics is not important, those who do teach ethics hold the idea that believing ethics is not important is a major cause for others to not teach the topic.

Seeking to understand what help may be needed to teach ethics, we asked participants who have taught ethics what resources would help them include additional ethics content. The most selected resource was case studies or other active learning activities (86.7%, n=189). The other choices were sample assignments and grading rubrics (69.7%, n=152), a network of colleagues that has experience teaching computing ethics (49.1%, n=107), and sample course syllabi (44.5%, n=97). Notably, only 7 participants (3.2%) selected "None: I have the resources I need," indicating a desire for more assistance in teaching ethics content.

5 Discussion

We first compare our findings to those from prior literature. Then, motivated by our results, we discuss the need to diversify ethics syllabi and question the necessity of teaching ethical frameworks. We also offer recommendations and consider limitations.

5.1 Comparison to Prior Literature

Our survey reflects on some of the same topics as prior literature in the computing ethics education space. Here, we discuss how our results compare to this literature.

First, Smith et al.'s survey of higher education computing instructors showed that 72% of their respondents *disagree* that ethics should be taught by faculty outside the computing department [29]. Our results validate this finding in that we found only 5% of respondents thought that only faculty from outside computing should teach ethics; however, our results provide more nuance compared to Smith et al.'s in that 72% of our respondents thought that ethics should be taught by a team from multiple disciplines. Brown et al. found that prior literature frequently used guest lectures as a method for multidisciplinary support in teaching ethics [4]. This may be one way to teach ethics through a multidisciplinary approach without requiring co-instructors, which can be logistically challenging in the university setting.

Regarding pedagogical method, we found that discussion was the most commonly used teaching technique and lecture was the second-most common. This mirrors the most and second-most common techniques found in the systematic literature review by Brown et al. [4]. Additionally, we found that 57% of our respondents who teach ethics reported covering ethical theories. Similarly, Fiesler et al.'s syllabi analysis similarly found that 53% of surveyed syllabi covered ethical theory with the same top four theories covered [11]. Brown et al. note in their systematic literature review that there has been no mention of non-Western ethical theories or ethics of care in ACM-published ethics research [4]. While we found quite limited instruction of those ethical theories (14% of our respondents who teach ethics teach non-Western theories and 24% teach Ethics of Care), some educators are teaching non-dominant theories.

Both our study and Fiesler et al.'s syllabi analysis show that privacy is a commonly covered topic in ethics instruction. Privacy & surveillance was the second-most covered topic in the syllabi analyzed, and our respondents also marked privacy as the second-most covered topic. However, law & policy was found to be the top-most covered topic in the syllabi analysis but was ranked in the middle by our participants (11th out of 23 topics) [11]. Given that our data showed more participants who teach primarily standalone ethics teach law than those who teach primarily integrated ethics, the discrepancy between our results and those of Fiesler et al. could be because Fiesler et al.'s syllabi analysis looks largely at standalone tech ethics courses whereas our data strongly represents those who teach integrated ethics.

Our survey shows that 59% of our respondents who teach ethics include research ethics in their course. This finding diverges from Fiesler et a.'s syllabi analysis, which found that only 16 of the 115 (14%) syllabi analyzed covered research ethics [11]. Because we saw little difference in our data between those who taught primarily using the standalone ethics method and those who primarily taught using the integrated ethics method, it is likely not the case that the difference between our findings and those of Fiesler et al. are due to their data being primarily standalone courses. Instead, perhaps those who teach research ethics do not include it directly on their syllabi, which could indicate a limitation of the syllabi analysis method.

In their systematic literature review, Brown et al. found that commonly noted challenges to including ethics were that it is difficult to integrate ethics into technical material, educators often do not have a background in ethics, there are difficulties in instructional design, ethics is difficult to assess, and teaching ethics topics can be "emotionally taxing" [4]. These challenges represent challenges of those who have already committed to teaching ethics whereas ours represent challenges for those who have not already committed to the practice. However, Smith et al. used qualitative analysis to identify challenges for those who do not teach ethics and identified many of the same challenges we asked about [29]. Our research provides quantitative data to understand the extent to which each is a challenge.

5.2 Syllabus Diversification

All students who want to study computing should feel like they belong, yet many still do not feel a sense of belonging in the field (i.e., [19, 30]). One step toward this is the diversification of syllabi, including the centering of not only white, Western ideas and readings but representing a diversity of experiences, similar to the movement toward citational justice in Human-Computer Interaction [7, 18]. This is important for ethics syllabi both outside the U.S. as discussed in [37] and also in U.S. computing classrooms.

For one, author diversity in readings across a syllabus allows students to see themselves and their cultures represented in the literature they are reading for their courses. Culturally sustaining pedagogy "requires that they [our pedagogies] support young people in sustaining the cultural and linguistic competence of their communities while simultaneously offering access to dominant cultural competence" [22]. Diversifying the reading list is one way to begin representing a diverse student body's cultures in a way that supports culturally sustaining pedagogy and works toward educating all students in cultural competence [36].

In addition, because computing ethics involves educating students on the impacts of computing on society, they must also be taught that the negative impacts of computing are not shared

equally; people of color, women, those in the Global South, the LGBTQ+ community, and others who are marginalized endure the most significant negative impacts (i.e., [2, 14, 25, 35]). One way to teach these impacts is through first-person accounts by those who are marginalized, as is done in narrative ethics [13]. Including first person accounts of computing's impacts by those who are marginalized shows students that these issues are important.

Our results indicate that this is not how ethics is taught currently. Our survey showed that participants rarely consider author demographics such as political views, country, race, gender, and sexual orientation when selecting readings to construct an ethics syllabus. Respondents were more likely to consider attributes unrelated to the authors' personal demographics than those related to personal demographics. This is likely a well-intentioned decision, yet inadvertently limits the education of students on the full impacts of computing on society. In "Shifting Frames: Pedagogical Interventions in Colorblind Teaching Practices," Reynolds writes, "Understanding that malice is not required to create differential outcomes helps educators to recognize that good intentions alone are not sufficient to create equitable and inclusive learning environments," reminding us that active desire to do harm through educational practices is not a prerequisite to doing so, nor is a desire to make change on its own sufficient without action [20].

We call on ethics educators to consider authors' personal demographics in first-person narrative reading selections going forward.

5.3 Should We Teach Ethical Frameworks?

Our study shows that a majority (56.8%) of respondents who teach ethics teach ethical frameworks such as Utilitarianism, Deontology, and Virtue Ethics. Yet, knowledge of ethical theories was rated, on average, as the *least important* learning outcome for students out of six options.

This data shows a dissonance between what educators teach and what they value as a learning outcome. Although educators may believe all six of the learning outcomes are important, ethical frameworks' consistently low rating shows that it is considered less important than the others. Instead, educators may be teaching ethical frameworks because they feel they cannot change the curriculum or because it is part of the textbook. Future research should seek to better understand why educators continue to teach ethical frameworks and if they have value for students' ethical reasoning.

If research does show that ethical frameworks are an important part of the computing ethics curricula, the frameworks that are being taught need to be diversified as in the above section. Our results show that educators are primarily teaching Western ethical frameworks; only a small minority (14.4%) of our participants teach non-Western ethical frameworks. These practices reinforce the idea that Western philosophy is the only right way to consider ethical decision making. Instead, if ethical theories are an important part of the ethics curriculum, the set taught should include diverse ethical theories such as Confucianism or Indigenous frameworks. This recommendation was also made in [4] and in the 2023 ACM / IEEE / AAAI curricula guidelines, which state, "Effort must be taken to include decolonial, indigenous, and historically marginalized ethical perspectives whenever possible" [1].

5.4 Recommendations for Improved Ethics Instruction

In addition, our survey provides ideas for ways to improve ethics instruction. One area of improvement may be in leading classroom discussions. Educators in our study reported that classroom discussion is the second most common method for teaching ethics. However, limited research has been published in the computing ethics space on the best ways to engage students in discussion, and one 2005 SIGCSE TS paper offered the insight that discussions are difficult to implement and assess [26]. For educators who feel they have a lack of familiarity with ethics content, a lack of familiarity with the discussion format may provide an additional barrier to teaching ethics in their courses. To overcome this barrier, universities should offer professional development for educators around how to lead discussions in a productive and engaging manner, including how to deal with challenging topics as they arise.

A second recommendation is to increase and improve the active learning activities that are available for educators to use in their own classes. Although many do exist (for example, [17, 27]), there is still a strong need as evidenced by the 87% of respondents who selected that these resources would help them include more ethics in their courses. Currently available resources need to be better advertised, and additional resources, such as those that can be integrated into more advanced courses like operating systems or networking, should be created and shared. These resources should be easy to use out-of-the-box to make it simple for educators to integrate ethics into their existing courses [17].

5.5 Limitations and Future Research

Surveys inherently carry sampling bias. Our survey was most likely biased toward educators who already perceive ethics instruction to be important, as indicated by the fact that 82% of participants have taught ethics and only six participants expressed that they do not think ethics needs to be taught. Additionally, there may be bias in the sample due to distributing our survey through our network.

Finally, our research aimed to oversample educators of color or educators who teach at MSIs and compare their responses to educators at non-MSIs. However, we were unsuccessful in obtaining a large enough sample to run statistically significant analysis on this comparison. We pose understanding the ideas and perceptions of these educators as an important question for future research.

6 Conclusion

This paper presents a survey of 318 computing educators in the U.S. about their opinions on computing ethics. We found that despite the importance of first-person narrative in ethics courses, participants barely consider authors' personal demographics when selecting course readings and that despite ranking ethical frameworks as the least important learning outcome, a majority of educators teach them. With the increased public concern about the impact computing technologies have on society, we must consider how to update ethics instruction to improve student learning.

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