

Public Interest Technology University Network Challenge Grant: Evaluating and Assessing Tech Ethics Education

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Narrative Report (in partial fulfillment of Final Report)

Goals and objectives, with results achieved

Our project had three original objectives: 1) understanding Public Interest Technology (PIT) pedagogies with the goal of improvement; 2) producing new test tools to evaluate approaches to teaching PIT-related ethics; and 3) testing the hypothesis that alignment between instructors and learners promotes learning in PIT contexts. In the present study, the research team was able to make significant advances in regards to the first two goals, and to gather evidence that can be used to inform and shape future studies aimed at testing the hypothesis outlined in the third objective. First, we refined and expanded survey instruments and an interview protocol that can be used to understand instructor and student perceptions of ethics education. Second, we utilized these instruments to evaluate the efficacy of PIT ethics education at three research sites. Furthermore, our study investigated two modes of Computer Science and Engineering ethics education: a) traditional, standalone ethics courses offered in an East Coast R1 public institution; and b) the Embedded EthiCS (EE) program¹ provided at East and West Coast R1 private universities, where short ethics modules are added to core Computer Science courses.

The novelty and import of the present study, in short, is two-fold. First, it approaches the evaluation of both instructional models innovatively, using newly developed survey instruments that allowed us to understand how instructors and students perceive the purposes, process, and outcomes of their ethics education. Second, it is one of the first endeavors to evaluate the effectiveness of the EE program along with its most common counterpart, the standalone model.

Due to the various challenges we encountered in collecting data,, we did not gather enough data to test the hypothesis that the instructor-student perception alignment promotes learning (our third objective; see below for a more detailed discussion on the recruitment challenges we encountered). That being said, the data we collected were useful in confirming the utility of our measurement tools, and gave us key insights into how PIT education is perceived by both instructors and students of different types of courses at different institutions. In addition, the data we collected allowed us to identify promising avenues for future research and helped us develop new research questions to advance the scholarly conversation on public interest technology and ethics education.

Below, we will discuss 1) the reasons we decided to focus on student-instructor perceptions of alignment as the proxy of pedagogical efficacy; 2) the survey instruments utilized to assess public interest technology education in our partner sites; 3) our samples and

¹ The Embedded EthiCS (EE) program is a multi-departmental project to embed ethics modules into multiple undergraduate CS courses to habituate students to think about the ethical dimensions of their future technical profession. Thus, by embedding ethics modules into several key CS courses, the EE program makes it inevitable for students to encounter ethics materials multiple times during their program completion.

methodologies; and 4) a summary of the key findings. Then, in the following subsection, we address challenges we faced and the lessons we learned from them.

Measuring Instructor and Student Perceptions

Heretofore, research has traditionally equated the efficacy of ethics instructions with an increase in students' moral reasoning skills measured via tools such as James Rest's Defining Issues Test (Rest et al., 1997; Schlaefli et al., 1985). There are, however, limitations in construing the success of ethics education in such a manner. Most importantly, the instructors of ethics education themselves may not perceive enhancing students' moral reasoning skills as a top goal of their instruction. As our study suggests, instructors often have multifaceted, diverse goals for their classes, and evaluating them only in the development of students' moral reasoning capacities would not amount to assessing the quality of the ethics instruction. Thus, there is a need for a way to assess the efficacy of ethics education that is sensitive to instructors' intentions.

Furthermore, research indicates that students learn best when instructors align teaching and learning activities with clear educational outcomes (Biggs, 1996; Squires, 2012). When students share this clarity of purpose, they demonstrate greater motivation (Stamov-Roßnagel et al., 2020), better study habits (van der Meer, 2012; Wong et al., 2014), and higher achievement (Deslauriers et al., 2019).

Yet, a shared understanding of the methods and goals may be challenging to attain in the context of ethics education. Matchett (2008) observes that the purposes and appropriate venues for ethics education are often poorly understood or articulated by both faculty and students in higher education. This is corroborated by studies in multiple disciplines noting discrepancies between faculty and student perceptions of ethics education (e.g., Adkins & Radtke, 2004; Holsapple et al., 2012).

Establishing a clear alignment of teaching methods and goals is especially important when ethics education is embedded within STEM-oriented courses, where students may not expect to encounter the more humanistic methods associated with ethics and may not clearly understand the intended learning outcomes (Grosz et al., 2019). These considerations suggest that an adequate assessment of STEM ethics education would be better achieved by investigating the degree to which students share instructor intentions.

The ILTS and SPEL Surveys: New Assessment Tools

To evaluate instructor and student perceptions of public interest technology education, we asked instructors and students at three higher educational institutions to complete two surveys. First, the instructors received a modified version of the Instructor Learning Theory Survey (ILTS; Kidd, Miner, Schein, Blauw, & Allen, 2020), a survey instrument that asks instructors to identify the materials, activities, class climate, forms of engagement, and outcomes most important to their course.

Though it shares features with other surveys aimed at teaching methods (e.g., Trigwell & Prosser, 2004; Watts & Becker, 2008), the ILTS was specifically designed to elicit the often implicit logic underpinning instructors' pedagogical strategies (Shulman, 1987), as well as to

clarify how ethics education supports human flourishing in personal, civic, and professional life (Allen, 2016).

The ILTS we used in this study has five major sections. In each section, instructors are asked to identify the three most essential items for their teaching from lists of common items. The first section of the ILTS asked the instructors to indicate 1) the materials important to their ethics instruction in their course (e.g., case studies, philosophical readings); 2) the activities essential to their ethics instruction (e.g., class discussions); 3) the skills and capacities they expect their students to engage in their course (i.e., cultivation; e.g., analyzing ethical issues); 4) the ethics-related capacities or skills they hope their students take away (i.e., learning outcomes; e.g., cultivating one's moral imagination.); and finally 5) the primary developmental domain in which they think their course is most likely to foster (civic, existential, or vocational).

This ILTS was supplemented by a similar survey administered to students, the Student Perceptions of Ethics Learning survey (SPEL; Kidd et al., 2020). The SPEL was designed to prompt students to reflect on their own learning to report the materials, activities, cultivations, learning outcomes, and developmental contributions of the course and evaluate the alignment of instructor and student perceptions.

We have included the updated ILTS, SPEL, and interview protocol in the accompanying Final Report document that details our intellectual property created through use of our grant funds.

Research Overview

To measure instructors' and students' perceptions of ethics instruction at our three target institutions, the present study utilized two parallel research methods. First, we used quantitative methods (i.e., the ILTS and SPEL surveys) to gather information from instructors and students about course materials, activities, learning experiences, outcomes, and anticipated long-term developmental effects.

Second, qualitative interview analysis was used to gauge students' understanding of ethics, their career goals, their views of how ethics relates to their career goals, and their impressions of the overall institutional approach to ethics. Instead of mechanically covering the topics listed in the protocol, we employed a more conversational, "empathy-guided" approach rooted in design thinking to elicit rich participant responses. This method allowed the participants to spontaneously bring up any points or topics that they believed were important, which further supplemented the student survey responses.

Combined, these two methods provide a focused picture of experiences at the classroom level and a broader, more exploratory overview of how students understand and engage with ethics beyond a single course.

We conducted the study at three institutions: A private R1 university in New England, a public R1 university in the Northeast, and a private R1 university on the West Coast. Courses that utilized the EE model were selected at the two private universities. At the public university, the core ethics course with multiple sections for engineering majors was selected as the most relevant standalone course based on consultation with local experts.

Across both the Spring and Fall 2021 semesters, we collected 41 instructor responses to the ILTS (roughly equally distributed across institutions), 544 student responses to the SPEL (mostly from the private R1 West Coast institution in our study), and we conducted 59 student interviews (roughly equally distributed across institutions).

Although we were not able to gather enough data to run inferential statistical tests, and therefore we were unable to run quantitative analyses on the alignment between instructors' and students' perceptions, our quantitative and qualitative analyses revealed a number of important observations. For reasons of space, we report two of our key findings — one from the ILTS and the other from the student interviews — alongside insights that may be relevant to public interest technology. For a more comprehensive overview of results, please see our article, *The Alignment of Instructor and Student Perceptions of Ethics Instruction in Embedded Ethics Programs and Standalone Courses*, appended below.

Finding 1: Instructors See Learning Ethics as a Matter of Developing Social and Personal Skills While Students Understand Ethics Education as a Tool to Cultivate Primarily Personal Skills

In one section of the surveys, instructors and students were asked to identify what they considered the three most important outcomes for their learning from a list of 20 commonly used learning outcomes (for a list of the outcomes see Kidd et al., 2020).

Both instructors and students identified two learning outcomes among their three most important ones: *Bring an ethical orientation to one's personal, professional, and/or civic life*; and *Critically evaluate the perspectives of multiple stakeholders*. These learning outcomes are important for two reasons. First, neither can be readily linked to measures backed by formal evidence supporting their valid use for classroom and research purposes. Second, these two items selected by both students and instructors are closely tied to priorities in STEM ethics education and the concept of public interest technology, which calls for practitioners to be sensitive to the broader implications of their work and to incorporate diverse perspectives into their decision-making (Stribling, 2021).

When it comes to these learning outcomes, however, we also observed a significant difference between instructor and student responses. For instructors, the third most important learning outcome—in addition to the two outcomes already mentioned—was: *Being able to engage in dialogue with others about ethical issues*. Taken together, these items bring to the forefront the *social* aspect of what it means to engage in ethics. That is, for instructors, the most important outcomes of their ethics instructions include developing both personal and social orientation to doing ethics.

On the other hand, our survey and interview data show that students deem the outcomes of their ethics learning to be mostly personalized, and not exclusively social. In the SPEL, the most common learning outcome selected by students was *Understand how biases and heuristics can affect ethical decision-making*, followed by the two outcomes mentioned above. This

finding suggests that students predominantly saw their ethics education as a matter of cultivating personal skills, not necessarily social skills.²

Findings 2: Both Instructors and Students See Ethics Education as Relevant to Vocational Development; Only Students See it Related to Personal Development; and Neither Party Recognizes it as Pertinent to Civic Development

In our semi-structured interviews, we observed that there are six major ways in which students frame their learning gains: 1) tech-ethics topics; 2) increase in ethical reasoning skills; 3) increase in ethical sensitivity; 4) dispositional or behavioral change; 5) philosophical concepts; and 6) not being able to recall. It is noteworthy that, unlike the items on the survey, these patterns are not fixed categories pre-selected by the research team but rather a coherent pattern that emerged from students' spontaneous remarks about what they learned or gained from their ethics instructions.

In addition to how students spontaneously report their learning takeaways, we also developed codes to capture what areas of human development (i.e., civic, existential, and vocational) participants deem their ethics education as applicable to. Interestingly, no student from the interviews said that their computer science or engineering ethics education was useful for their civic development.

Overall, students tend to frame their learning in terms of tech-ethics topics covered in class and an increase in their ethical reasoning skills and sensitivity. In addition, students see that their ethics learning is useful for their vocational and personal development. When it comes to the applicability of their learning to their vocational development, some students report that their ethics education helped shape their *career choice*, while others recalled that their ethics education heightened their responsibility as a future technical workforce (e.g., "It's given me a sense of responsibility as someone who may be developing software in the future").

Importantly, a similar pattern emerged from analysis of our survey data, where students and instructors were asked to indicate what they considered to be the most important form of human development for their ethics-related learning. The majority of the instructors (75%) viewed vocational development as the most relevant to their ethics education, while only a few (12%) selected civic development and very few (7%) chose personal development. Forty-three percent of students somewhat agree with their instructors in that they considered vocational development as the most relevant form of human development to their ethics education. However, the weight that instructors and students placed on civic development differs. Whereas only a few instructors indicated that civic development was an important area of developmental goals, students indicated that it is the third most important.

Evaluating Different Approaches to Ethics Education

The ILTS and SPEL surveys supplemented by student interviews revealed areas of student-instructor agreements, but also points of divergence. First, instructors and students of

² It should be noted that "Critically evaluate the perspectives of multiple stakeholders" is different from "Engage with the perspectives of multiple stakeholders." The latter is about socially engaging with others while the former pertains to internally assessing others' perspectives, and thus, to a personal skill, not a social skill.

both the EE program and standalone ethics courses agreed that among the three major areas of human development (i.e., vocational, civic, and existential), vocational development is the most relevant to their class goals. Interestingly, both instructors and students across course types selected civic development as the least relevant form of human development. The perceptions of the relevance of vocational development and, conversely, the lack of relevance regarding civic development were the only areas in which students and instructors of both instructional models showed substantive agreement.

When it comes to existential development, we observed some misalignment; some students from both models indicated that the course was primarily geared toward their existential development, whereas this perception was not shared by the instructors of either model. Overall, students of both course types share the heightened importance of existential development when it comes to their ethics education, while their instructors do not seem to share this perspective.

The surveys and interviews also allowed us to see another important misalignment between instructors and students. Notably, instructors of both pedagogical models expected students to take away both *social and personal* aspects of practicing ethics while students of both models expected their learning takeaways to be primarily personal. Social dimensions of engaging in ethics include actions such as taking stakeholder perspectives into account, engaging in dialogue with others about ethics, and so forth, whereas personal aspects of doing ethics include being aware of one's own biases, developing ethical reasoning skills, etc.

What Does This All Mean for Public Interest Technology Education?

Our findings suggest two key areas of interest for PIT education generally and recommended areas for improvement at the sites we studied. First, both instructors and students do not see their ethics education offered within the context of technical training as civically relevant. This finding seems to pose a critical issue for those who wish to advance PIT education: if we are to cultivate a future generation of technology workers who are committed to contributing to the public interest, it would be imperative to signal to both instructors and students that their ethics education is related to civic concerns.

Second, while instructors seem to understand the nature of practicing ethics to be both personal and social, students primarily see their ethics education to be a matter of developing personal skills such as cultivating ethical sensitivity. The findings that students' perception of learning ethics is mostly personal should also raise concerns for those who share the mission of PIT-UN: presumably, if we are to take the goal of *public* interest technology seriously, we would want to educate students such that they are capable of engaging in ethics *publicly* and, thus, *socially* by being able to engage in dialogue with others about ethical issues.

In summary, our present study revealed the need to make the goals of public interest technology education more explicit such that 1) both instructors and students see their ethics education as a matter of both *vocational and civic* development; and 2) students understand the *social* dimensions of learning and practicing tech ethics.

Summary

The present project was able to accomplish the following two objectives. First, by refining and utilizing the ILTS and SPEL surveys, we were able to expand and refine a novel approach to assessing the efficacy of public interest technology education. Second, as a result of the survey and interview study reported above, we were able to identify two key areas of improvement for public interest technology education.

Challenges Encountered/ Lessons Learned

The present study encountered a few difficulties in regards to data collection.

First and foremost, the present study was conducted during Covid-19 pandemic, which made various aspects of data collection challenging. First, we administered the ITLS and SPEL surveys as well as student interviews across two semesters: Spring 2021 and Fall 2021. In all of our study sites, ethics instruction was delivered online during Spring 2021, while the instructional delivery across the three sites varied during Fall 2021 — the East Coast R1 and West Coast R1 private institution adopted a hybrid model, which allowed students to watch live-streaming of their Embedded EthiCS modules. Our East Coast R1 public university, on the other hand, conducted their standalone ethics courses entirely in person. The varied instructional deliveries during Fall 2021 made it difficult for us to make careful inferences about the nature of the instructor and student perceptions since they may be conflated with the way that the ethics education was conducted.

Second, one of our sites had a Covid outbreak during Fall 2021, which caused a panic among undergraduate students because of the shared living spaces and rendered the survey and interview recruitment extremely challenging.

Third, the structure of the Embedded EthiCS Program often made it difficult to collect data. The primary reason that such difficulties arose was because the ethics modules are often embedded into the last few weeks of a standalone Computer Science course. By the time students finish taking these modules and thus are ready to answer our SPEL survey and participate in the interviews, they were often already inundated with end-of-semester obligations, which worked against our data collection interests.

For these reasons mentioned above, the extent of the data collection was hindered and did not allow us to run analysis using inferential statistics techniques. And because of these limitations and challenges, we were not able to gather enough data to run a study to validate the ILTS and SPEL surveys and establish their validity as a measure of instructor and student understanding of ethics education. We are eager to administer these surveys at a post-pandemic time and at a larger scale so as to afford the ability to refine and establish the validity of the assessment tools, which would serve as an important step toward accomplishing the third goal of our project: testing the hypothesis that alignment between instructors and learners promotes learning.

Finally, the timing challenges outlined above also gave rise to one of the most disappointing shortcomings of our work: Our inability to complete our research work in time to analyze, summarize, and share our findings with the wider PIT-UN community. We successfully presented preliminary findings at two conferences during the grant period and submitted a journal article of results at the conclusion of the grant. Additionally, we were very grateful for

the opportunity to engage with other PIT-UN grantees throughout the grant period during the monthly calls. That said, we had hoped that our initial round of work would put us in a position to immediately plan convenings and dissemination efforts to help and learn from the PIT-UN more broadly. We remain committed to following through on that intention, and are hopeful that we will have the opportunity to deepen our work and engage more closely with the network through our proposed expansion project. (Because we were unable to dedicate time and resources to dissemination and convenings with other PIT-UN members, we also incurred no costs related to those activities. We had originally budgeted for several thousand dollars of expenses related to those efforts, and that is the primary explanation for the fact that we did not spend down the total amount of the grant.)

Copies of any publications or media generated as a result of the project

[The Alignment of Instructor and Student Perceptions of Ethics Instruction in Embedded Ethics Programs and Standalone Courses](#): A manuscript based on PIT-UN Y1 study findings, under review at *Science & Engineering Ethics*

Lee, K., Ongis, M., Kidd, D., & Kuzan, J. (2022, February 24–27). *Ethics Education in the Computer Science and Engineering Programs: the Instructor-Student Perception Alignment Study* [Conference presentation]. 31st Annual APPE International Conference, Cincinnati, OH, United States.

Elliott, D., Biasucci, C., Chambers, D., Miner, J. & Ongis, M. (2022, February 9-12). *Should all students learn ethics? Assessing university commitment to ethics* [Conference presentation]. 2022 Conference of the American Association of Colleges and Universities on General Education, Pedagogy, and Assessment, San Diego, CA, United States.

Certification

All President and Fellows of Harvard College activities were and are consistent with charitable purposes under Sections 501(c)(3) and 509(a)(1), (2) or (3) of the Internal Revenue Code, and President and Fellows of Harvard College complied with all provisions and restrictions contained in this Agreement, including, for example and without limitation, those provisions related to lobbying and political activity.

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