A Framework to Develop and Implement Role-Play Case Studies to Teach Responsible Technology Use

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Abstract— **Case studies are among the most popular and effective pedagogical techniques in ethics education. In this paper, we present a framework to develop and effectively use one type of case study: role-plays. We argue that role-plays are particularly effective for allowing students to think through complex problems and bridge multi-level issues, a core concern of ethics education. The fictional case implemented in the study presented here focuses on the use of algorithms for making lending decisions. The case narrative and its associated roles highlight and emphasize the interdependent and intertwined individual and societal perspectives. Thirty-six students consented to the research study in the course where the role-plays were implemented. Student responses related to their engagement with the role were analyzed. We found that participants moved between the multi-level perspectives in the case, identified ethical principles at each level, and connected case examples to real-world occurrences. Overall, using role-plays strongly encouraged students to appreciate the complexity of technology. This work is part of a larger project on using role-play case studies, and in our conclusions, we draw implications from our overall findings.**

Index Terms—**Case study, role-play, ethics, responsible use, responsible innovation, technology**

I. INTRODUCTION

I N recent years, the use of computing has surged significantly across all sectors of society, providing both useful services that improve access and efficiency while raising ethical concerns about data usage, collection, and compensation. In particular, the rise of algorithmic and artificial intelligence (AI) systems, often described as black box systems, are impacting people directly and indirectly through their use for decision-making. Some examples of this are employee hiring [1] with questions about discriminatory processing [2], calculating prisoner recidivism [3], and flagging facial recognition at airports [4]. These technologies can alter opportunity and access to resources, such as when used to make lending decisions about who should and should not receive

loans or mortgages [5]. The proliferation of these systems is creating a need to train students and the future workforce on the ethical and responsible design of algorithms and AI. This is the domain that we focus on in this paper.

Fostering a sense of responsibility among future professionals is one step in building towards safer and just technology. Responsibility as a professional, to the profession, and to society at large can all be explored through the rich narrative framing afforded by a case study. However, discussions about responsibility are strengthened when participants can engage as stakeholders rather than simply being observers [6]. Through the expression of different viewpoints, the discussion can explore the complexity of a case in a more nuanced and comprehensive manner. This is the value-add provided by a role-play approach to a case study discussion.

In this article, we describe and assess the use of role-play case studies for actively engaging undergraduate students in the responsible and ethical use and design of algorithms. We explore the affordances of role-plays to allow students to take on unique and novel perspectives and explore the latent values that decisions entail. The case narrative and role descriptions emphasize the entanglement of the individual, social, professional, and societal levels of decision-making.

This article is structured as follows: Section II presents our review of prior work about broadening ethical perspectives, role-playing, and case studies; Section III presents our framework for developing and implementing role-play case studies; Section IV describes the methods for data collection and analysis in a course where the role-play case studies were implemented; and Section V highlights the findings and discussion across the implementation. The full role-play case study and roles, instructions, script, and assignments are included in the appendices.

II. LITERATURE REVIEW

To situate our use of role-plays for ethics education, we discuss prior work that argues for providing broader ethical perspectives to students and scholarship on case studies and role-playing as an activity to engage students.

A. The Need for Broader Ethical Perspectives

Traditionally, the teaching of ethics within engineering and computing has often focused on an individual's decision-making competency or capacity, reflected in the professional codes of conduct that are the mainstay of these fields [33]. In recent years, ethics educators have called for a broader perspective on teaching about the professional responsibility

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of designers, developers, and builders of new technology. They argue that expanding the *framing* or *fields* of ethics education can help develop a broader perspective among students more attuned to how decision-making works in larger organizational, institutional, and societal contexts. Herkert, specifically, has called for the expansion beyond the individual microethical perspective to include a more significant societal macroethical perspective [7]. He has also argued for greater cross-collaboration between technology fields, such as Engineering Ethics, Science, Technology and Society (STS), and Computing Ethics, and the professional codes of associations, such as *IEEE* or *ACM*, to allow for discussions about public policy issues of relevance to engineering [8, p. 376]. These interdisciplinary perspectives can help engineering students engage with the social context of the profession better through, for example, a focus on sustainability [9].

Much progress has been made in broadening ethics education in traditional disciplines engaged with technology, but in recent years, new ethics-focused fields that fall at the cross-section of engineering, computing, STS, and other adjacent fields have emerged [10]. "Technology ethics," "cyber-ethics," and "AI ethics" are expanding and aim to address the practical applications of algorithmic and AI systems specifically in any context. Although many aspects of ethics education are relevant to these areas, the unique aspects must also be considered. Therefore, fields such as AI ethics are developing their own approaches to bridge technical and social perspectives. For example, Jobin et al. conducted a scoping review of guidelines, articles, grey literature, and reports to define a broader stake of ethical principles that address the implications of AI development and application [11]. The authors highlight 11 principles that have implications for policy, regulations, and implementation guidelines for broader technology: 1) transparency, 2) justice, fairness, and equity, 3) non-maleficence, 4) responsibility and accountability, 5) privacy, 6) beneficence, 7) freedom and autonomy, 8) trust, 9) sustainability, 10) dignity, and 11) solidarity. The principles are not focused on a specific discipline and allow for multidisciplinary discussion.

The need to expand the siloed conversation of ethics beyond disciplines is further supported by the growth of algorithmic technology, which has not been limited to just technical systems. The reliance on technology is becoming a part of everyday interactions. Research suggests that the growing reliance on algorithms has changed social dynamics and how people enact information-seeking behaviors, often increasingly looking toward algorithms rather than social circles for answers [12]. Similarly, research suggests that "advice coming from an algorithmic source—rather than other people—significantly influences how individuals solve analytic problems" [13]. Cohesive discussion across fields is necessary to ensure a human-centered approach to employing these technologies to solve tomorrow's problems.

B. Role-Playing Perspectives with Case Studies

Case studies are used across ethics education to explore how individuals' perspectives, dilemmas, and choices might inform a decision or issue [14]. Ellet describes a case as "verbal representations of reality that put the reader in the role of a participant in the situation" [15]. Cases have been used to discuss ethics on topics including the *Bhopal Disaster* [16], the *Challenger Disaster* [17], among others [18], [19]. Case studies articulate value systems at an individual and societal level and domain-specific principles using a narrative. In doing so, case studies can underscore the rationale behind decision-making and allow learners to imagine other alternatives.

While case studies provide the context and narrative of the case, role-playing operationalizes it as an interactive activity. Role-plays are an active group activity where participants are given facts and context about a situation to engage in decision-making conversations and interact with different perspectives [20], [21]. They can create lower-risk opportunities for peer collaboration and encourage critical thinking about complex topics [22], [23], [24]. Role-plays can also be used to achieve the instructional goals of a course, encouraging students to connect themes and topics as they progress through the activity [20]. Overall, role-play activities can fill the need for active collaborative learning activities for students and lead to discussions where students can bring on board a range of perspectives and ideas, both at the micro and individual levels, as well as macro and group levels [25], [26] .

Role-plays are often used with case studies to teach communication to professionals [27], project management methodologies [28], and future uses of AI [29]. They can also improve perspective-taking skills [30] and teach traditional course concepts [31]. Role-plays have also been helpful in engineering ethics education [26], including instructing graduate students and early-career researchers on responsible conduct of research (RCR) [21] and thinking of responsible action in the profession [24]. They can also be used successfully to engage critical thought toward engineering processes through a cultural learning lens [32].

C. Iterative Design Process for Cases

The traditional approach to ethics discussions in engineering takes the form of "dramatic conflicts in individual settings" and can leave students disengaged with discussions about ethics [33]. While historical cases presenting events and activities leading to a disaster have been an important medium for discussion on ethics [34, p. 8], our work focuses on creating fictional cases that can be tuned to the course's learning outcomes. Brown highlights key elements of creating role-play cases: 1) the situation needs to have a potential conflict, 2) should be identifiable by the vast majority of participants, and 3) encourage their participation [22]. In addressing these components, the case can be grounded in real-world situations while providing opportunities to foster imaginative thinking about engineering and technology [35]. Lawlor describes situations where students learn about engineering ethics and ethical awareness – the knowledge to understand that an ethical issue is at play [36]. Finding the balance between information and instruction can depend heavily on the context of the learners.

III. A FRAMEWORK FOR DEVELOPING AND IMPLEMENTING ROLE-PLAY CASE STUDIES

Using role-play case studies to explore these topics, we highlight how they emphasize the interactions within sociotechnical systems - the case study narrative accounts for the technical components, featuring information on the algorithm, hardware, software, and context in which they are applied and the role-play roles associated with the case highlight the social aspects, the relationships between decision-making about these components and the responsibility to the individual, profession, and society.

With these elements in mind, we describe an iterative design process to create role-play case studies. We highlight four stages in developing a role-play case study: 1) scoping the overarching topic, 2) reviewing and collecting resources, 3) establishing the case and roles, and 4) implementing (and adjusting) the case. Fig. 1 visualizes our iterative development process for implementing role-play case studies. Each stage is conducted in sequence but requires revisiting as the case is developed and after it has been implemented. Adjustments resulting from feedback are critical when the case describes emergent or future technologies. Though the underlying perspectives and considerations may not change, new information may alter the imagination or credibility of a case. For example, where a technology that was unimaginable due to data and infrastructure constraints has since been implemented in some context, the impacts of the implementation can now be more accurately described through additional resources.
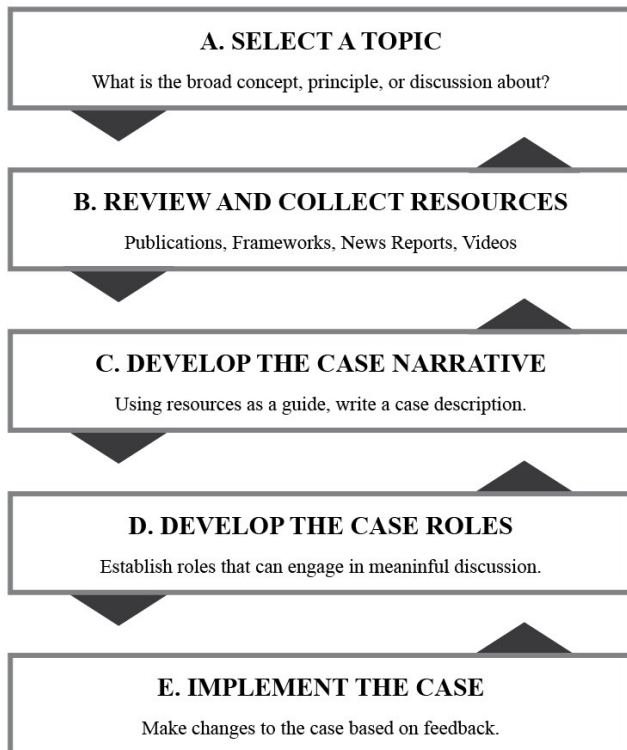

Fig. 1. Framework for iterative role-play case development and implementation.

A. Select a Topic

In the first stage, a relevant topic needs to be selected. This stage is primarily about setting boundaries to the topic and can take the form of answering questions regarding what will be covered, for which target audience, in what context, and how the values/principles of interest will be embedded. This step has no formula; it requires reading broadly and keeping abreast of interesting incidents and events. One critical aspect to remember while selecting a topic is that it should involve various stakeholders and perspectives.

B. Review and Collect Resources

After selecting an overarching topic for the case, the next element is collecting resources to support and ground the narrative and provide participants with opportunities to explore the content beyond the case. When selecting resources, it is important to include a variety of modalities (text, audio, video) and content approachability (short reports, full academic papers, organization guidelines) to engage the audience. Depending on the participants' technical knowledge, it is necessary to include resources that describe the issues to a non-technical audience, such as news reports or videos that use minimal jargon. Academic and peer-reviewed articles can be given to scaffold theories, algorithms, or other more technical items that require a deeper understanding. However, providing too many technical descriptions or challenging readings can be a barrier to participant learning.

In exploring student feedback to role-play case studies, we found that participants highlighted doing additional research to prepare for playing their role and get an informed look into the case [37]. While not mandatory, this is encouraged.

C. Develop the Case Narrative

We detail four components to structuring and developing engaging narratives for active discussion. These are: 1) reality-based, 2) connection to student interests, 3) technology uncertainty, and 4) agency in altering the course of action.

1) *Reality-based*: The case and the real world's connection should be apparent and easily identified. Some researchers describe this component as verisimilitude [34]. Although the cases are written as fictional, they are grounded in reality – often by referencing a phenomenon occurring somewhere the participants are already used to or can recognize.

2) *Relatable to Interests*: The cases should relate to participants' interests. Cases that raise discussion on ethical decision-making can be done in a relatable and interesting context to allow students to participate actively.

3) *Technology Uncertainty*: Technology uncertainty is expected to play out when discussing new technology posed to solve societal problems. Sollie highlights three factors of uncertainty in emergent technology: 1) making decisions with current information, 2) uncertainty in applying principles to new technology, and 3) the various possible development trajectories [38]. All three of these factors play into the narrative and should be given room to be explored in more detail by the participants. Having a consensus at the end of the discussion is one way to bridge the uncertainty to a

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unified decision.

4) *Agency to Alter Actions*: The case should highlight the participant's ability to make choices and alter the course of actions. This is where fictional cases deviate from historical cases, where the outcomes are already reported. The narrative should allow participants to decide whether the technology is implemented without reservation, with changes, or not implemented–each outcome is valid. The need for technology in the case should be discussed, especially if the effects of implementation create additional consequences.

D. Develop the Case Roles

The roles represent the social element of encouraging sociotechnical thinking for the participants. Dignum says, "In fact, it is not the AI artefact or application that is ethical, trustworthy or responsible. Rather, it is the people and organizations that create, develop or use these systems that should take responsibility and act in consideration of human values and ethical principles, such that the overall system and its results can be trusted by society" [39, p. 3]. This emphasis on the ability of the participant's role to bring in specialized knowledge, engage with the common information of the case, and negotiate with other roles is a central component of the role-play case study.

We detail three components to write fictional case roles, including 1) supporting and contrasting roles, 2) diverse viewpoints, and 3) viewpoints intensely in favor or opposition.

1) *Supporting and Contrasting Roles*: The roles should be written with differing viewpoints. They should allow for some roles to support others, some in contrast to the values they perceive as most important, and roles left to the interpretation of the participant (grey areas). For example, highlighting technology readiness levels (how mature a technology is) through the roles can encourage participants to consider the effects of implementing technology across a broader context.

2) *Diverse Viewpoints*: Some roles are used to bring forward diverse viewpoints on the topic. Often, ethical principles and values are detailed in these roles. That is not to say all roles do not have this component, but they are especially pronounced with some. For example, a role focused on unfair access in past algorithmic decision-making can encourage participants to question the underlying reasons for past decisions - perhaps bias, under-representation, and exclusion discussions can emerge.

3) *Intensely in Favor or Opposition*: Including roles that represent viewpoints in favor or opposition in an intense manner is symbolic of the power differential often found in developing technology today [40]. For example, having a role solely interested in maximizing profits can highlight the need to discuss balancing corporate interests with the effects of implementing a technology. It is, however, important that the intense role favors discussion, and we encourage including a description that displays an open and approachable attitude. *Role incongruency* can also factor into the intense role. Using the previous example, some participants may consider the role strictly money-motivated. If the intense role is focused solely on maximizing profit, the other participants may question whether there is truly willingness for a combined group compromise for a safer decision if it reduces the most profit possible.

The number of roles will likely change depending on the setting where the role-play cases are used (online vs. in-person, undergraduate vs. graduate, etc.). We recommend having at minimum 4 roles and a maximum of 6 (including the moderating role), but the number can be adjusted to the setting. Our recommended staging for a discussion would include one viewpoint intensely in favor of the technology, one intensely against the technology, one neutral or moderate viewpoint, and one that adds the specific disciplinary viewpoints required for the case, such as economics, policy, equity, justice, and/or inclusion. The disciplinary viewpoints will likely reflect the course where the case is being implemented and provide significant opportunities for customization. Viewpoints can be duplicated as different roles to fill in the number of roles needed.

E. Implement the Case

The final stage is implementing the case. This requires making decisions about the number of students in each team, the mode of discussion – in class or online, moderation by faculty or self-moderated discussion by students, which assessments to use, and the number of role-plays to use in a course, among others. Many of these decisions are specific to the context of the implementation. The case example and appendices provide further insights into implementing a case.

One final remark on implementation: as described earlier, this process is iterative, where the learnings and idiosyncrasies of the group will inform the next implementation. This is part of developing cases that work for different learners.

IV. METHODS

The fictional case studies and role-play activities were implemented in a course on technology in a global society. Thirty-nine (39) undergraduate students from a college of engineering and computing, representing backgrounds such as information technology, data analytics, cybersecurity, and computer science, participated in the course. Thirty-six (36) students consented to participate in this study and were included in the analysis and discussion hereafter. The intended course outcomes were to engage students in thinking about the role of technology from a global perspective and address current topics related to technology implementations, including facial recognition, using generative AI, supply chain reliance on data, and the ethical responsibility of professionals. The Institutional Review Board (IRB) at the implementation site approved the study at the institution where data were collected. Analysis of any data from the course did not begin until after the course was completed and grades assigned.

A. Case and Implementation Example: Financial Lending Using Algorithms To Calculate Risk

The case covers the topic of algorithmic lending risk. A fictional bank (EDK Bank) is currently using a human approach

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to making credit decisions. The loan manager receives information from team members who can analyze the applicant's record - their credit score, income, work history, and other financial obligations.

They have found an example of two cases where applicants with similar backgrounds were given two different decisions based on the human analysis method. Additionally, EDK Bank knows they currently do not support a significant majority of the growing population who have not participated in the credit rating system – young people, new immigrants, or refugees, to name a few groups. There is the opportunity to provide loans to a broader audience, but this is not a simple scaling change with the current system.

They are interested in using a more complex algorithmic model to make lending decisions and are exploring adding non-traditional factors such as social media analytics (followers, interactions, etc.) to make credit-risk decisions. Additionally, they are interested in the role of individuals in the bank. In theory, the algorithmic model would allow for a decision to be presented that could remove some of the team's bias, but is this possible with the data, and should this approach be used?

Some of the questions highlighted through the multi-level perspectives are:

Individual Perspectives
1) Should EDK decide an applicant's case solely based on an algorithm, a human-in-the-loop, or solely by a human?
2) What metrics should EDK use for making decisions?

Professional Perspectives
1) What is the role of algorithm-based decision-making in services that provide basic necessities to people?
2) Should banks use non-financial information in making credit risk decisions?

Societal Perspectives
1) What is the role of algorithmic decision-making in banking?
2) Do current metrics pose a barrier to equitable lending?

The complete case, roles, and instructions can be found in the Appendices. The case was introduced to students over 3 weeks. Students were gradually introduced to the case and the role-play as these elements were new for most students. In week 1, students were given the resources related to the case (Appendix C). The resources described both required and optional resources that provided insights into specific roles. In week 2, students received a lecture and Q&A session with the course instructor. Students were split into six groups of 6-7 members and assigned roles at random at this point. In week 3, students participated in the role-play and engaged in a debrief immediately after the activity.

B. Analyzing Participant Responses

Participants' transcripts from the role-play activity and the debrief were analyzed using an iterative approach similar to a "reflexive thematic analysis" approach [41]. The two authors served as reviewers and familiarized themselves by reading all the role-play transcripts, taking their own notes, and generating initial codes. They then discussed the codes and generated the initial themes. They each applied the themes through the data, further refining them before shaping a final set. The reviewers paid close attention to both semantic and latent discourse. Some participants directly described a phenomenon (i.e., "I feel like we should use the algorithm" – Student 4). Others described ideas in the context of the broader discussion, where the implications are more nuanced (i.e., "It is clear profits should not be our first priority" – Student 9).

The case details, perspectives of the roles, and their adjacent decision-making thought processes were considered when the authors reviewed the transcripts, but these were used to explore themes further rather than to form themes initially. For example, moving between individual and societal perspectives was a theme expressed in some responses, further explored by the decisions the participants ultimately negotiated in the consensus response. The analysis was predominantly done at a semantic level, but the authors did review latent descriptions as students connected topics to others in the discussion. Observing the role-play activity and being able to take notes as the discussion happened allowed for the connections to become more apparent.

V. FINDINGS AND DISCUSSION

Through the analysis, the findings of this work can be summarized into students demonstrating three broad themes:
A. Taking multi-level perspectives
B. Recognition of responsible ethical principles
C. Drawing real-world implications by role-playing

A. Taking Multi-Level Perspectives

The students' roles focus on individual details - their character's background and how they see the world. As a result of participating in the role-play discussion and interacting with their teammates, all groups described movement between analyzing the case from their individual perspective to including the perspectives of others in the group:

I think, [the role-play] helped expand my perspective because it introduced me to a role that's obviously a lot different than me. So yeah, it helped me see a perspective that I had not thought of before. So I think it helped me change my perspective, or better my perspective to see the bigger picture than just me. - Student 1

In moving from an individual to a group perspective, some students highlighted recognizing another role's micro or individual thinking. Most groups described this by "wearing the role" of their peers to empathize and identify their rationale, highlighting the multiple perspectives students were navigating along with the clash of values:

I can understand why Thomas Schmidt would think that these biases in AI data... they're not really important. That privacy is not an issue when it's more about the money that could be made. For a second, I can understand that, but for me, my opinion did not align with his at the start of the discussion, and even until right now, my own or my role's perspective does not align with it at all. - Student 2

Other students described the challenges of arguing for the 'intensely in favor' role. Several groups noted that through their personal negotiation between their role and their own perspective, engaging with the drastic role may have altered or strengthened their own feelings toward the case:

It got to a point where it was pretty hard to keep fighting for the most amount of profits and the lowest risk because that just means collecting every piece of data that you can get your hands on to lower the risk, and personally, I don't believe in that at all. It just kept getting harder to keep that up as [other participants] brought up good points. - Student 3

As noted earlier, the case contents and role-play activity were new for many participants. A couple of groups discussed that the activity was the first time they actively considered how lending risk and creditworthiness were calculated by engaging in the case:

To be honest, I never really had a perspective or opinion on a situation like this. I wasn't really knowledgeable or ever thought about the different biases or steps that go into accepting loan applications. - Student 4

Overall, students successfully moved from exploring their individual roles to how the roles engaged with each other and the case in the larger context.

B. Recognition of Responsible Ethical Principles

Through engaging in the role-play activity, students highlighted ethical principles related to the responsible use of technology and the problem it aimed to solve. The discussion reflected the principles described in Jobin et al., as students were introduced to them earlier in the course [11].

The current system used to make credit risk decisions was based on a team review that discussed the likelihood of recovering any borrowed money. The new solution, however, was not as simple to describe - the proposed algorithm could include data that applicants were not aware was collected and would not be disclosed to them in providing them with a decision. All the groups discussed transparency (sometimes using the phrases explainability or understandability, consistent with Jobin et al.) as a central theme throughout the case:

Transparency basically means being able to determine how and why a certain algorithm reached its decision, and because algorithms can be susceptible to bias, I think working with that in mind, we can help create an algorithm that is less susceptible to bias by being transparent and, as everyone else said, by not including gender, race, and other items like that. - Student 5

Trust was another central idea across all the discussions. For most groups, the discussion focused on how much trust could be put into the results of an algorithmic decision. There was trust, but it was not unwavering:

It can be helpful to have the decisions generated by the algorithm. I obviously don't think they should be making total decisions, as there definitely will still be some outliers even through using the algorithms, so it may be beneficial just to have someone look at the case. Because no AI is perfect. So I definitely feel they shouldn't be checking every single case all the time, but if there's an outlier that needs to be looked at, they should have the power to overturn the results, especially if the algorithm made an unfair biased decision. - Student 6

Both trust and transparency emerged in discussions about how technology use for decision-making would be perceived by applicants or others beyond the bank. As Jobin et al. specify, the principles of transparency and trust are highly related, as transparency can be used to build trust or ensure public expectations [11, p. 7]. The groups frequently talked about this with the notion that people would rather see a human involved in life-altering decisions rather than simply rely on an algorithm:

I don't know, using the algorithm over a human... it's 50/50 for me. I can see why banks need to be efficient and everything... and to make money and process the number of applications they receive, but agreeing with what everyone else was saying, people still need that human intervention. It just makes it a little bit of a more comfortable environment, you know, seeing someone actually do the process, and you can ask questions and get feedback. - Student 7

Dignity emerged as a theme for some groups. Though context-specific, the students aligned with the ideas of dignity being closely associated with human rights, choice, and respect for people [11, p. 8]. Dignity as a principle often emerged with the sustainability of decision-making in the context of a bank that is, at the end of the day, trying to be profitable. Specifically understanding the ability for loans to provide opportunities to make personal or financial progress in one's life, these groups discussed the dignity of engaging and interacting with a system that may not be looking out for your best interest:

I think it was an interesting perspective to look at it from the bank's side of view, in that you're talking about risk categories and risk assessments from the bank's perspective. They're just looking at all different factors to basically form a single number that says, 'this person is going to allow us to recoup our money or not.' I don't know. It's probably going to be pretty difficult from the bank's side to humanize the applicants instead of just seeing them all as numbers. - Student 8

Other principles from Jobin et al. that students discussed were fairness of opportunity, navigating models that do less harm at the expense of profits (non-maleficence), and freedom and autonomy to make informed decisions. Privacy and solidarity emerged more during the debrief when students navigated their personal perspectives and that of their role.

Sustainability did not emerge directly through the case, and students largely did not discuss it.

C. Drawing Real-World Implications by Role-Playing

The case elements were modeled after real-world situations, often obfuscated in complication. Several groups made these connections more visceral by comparing how the case would play out beyond it being a narrative. Most groups highlighted the complexity of the technological processes:

To me, the role-play helped me understand the case better and why it is that so many corporations choose to use AI. But in a way, it also changed my perspective because I usually think that the world will always need human intervention because technology is incapable of managing things on its own, but I suppose because the world is so hectic and there are so many applicants, it's going to need the use of AI to help speed things up and produce more efficient results. But only as long as someone is regulating how AI operates, right? - Student 9

Consistent with other implementations of role-play case studies, most groups highlighted doing additional research into their role to take on a more comprehensive perspective. The starting point is often similar - an article mentions a phenomenon that students continue to explore:

Playing my role, I learned a lot about what goes into determining loan eligibility. While I was doing research, I think the most interesting thing that I found was the study by three economists that found that certain language used can determine whether someone goes into loan default or if it's a predictor of loan repayment. - Student 10

D. Limitations and lessons learned

We acknowledge that role-plays can be intimidating for both instructor and student, especially if they have not been done before. There is an active feeling of giving away control of the discussion to the participants from the instructor's end, which may be uncomfortable. This aligns with the experiences Brown highlights in running a role-play [22]. Facilitating conversation in such a group dynamic may be new for students, coupled with the additional uncertainty of exploring a complex topic. Students can come into the course at different levels of exposure and understanding of a topic and, depending on the type of course (first-year seminar vs. senior-project course), may require additional scaffolding in the curriculum to ensure all participants can engage in conversation at a meaningful level. To alleviate some of the student's nervousness toward doing a role-play for the first time, we included a sample role-play case study activity video to highlight how the activity should flow to ease participants into the activity.

We also acknowledge that awareness of a topic through role-play case studies and demonstrating or practicing that knowledge in the future beyond the confines of the course may not always be possible. We implemented these sessions in 16-week courses, and while students highlighted the activities as being engaging, and we can encourage students to revisit the topics in their future work, we have not conducted longitudinal research on using role-plays.

The research study's limitations are that it uses data from only one course, and the analysis is largely interpretive. The role-play was implemented in only one context, limiting the scope of what we can learn. We have undertaken similar studies on other implementations with consistent findings.

VI. CONCLUSION

In this paper, we discussed a framework for developing and using role-play case studies effectively. We illustrated with the framework outlined, developing and using fictional role-play case studies to teach about the responsible use of technology. Cases can be developed by focusing on the narratives, roles, and resources to achieve active engagement and address various learning goals.

The exemplar case highlighted is about financial risk and brings participants to think about the perspectives, connecting fictional elements to real-world occurrences and exploring the link between principles and ethical issues. Through analysis of the discussion, we noted that students were able to move between the multi-level perspectives in the case, recognize principles of the responsible use of technology, and connect the broader case to real-world examples. Overall, students recognized the impact of the discussion.

This work extends a significant research effort to implement role-play case studies for technology students. This work highlights the development of cases, while other work describes components needed in implementing a role-play case study, including assessment [42], implementation in various courses [43], [44], and theoretical implications of role-plays [37].

Through this work, we hope to lower barriers to adopting role-play case studies on topics not traditionally represented in the classroom. Introducing technology students to the impacts of their work in everyday places is fundamental to constructing a responsible developer and user of technology.

APPENDIX A - FICTIONAL CASE STUDY

EDK Bank of Germany – Lending Risk Analysis Scenario

A loan manager at *Erstes Darlehen und Kredit (EDK) Bank of Germany,* Nina Pritchard, requests a statistical model to help her department determine which loan applicants are creditable (likely to repay their loans). Typically, loan managers consider an applicant's demographic and socio-economic profiles. Nina's approach is to work with a team that can provide her with different kinds of information and use that information to minimize the risk and maximize the bank's profit.

The German and EU guidelines for credit risk analysis are quite stringent. Lately, there has been a move towards making credit lending more inclusive by utilizing new datasets and analysis techniques. Since not all analytical approaches are allowed by regulators, the decision-making process can be complex. EDK was founded to leverage these newer rules and regulations to provide credit and loans to first-time applicants

whom other banks might not serve.

As a relatively new and small bank, EDK outsources many of its services and expertise to outside consultants across the industry. This helps them keep their costs low and serve consumers in small cities and towns and those whom large banks usually underserve due to their risk profile. EDK, when it was formed, determined that many of the applicants who were denied credit by larger banks had a decent risk profile and were not likely to default on their loans. Servicing them required additional due diligence and the ability to use data in new ways that many traditional banks were unwilling to do.

Nina has sent an urgent request to her team for information on one applicant, Murat Yilmaz, as the 30-day deadline for deciding on his application was fast approaching. There were many applicants with similar characteristics, and Nina hoped working on this application closely would help her make better decisions on similar cases. In particular, she was interested in the probability that Yilmaz would be able to repay the loan in full, and she wanted to understand what parameters of the applicant's profile are the best predictors of repayment. If she could develop a good model to understand the driving factors (or driver variables) behind loan default, then EDK can utilize this knowledge for its portfolio and risk assessment. Nina knows she must be careful as she develops this model to prevent biases and not discriminate against applicants due to demographic factors. She realized the system appeared to be approving male applicants over females. Murat was greenlit, but another applicant with a similar profile, Sabrina Mann, was denied.

To assist her with the decision on Yilmaz's application and to develop a better understanding of how to approach this task, Nina has asked the following people to provide her with their individual opinions on the topic and to discuss the issue and reach some form of consensus recommendation on whether Yilmaz's loan should be approved or declined. She has also shared a dataset she created with the information they can use to decide.

APPENDIX B - FICTIONAL CASE ROLES

Michael Rhode is a Data Analyst at EDK and works closely with Nina on data collection and filtering. Although he has some experience and expertise with data analysis, it is a skill he has acquired by playing around with data on his own time. Primarily, he is a database person, and before joining EDK for over a decade, he worked as a data administrator for a large bank. His other expertise is in data security, and at EDK, he is admired and valued for ensuring that their data remains secure. He is a traditionalist who appreciates data quality over everything else – it's not data but good data that matters.

Claudia Muller is an Underwriting Specialist whose primary role is to ascertain the completeness of all paperwork submitted by an applicant. After working in medium and larger credit organizations for over two decades, she now works as a consultant, and EDK is one of her largest clients. She is committed to their success, and having come across myriad ways in which loan applicants are rejected, she is also

committed to finding new ways to be more inclusive. She knows credit data well and is always willing to learn new ways to get more information from that data.

Thomas Schmidt is the Chief Credit Innovation Officer at EDK. He is new to EDK and has been hired for his reputation for developing innovative financial products with huge profit margins. He is an aggressive marketer who believes in selling his ideas internally and externally. He is trying to convince Nina and others to use machine learning techniques to get more out of data and move towards collecting or buying other datasets of applicants' digital footprints to make the most *profitable* decisions for EDK.

Anja Fischer is a Research Analyst at a financial technology start-up focusing on using artificial intelligence to make banking decisions. EDK is both a client and a partner organization where they are hoping to put a lot of their ideas and algorithms to the test. The start-up is hoping to use its seed funding to prove that it can increase profitability for credit organizations while at the same time ensuring that the process is fair and can easily pass scrutiny by regulatory agencies. Anja is especially interested in creating a process flow that allows for transparency in decision-making. She wants to balance profitmaking with a social justice goal.

Stefani Meyer is a Loan Process Regulatory Officer in the central regulatory authority and works for their new office, which was formed to regulate algorithmic decision-making for better lending. The regulatory authority serves as a third party to certify technology and ensure that it meets the criteria for being fair and just. Stefani has worked for almost a decade as a regulator but has been busy trying to keep up with all the new forms of data available to credit companies and their use of algorithms for decision-making. She was initially trained as a mathematician and has a graduate degree in statistics but is struggling to understand new techniques. Right now, her only goal is to avoid a major mistake by approving or denying something that proves to be severely problematic.

Kwame Alexander is Director of AI in Finance at the Berlin Institute of AI Ethics (BIAIE) and previously worked at the Google offices in Amsterdam. He is an expert on Machine Learning and Data Mining with a PhD from University College, London. While living in the Netherlands, he volunteered at a refugee center to assist asylum seekers with their paperwork and realized that lack of access to credit was a major barrier to settling refugees in a country. In his spare time, while working at Google, he took courses to understand the finance space better, and he jumped at the opportunity to join BIAIE. He is currently working on methods to improve the transparency of lending algorithms.

APPENDIX C - ROLE-PLAY INSTRUCTIONS, SCRIPT, AND ASSIGNMENTS

The complete case study and additional resources, including the *Author's Commentary* and *Instructor Notes,* are available through the Online Ethics Center [45].

Role-play Instructions

1) Students are assigned roles a week before the role-play.
2) One student is assigned the role of Nina, serving as the moderator and leading the conversation using the script.
3) The script (provided below) guides the discussion, leaving room for the conversation to flow naturally and allowing everyone to contribute.

Role-play Script (for Moderating Role, Nina Pritchard)
1) What role are you playing in the role-play group discussion? [answered by each participant individually]
2) From the perspective of your role, what is the best approach to decide on a loan application – what factors should be considered, and how should these factors be weighed? [answered by each participant individually]
3) What decision should Nina take on Yilmaz's loan? Should she be approved or declined? [answered by each participant individually]
4) What is your overall group recommendation to Nina? [open discussion;]

Role-play Script Assignments
One way to ensure students are prepared for the discussion is to assign a few questions from the script as a pre-discussion assignment (short answers). Similarly, to ensure students reflect on the discussion, they can be assigned some reflection questions. For example:
1) What solution was reached following the discussion?
2) What criteria were considered to reach this solution?
3) Was the solution agreed upon by all, or did one person have more influence? Why or why not?
4) Do you personally agree with the solution reached? Why or why not?

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