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Do you need an ethical framework? Examining and negotiating ethical standards using students' personal moral perspectives

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1. Introduction

In this evidence-based practice paper, we examine a team-based exercise in developing and negotiating standards for a hypothetical engineering company, in order to prompt students to identify and explore competing moral perspectives among professionals in the engineering workplace without relying upon an ethical framework or moral philosophy. The exercise gave them the opportunity to explore their own moral priorities, and then to apply these priorities to a hypothetical engineering company in concert with other students as part of a team. It can also be surprising to students to discover just how different other moral perspectives may be from their own. This is the way in which a company code of ethics or values statement would be formed in real life - by a team. We chose to not rely on an ethical framework for reference, because we have found that many students have interpreted ethical frameworks in absolute terms.

The exercise began with a briefing about the differences between ethics and morals, with examples of typical moral themes, followed by individual reflection about what the students knew about themselves. The participants were then assigned to ad-hoc teams in order to compare their moral priorities to those of other team members. Finally, each team formed a set of moral priorities for their own hypothetical engineering company.

In order to assess the outcomes of this activity, we sought to answer the following question:

> **How did this exercise bring out multiple competing moral standpoints and foster discussion about those differences?**

Because classroom settings and participants vary, and other teachers may wish to adapt rather than adopt our exercise, we chose a qualitative approach to interpret the experiences of students when placed in the circumstances of this activity. Our analytic output consisted of themes for competing moral standpoints and discussion. We present these in our discussion of the student experience as examples to illustrate the variety of responses gained from this exercise and the moral priorities that they indicate.

2. Background and Literature

Teachers of engineering ethics have many ways of approaching their task. Hess and Fore's [1] review of engineering ethics interventions provides a picture of the breadth of interventions. In our first-year program, we have tended to use case-study, reviews of engineering codes of ethics, and debate. We have also employed at least a brief discussion of philosophical ethics as a way of capturing the fact that people can come to different conclusions about what is "right", and may also take very different paths to get

to the same place. Our context requires ethics education, but allows at most a few dedicated class sessions per semester. It is also meant only to be an introduction to ethical decision making in engineering. Developing more advanced understandings of ethical frameworks can require more time and depth (e.g. [2,3]). Therefore, we sought alternative ways to address introductions to ethical challenges and compromises in the field, which do not require reading full codes of ethics (e.g. [4]), or spending time describing and understanding existing frameworks. As teaching practitioners, we seek to maintain a quick pace in class, and maximize active and collaborative learning experiences.

Moral Foundations Theory (MFT) posits that moral reasoning is largely intuitive, based on mental moral foundations [5,6]. These foundational psychological responses include care/harm, fairness/cheating, loyalty/betrayal, authority/subversion, sanctity/degradation, and liberty/oppression. By "foundation" as part of this theory, its originator asserted that these aspects of moral behavior begin in early childhood as more of the capability to learn moral behavior, and that people are taught by their culture to act in one way or another according to the abovementioned foundations. This also means that individual values and priorities are influenced by what a society or culture views as norms, where what is acceptable in one society is unacceptable in another. That is why MFT includes both constructive and destructive values.

These differences across culture and background have been demonstrated in a variety of ways in the literature. Expression of foundations can be predicted by things like political ideology (e.g. [7]), and further variation can occur in challenging contexts (e.g. [8]). MFT has been used more specifically to establish differences in moral perspectives of engineers. For instance, foundation expression correlates with moral foundations and political ideologies differently between engineering disciplines [9]. There are also differences between engineering students from different nations, particularly before they have had much ethics education (e.g. [10,11]). These works suggest that to demonstrate differences in morality and develop a rich educational activity with competing values, one might be able to leverage the variety of cultural and national backgrounds present in an introductory engineering classroom, without the need to develop student understanding of several existing ethical frameworks. By adding an element of consensus-seeking, we might also be able to pit these values against each other to encourage discussion and evaluation.

3. Methods

3.1 Study Context

This study was conducted within the second half of a two-semester sequence in engineering fundamentals at a large university in the United States. The course involved

student teams developing design solutions to an engineering problem, coupled with individual instruction and practice in technical and professional skills. Engineering ethics was among the professional skills addressed, and was repeated several times throughout the course. Prior to the activity examined in this work, there was a session about academic and professional integrity, along with discussions about responsibility and ethical violations.

3.2 Activity Description

In order to further engage students in exploring this complex, nuanced, and sometimes uninteresting subject, in-class exercises were conducted in the area of individual and group moral priorities in an effort to make the subject more "real" and relevant to students. After completing the activities, we wanted students to be able to describe differences in moral preferences amongst engineers, evaluate how those differences impact financial success, and collaboratively develop a set of moral priorities for a company. All activities discussed here were performed during a single 75-minute class session per section, with the majority of time dedicated to activity and discussion. The instructor's role was to briefly deliver framing content and instructions, and to facilitate activity and discussions.

The in-class exercises were introduced by asking the students the following questions as think-pair-shares:

- Why do we think that some entities "deserve" to be cared about?
- Which people (groups or individuals) are most (and least) important to you?
- When making decisions, how do you choose between the wellbeing of various groups?

To help situate themselves in their own moral perspectives, students were then prompted to consider their moral priorities regarding various groups of people and other sentient beings who were most important and least important in terms of moral behavior. That is, given an either-or choice, who would get rights or resources. Suggested examples of beings included themselves, family, community, other living things, and ecosystems, among others. Each student took 10 minutes with paper and pencil to represent their priorities in a "moral hierarchy", as a pyramid or a network diagram. Reflective small-group brief discussion prompts were then administered asking students to discuss their hierarchy vs. their actual behavior, how their priorities might change with additional access to money and power, and what kind of company for which they'd like to work.

Following the individual exercise and related discussion, students convened in groups for 20 minutes to develop a hierarchy for a hypothetical engineering company, with the

encouragement to address ideas as well as entities. As part of the prompt, we indicated that the students would only ever be able to work for this one company in their entire careers. This constraint was added in order to force students to consider tradeoffs between various priorities. The hierarchy development was done with giant sticky notes, colored writing utensils, and a suggestion to illustrate the hierarchy. After completion, the class was invited to share and discuss the hierarchies.

Finally, each student completed a reflective exit survey about their individual and group experiences. The survey contained questions about their group's areas of consensus and disagreement, how to reconcile differences in moral priorities, and how this exercise indicated the types of moral compromises that a student might need to make in their professional life.

3.3 Participants

The activity was conducted with two sections of 72 students each. The participants were first-year engineering students who were introduced to the purpose and importance of engineering ethics during the prior semester. Each group contained three to five self-selected members, chosen after being given instructions that they should not have previously worked with each other.

3.4 Data Collection

Data included sets of "moral hierarchy" diagrams, co-created for a hypothetical engineering company where the team would need to spend their entire careers. These diagrams were supported by brief reflection questions collected from each student at the end of class, asking about disagreements in the team, how they were negotiated, and what moral compromises the students expected to make in their future careers.

We used our learning management system to collect each group's moral hierarchy diagram for a hypothetical company that employed engineers. The individual reflective survey responses were collected using an online form after the conclusion of the in-class exercise. Data were excluded from analysis if they came from a group of only two students, if the team had incomplete responses, or if the submission was illegible. A total of 26 groups remained, with responses from 98 students.

3.5 Data Analysis

After clearance by our Institutional Review Board, we began analysis to understand the development of team-based moral priorities, and how student-reported methods of negotiation influenced the team-based results. Reflective responses were examined and compared to identify common themes in disagreement and negotiation. As an additional

assessment measure, we also counted the number of groups where more than 1/2 of the students indicated that there was no disagreement.

We used reflexive thematic analysis (RTA) to generate themes for the diagrams and written responses [12,13,14,15]. RTA is a type of thematic analysis that emphasizes the researchers' roles, and considers their subjectivity to be a resource. It is useful in analyzing outcomes from a classroom setting. It is non-positivist and interpretive, and is not typically philosophically compatible with some processes from other popular positivist types of thematic analysis, like saturation or rater reliability measures. Instead, it focuses on reflexivity and openness for quality. For more on quality RTA and the distinctions between RTA and other types of thematic analysis, see the extensive recent work by Braun and Clarke [12,13,14,15].

We followed the six stages of RTA recursively, with coding performed by the first author. We initially immersed ourselves in the data by reviewing the diagrams together for each team and student pair, and reading through each written response, several times each. The first author read through again and inductively generated initial codes for meanings in the data. In the team hierarchies, they coded for the values prioritized in development. For the disagreement question, they coded for the subjects of disagreement. For the negotiation question, they coded for methods used. Codes were then examined and organized to generate initial themes, then reviewed and developed with cross-comparison between hierarchies and disagreement codes. We discussed these themes, settled on scope and focus, and then developed names to capture the story and central idea of each. Finally, we wrote up the results to capture the story in the analysis and results.

4. Results

4.1 Themes of development questions for team hierarchies of company moral values

In examining the team hierarchies and notes about negotiation and disagreement, we developed five themes for questions which students were considering. These were not necessarily mutually exclusive, except when rooted in feelings about altruism and self-interest, or differing interpretations of their roles within the company. Here, we remind the reader that the exercise specified that students were developing a preferential hierarchy assuming they could never have a different company or job in their lives.

4.1.1 How can our company make the world better for everyone?

This goal captures student considerations about their desire to work for a company that has positive impacts on the world. This could involve internal questions, such as care for employees and pride in the quality of products. There may also have been external considerations about environmental health, social justice, and charity. Regardless of the

specifics, we interpret the underlying meaning as students interested in being good and contributing members of society. Example: Figure 1.

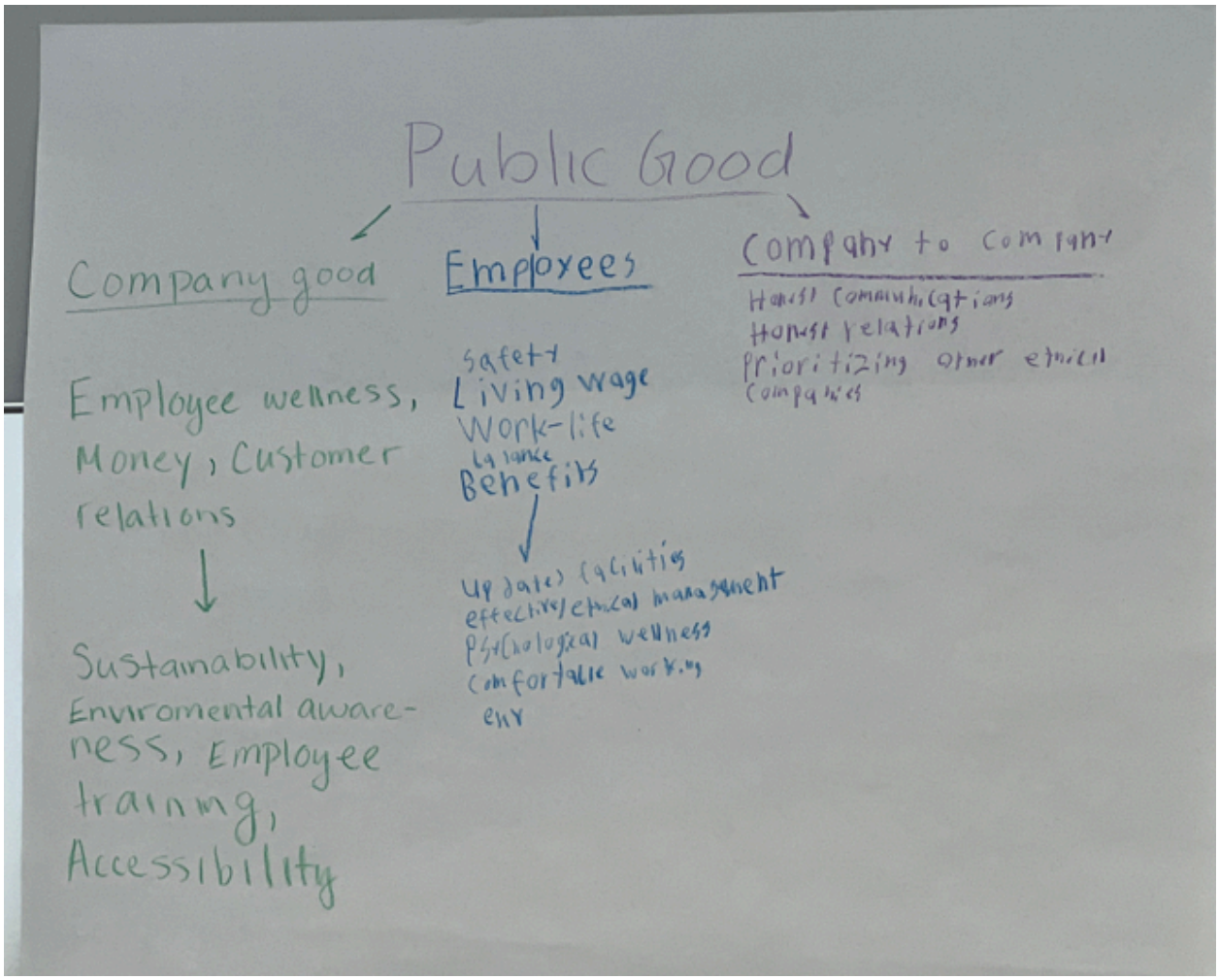

Figure 1: Hierarchy demonstrating benefit to society and community as a top priority.

4.1.2 What is best for the employees?

This goal focuses on a positive experience for employees. This may be associated with an interpretation of the team as being lower-level employees rather than leadership, but not necessarily. This relates specifically to the experience of and benefits for the employees, and is independent from the broader impacts of the company. Example: Figure 2.

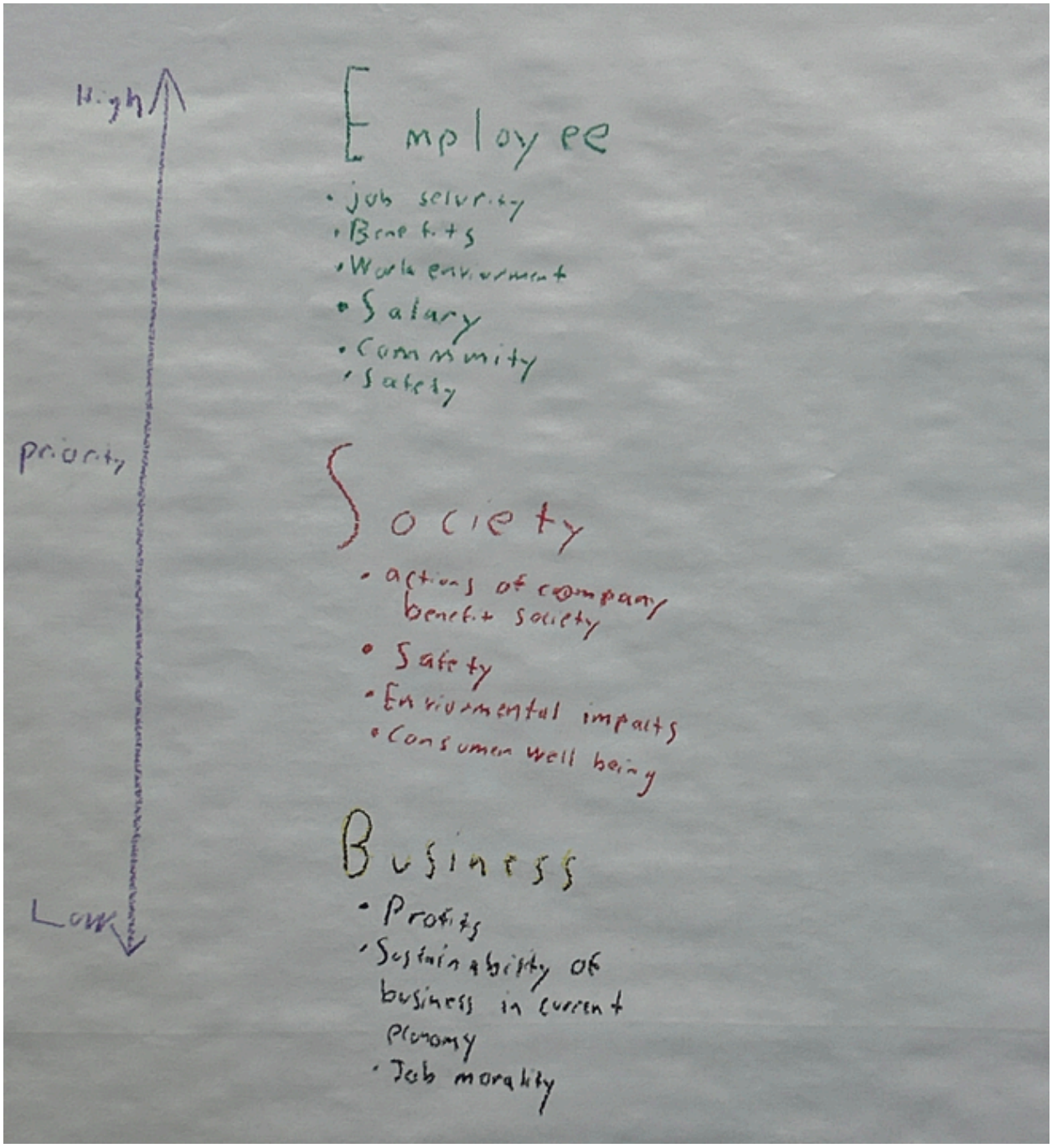

Figure 2: Hierarchy placing the employee lives and benefits at the top.

4.1.3 What will keep the business afloat?

This goal recognizes the part of the prompt where students can only ever work for one company. The company has to exist in the world, and last. Therefore, relationships with the law and customers must be maintained, and income must meet or exceed expenses. Example: Figure 3.

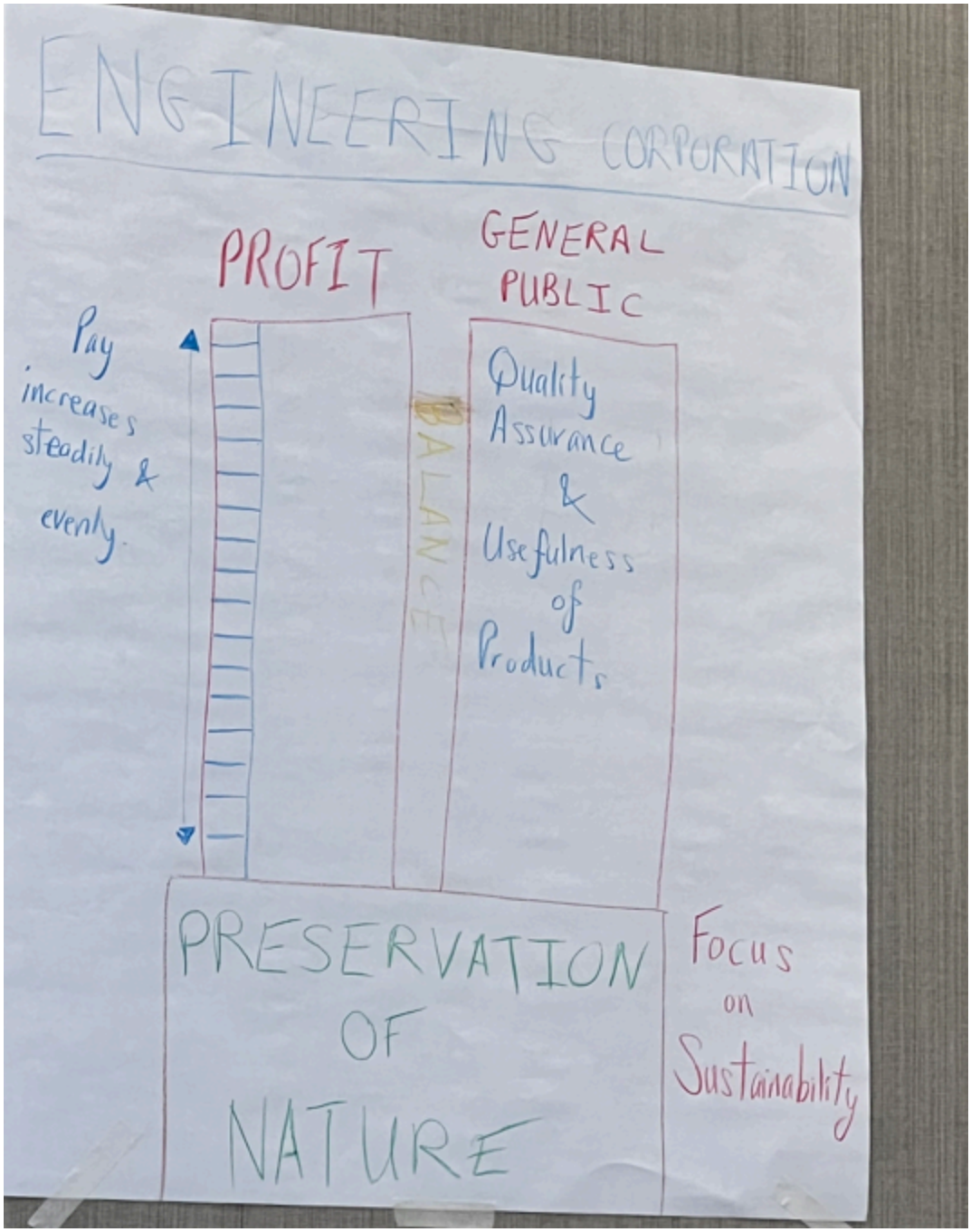

Figure 3: Hierarchy of a team seeking balance, but recognizing the importance of profit.

4.1.4 How can we maximize financial gain?

This question is rooted in self-interest. We often have students tell us that they want to be engineers because of their expectation for high salaries. High employee and executive salaries are manifestations of this theme, as are indications of maximizing shareholder

value. This may relate to the limitations on working for other companies embedded in the exercise. Example: Figure 4.

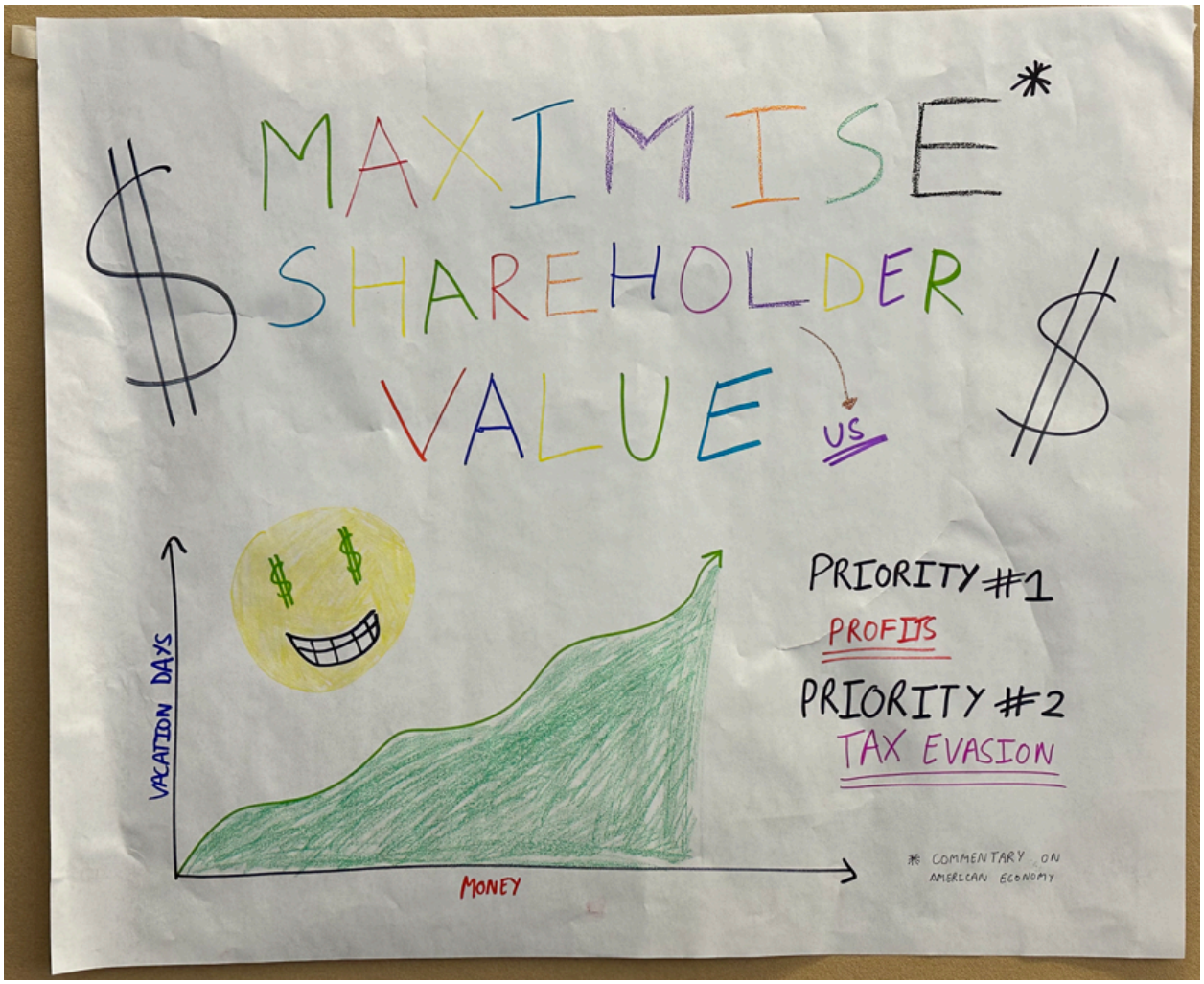

Figure 4: Simple hierarchy capturing the goal of maximizing financial gain.

4.1.5 How can we profit at the expense of other people?

This goal illustrates strong self-interest achieved by leveraging social injustice. Criminal activity and cruelty may be treated as virtuous, especially when in service of profit, though possibly for their own sake. We noted many elements of popular critiques of capitalist systems. We either read these hierarchies as satirical, or they were explicitly stated as such. We found ourselves interpreting all of these as having humorous intent, though we note there is often truth in jest. Example: Figure 5.

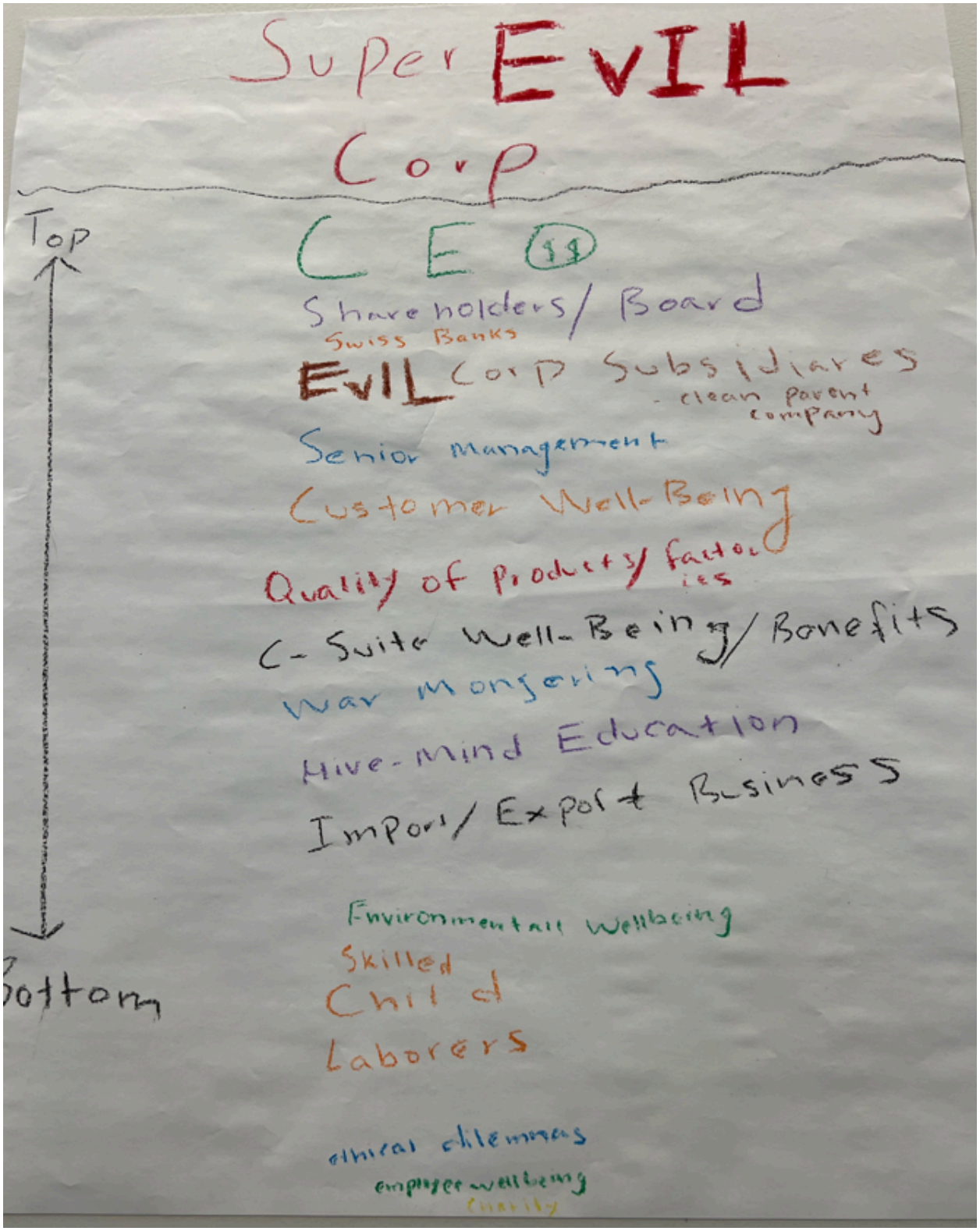

Figure 5: Hierarchy representing an approach highlighting harm.

4.2 Themes of Negotiation During Development

As students came together with several others, who were often not well known to them, they were expected to share their individual moral preferences, and negotiate a new set for the hypothetical company. On exiting the class, we asked them to describe their negotiation methods. In reviewing those responses, we developed three themes.

4.2.1 I will try to persuade you

This theme is about discussion and argumentation, with the goal of convincing the team to change their perspective to align with another. This can involve emotional or logical appeals, and illustrative examples. Ultimately, one perspective is assumed to be right, and the others to be less right.

4.2.2 Let's find a compromise

Teams demonstrating this theme discussed efforts to have everyone be heard, and to find common ground. All opinions matter, and can inform each other. Discussion has the goal of making everyone happy, or at least feel included. This may be accomplished naturally through talk, or resolved through voting.

4.2.3 Let's do an analysis

With engineering students, analysis may be a comfortable approach, and may add structure to an open-ended discussion. Teams taking this approach may have chosen a simple pro/con list, or weighed the interests of various stakeholders efforts against a particular chosen factor. The long-term viability of the company was an obvious choice in this particular exercise, but students also chose to weigh the impacts of decisions on other ideals like humanity, or the environment.

4.3 Themes of Disagreement

Students described the subjects of the disagreements within their teams as they developed their hierarchies, from which we developed three main themes.

4.3.1 What should our company value internally?

There was debate within teams about the company's values related to how it is run. Should the company focus on being a good, long-term employer with a solid product, or was cost-cutting an acceptable means to increase profit? For example, how much should employee well-being matter? There were discussions centered around the impact of a given item on the bottom line, or whether a team really ought to care about money. This question of the value of money was very much part of this conversation, particularly where discussions about other items were framed as a tradeoff with profit.

4.3.2 What should our broader impact be?

Teams disagreed on how much they should consider their effects on the world. No company exists in a vacuum, so there may be some importance to relationships and consequences for actions. However, being considerate of the law, society, and environment also comes with a cost.

4.3.3 What should be the basis of our moral philosophy?

The exercise prompted debate about the foundations of moral philosophy, and demonstrated some fundamental differences within teams. There were disagreements about what was morally right, why or if we should care about other people, and whether goodness is an inherent trait of humanity. In some cases, this demonstrated religious differences. Regardless of the specifics, students were trying to figure out why they should value what they would value.

4.4 No disagreement

In five of the 26 teams (20%), more than half of the members indicated that there was no real disagreement within the team. As shown in the themes, this does not necessarily indicate that there was no exposure to multiple viewpoints, only that there was agreement on how to approach developing the company's preferences. Three of these five developed obviously satirical company hierarchies with humorous intent, so lack of disagreement may indicate a decision to have fun with it.

4.5 Reflexivity in Results

As we developed and refined the themes, we checked back and forth between the responses and codes for development, disagreement, and negotiation. While we did not seek to make them align, we found these to be useful and informative for each other.

We made particular note of our interpretation of the team approach focused on profit and doing things that are either illegal or or counter to most professional codes of ethics. We chose to read these as humor, given the content, drawings, framing, and the instructor's observation of laughter coming from those teams. This is also a more comfortable interpretation. However, they were referring to things that definitely happen in real life. In a large classroom, it is not unreasonable to assume that some participants who took this approach were being serious about their moral priorities.

5. Discussion

The themes of development demonstrate multiple standpoints guiding the development of a company's moral values. Each question describes a different fundamental goal, focused on helping society, employees, the company, shareholders, or harming society. They were not necessarily mutually exclusive, but did compete with each other, as demonstrated by the themes of negotiation and disagreement. The approach of teams also seems to have been informed by how students interpreted the prompt: do we just work at the company, or do we own it? This was left ambiguous in the class exercise. We did not see this as a theme of disagreement in the data, suggesting that students settled upon an interpretation, or were comfortable with the ambiguity. This distinction supports the development of competing perspectives, so we do consider it worth leaving unclear in future iterations of the exercise.

We note also that these themes of development loosely relate to several popular moral or ethical doctrines. For instance, an instructor could easily tie the social responsibility to altruism or utilitarianism, the focus on company longevity as pragmatism, or the profit and harm motives to ethical egoism. The themes of disagreement indicate some discussion of how moral decisions are made and therefore could be guided towards further examination of the development of ethical frameworks, and philosophy, if that were within the scope of the course or exercise. As our objective was to expose students to the experience of competing moral perspectives in the engineering profession without the necessity of naming or explaining prior philosophical thought on morality and ethics, we consider this to be a success.

While some may find the theme of "at the expense of others" to be concerning, even if presented with humor or irony, this is also an acknowledgement of real phenomena. Students may be observing this approach in their own lives, or in popular culture. There are many examples of public figures and fictional characters who seem to get through most or all of their lives while intentionally hurting people for profit without consequence. This approach provided strong contrast with the question of how we can feel good about what we do, with inverted examples and hierarchy elements. We consider this to be useful in setting up discussions about what is right, what is practical, and what we must compete with. Perhaps more research could follow studies of moral engineering exemplars (e.g. [16]) with amoral or immoral engineering exemplars.

As this is an analysis of practice, we note the importance of using the resulting student products in discussion. We see in the results that the students did organically produce a variety of perspectives, and have disagreements within their teams. By bringing the class together after the products are complete, it is possible to demonstrate the full breadth of perspectives, and initiate further discussion and argument. Using other questions about the experience can enhance this discussion. For instance, the themes of negotiation

demonstrate a variety of styles that engineers may experience in class or in the workplace. Class discussion can be used to highlight these differences, and relate them to the various approaches to hierarchy development. The goal of persuasion is aligned with self-interest, compromise with themes of social responsibility, and analysis with pragmatism.

In our future work related to practice leveraging student perspectives for demonstrating moral disagreement in engineering, we think that an application of Moral Foundation Theory to the interpretation of the results could be useful. An interrogation of the individual perspectives and how they informed team discussion could be used to more effectively demonstrate the variety and differences within the classroom, and therefore expectations for experiences in industry.

Also of interest for successful facilitation of this and similar exercises is how engagement with the teams caused students to modify or suppress their own priorities, through the role of moral sensitivity. A person with moral sensitivity acts in ways that are influenced by how they perceive that their actions will affect others [17]. Similarly, in terms of ethical frameworks, the effects of one person's actions on others may correspond to virtue ethics, whereby a person acts in a way that will be perceived as "virtuous" by others [18]. Moral sensitivity can also be described in terms of 11 value priorities, which have been divided into individually-based vs. group-based values, as follows. Individual values include power, achievement, hedonism, stimulation, self-direction, spirituality. Group or societal values include benevolence, conformity, tradition. Values that belonged in both domains were universalism and security. The decision to exercise a group or societal value in lieu of an individual one is influenced by moral sensitivity, such as a decision to exercise conformity over hedonism or stimulation. Therefore, we might expect to see decisions based on moral sensitivity in the differences between what our students describe as moral priorities on an individual basis vs. what they decide in a group setting. We are particularly interested in how that plays out in teams who embrace the "at the expense of others" theme of development.

6. Conclusion

This work presents an analysis of the ways in which an activity that applies students' sense of morality to the development of an engineering company's moral priorities can demonstrate how varied moral perspectives can be. It also captures the ways in which students negotiate these differences. By running such an activity, an instructor can create an understanding of this professional challenge without having to devote time to descriptions of existing moral philosophies. This may be particularly useful in overview or introductory courses, where there is little time for ethics instruction.

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