

BEYOND THE “I”

Framing a model of participatory ethical decision-making for international engineering communication

Mark A. Hannah, Andrew Berardy,
Susan G. Spierre, and Thomas P. Seager
Arizona State University, USA

The article reports on findings of an ethics education unit in a cross-institutional partnership—an American university and an Indian university—that uses noncooperative gaming theory to extend ethics education to take on a global, group/systems perspective. Authors assert that a role of engineering communication at the global level is to position stakeholders to see ethical decision-making as participatory. The authors also comment on four deliberative challenges that students face as they assume participatory roles in ethical decision-making: (1) anticipating and imagining cultural interaction; (2) coordinating the group decision processes primarily through quantitative means of persuasion; (3) cultivating trust; and (4) coping with the challenges of articulating fairness. To address the communication challenges related to fostering participatory ethical decision-making, the authors conclude by opening a conversation about potential avenues for pursuing participatory ethical decision-making in international engineering contexts.



CONNEXIONS ■ INTERNATIONAL PROFESSIONAL COMMUNICATION JOURNAL

2013, 1(2), 11–41

ISSN 2325-6044

Keywords. Ethics education, Participatory decision-making, Rhetoric and engineering communication.

While engineering is increasingly a global profession, models for educating engineering students about the ethical implications of their work have generally remained locally focused. As Seager et al. (2010) explain, “dominant approaches to . . . engineering ethics education share a common focus on the proper conduct that individuals, defined as individual members of a profession, should exhibit.” As we begin to examine the role of engineering communication within global workplaces and among international audiences, we are presented with an occasion to reposition engineering ethics education to take on a global, group or systems perspective. This article reports on findings of a curricular unit in a cross-disciplinary research partnership—English and Sustainable Engineering—designed to extend ethics education in this way.

We argue that a role of engineering communication at the global level is to position stakeholders to see ethical decision-making as participatory—as operating beyond the individual level to that of the group or system. To support this argument, we provide examples from a curricular unit in an upper-division engineering course in which students from an American university and students from an Indian university were instructed on participatory ethics via a novel, noncooperative game-based module (aka The Externalities Game, or TEG) implemented in a distance education framework. Drawing from early work in noncooperative game theory (Sadowski, Seager, Selinger, Spierre, & Whyte, 2012; Seager et al., 2010; Spierre, Seager, Selinger, & Sadowski, 2011), we argue that using a noncooperative gaming theory model

positions engineering students to learn to appreciate and be sensitive to the global impact(s) their decisions have as they experiment with and experience participatory ethical decision-making. In particular, we extend this early work by focusing our analysis on four deliberative challenges students face as they assume participatory roles in ethical decision-making in TEG:

1. Anticipating and imagining cultural interaction.
2. Coordinating the group decision processes primarily through quantitative means of persuasion.
3. Cultivating trust between game players.
4. Coping with the challenges of articulating fairness.

With each of these items, we discuss the communication challenges students faced when attempting to negotiate ethical choices that would affect themselves and also the other players in the game. To address the communication challenges related to fostering participatory ethical decision-making, we conclude the article by opening a conversation about potential avenues for pursuing participatory ethical decision-making in international engineering contexts.

The Externalities Game

TEG is designed to experientially teach students about ethics related to the problem of environmental externalities, where the behaviors of a few impact otherwise uninvolved parties. For example, a company's manufacturing processes cause air pollution that imposes health and environmental costs to society as a whole. Analogously, TEG immerses students in a situation where their personal interests are at odds with group success. In TEG, students play with grade points for the TEG assignment, knowing that improving,

their grade comes at the cost of decreasing the grades of all other players—including players located internationally.

The game consists of two simultaneous decisions. First, students must decide how many grade points they want to produce. This establishes an initial grade that is negatively influenced by the production decisions of other players—externalities. The impact of a player's production decision depends on the production class randomly assigned to the player, as described in Table 1 (p. 17). Second, players decide whether or not to transfer grade points earned in the first part of the game to other players. Prior to gameplay, students are encouraged to strategize and negotiate about how to play, but are also informed that there is no third party enforcer for agreements made. The game is calibrated in a way that makes it necessary for players to cooperate in a production and sharing strategy to optimize the overall class grade. Students who realize this must determine if they trust their classmates enough to follow such a strategy as it poses both a risk and an opportunity to every student involved, and then convince their classmates that it is worth undertaking. Alternatively, students might not see the value in cooperation or fail in convincing their classmates, leading to a free-for-all and lower overall grades for the class.

Generally, the aims of TEG are threefold:

1. To create opportunities for ethical discourse and action.
2. To force participants to deal with injustice as part of the decision-making process.
3. To allow ethical leaders to emerge.

As part of the game design, instructors intentionally create ambiguity, surprise, risk, unfairness, and uncertainty to support these aims. Whereas typical ethics instruction deals with passive analysis of concrete case studies,

involvement in a game like TEG provides students with an opportunity to actively deal with ambiguous moral problems with uncertain outcomes, much like those they are likely to encounter during their career, where the right answer is difficult and unclear.

To foster emotional involvement in the strategies and outcomes of the game, instructors tie game outcomes to the grade that students will earn in the TEG unit. Students earn their TEG grade by participating in various activities in each of the game's three phases: Pregame, Gameplay, and Postgame. Each phase lasts approximately one week.

Pregame

Students prepare for TEG by watching an introductory video, reading a game guide, working with an Excel spreadsheet that will calculate production scores during the second and third phases of TEG, and participating in a pregame exercise. The video introduces the concept of noncooperative game theory—games without third party enforcers—and explains that the game is based on Tragedy of the Commons—rational actors using a shared resource will ultimately deplete that resource.

To help students imagine what is involved in the final two phases of the game, they read a game guide that provides a detailed schedule outlining what students must do in chronological order to participate fully in the game. To contextualize the activities in the game guide, students must watch and read material related to the two concepts supporting TEG: externalities, which are unintentional consequences of actions that affect other people; and Coase theorem, which is a theory regarding externalities that states that, with no transaction costs, trade will lead to an efficient outcome, so long as property rights are well defined. In addition to these readings, students

take a pregame survey regarding trust in classmates, and make a hypothesis regarding their prediction for how TEG will play out. Students are asked to share their hypotheses with other students by posting them as responses to the video explaining TEG.

While engaging in each of the above pregame activities, students also have an opportunity to play with the Excel spreadsheet that will be used to calculate production scores in the last two phases of TEG. The spreadsheet allows students to experiment with different gameplay strategies by immediately generating the possible outcomes from any decisions the students make (i.e., do the students underproduce or overproduce with respect to the production strategy negotiated between the game participants).

Finally, students engage in a pregame exercise to test the level of trust they have in their classmates. When organizing the exercise, instructors divide students into several groups and tell each group they can choose to “cooperate” or “compete.” If all students cooperate, they receive a passing grade for the exercise. If one or a few groups compete, they hurt the grades of those who cooperated, but improve their own grade substantially beyond just earning a passing grade. If all students compete, they all fail the exercise.

Gameplay

TEG gameplay consists of player assignments, deliberation, a production round, more deliberation, and a sharing round. Points earned during the game—a maximum of 100 per student—are treated as part of a 100-point assignment that counts towards the students’ final grades in their class. In this phase, instructors intentionally limit their interaction with students to encourage them to handle issues independently.

Table 1

Production classes and their characteristics

Class	Points per unit production	Externalities per unit production	Production limit (units)	Percent students in class
Luxury	High	High	0– 10	10%
Intermediate	Medium	Medium	0– 50	30%
Subsistence	Low	Low	0–240	60%

Production classes and their characteristics are subject to diminishing returns as production is increased

Players are assigned to one of three production types, as described in Table 1, and are provided an anonymous player code number. Each role has strategic advantages and disadvantages, but Luxury is typically considered as having an advantage, as this is the only role that can pass the assignment independent of the other players' actions. Instructors intentionally introduce unfairness by arbitrarily assigning these roles, and instructors assign roles so that there is the correct percentage of students in each production class. During gameplay, students are allowed to deliberate between institutions and within their own classes to persuade each other that they should produce a certain amount or go along with a certain plan, but no enforcement mechanisms are provided by the instructors. Lack of enforcement forces students to deal independently with the injustice inherent in certain production roles and provides an opportunity for ethical discourse and action as well as for ethical leaders to emerge.

After deliberating between and/or amongst the classes at the two universities, students anonymously submit their final production decisions. This is followed by results being posted via private player codes for the class

to see. Anonymity introduces an aspect of uncertainty and ambiguity, as it is not clear what decisions were made, and if students kept to their agreements or betrayed the class. If a production decision was not submitted on time, or a technical error resulted in the instructor not receiving the decision, the player is assumed to produce nothing and receives no grade points. This allows for unfair situations to emerge naturally during gameplay.

Following the posting of production results, players are allowed to deliberate once more regarding potential voluntary sharing of points. Strategic deliberation involving arguments for fairness or justice can be used to persuade classmates to share, once again providing an opportunity for ethical leaders to emerge and support discourse and action. Point sharing deliberation is followed by anonymous submission of final sharing decisions from specific players to specific players. After sharing decisions are submitted, final game results are revealed to students.

Postgame

Activities include a postgame survey regarding trust in classmates, class discussion, and a reflective essay. The class discussion focuses on the experiences of gameplay and is moderated by instructors, but led by students. Key ethical issues that arose during gameplay are a vital part of this discussion. This allows students to reflect on their actions or inactions in the face of injustice when they had an opportunity to intervene. The reflective essay provides an opportunity for students to think critically about their experience in TEG and how it relates to the course, ethics, and sustainability.

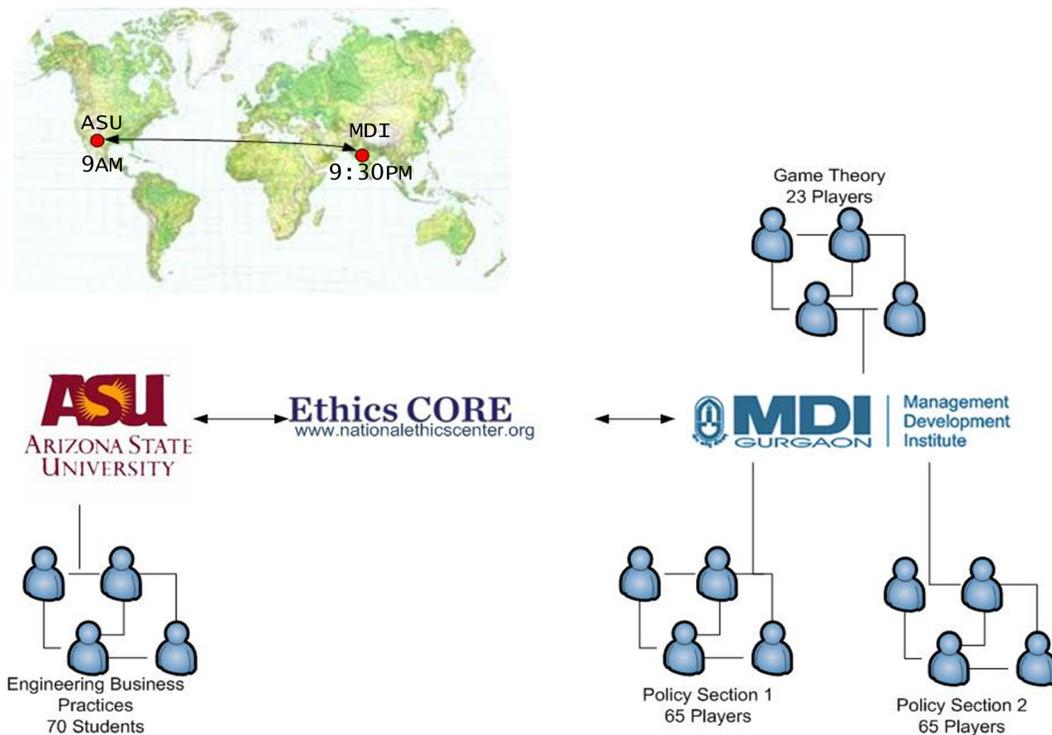
Methods

Participants

Game participants were distributed across two universities and two disciplines: 70 engineering students in the US and 153 management students in India (See Figure 1). The U.S. students were enrolled in an Engineering Business Practices course and the Indian students were enrolled in either a course in Game Theory (23 students) or Policy (130 students). The primary means of cross-institutional communication provided to the U.S. and Indian participants were discussion board posts on the site Ethics CORE, an NSF-funded online ethics resource center.

Figure 1.

Framework of TEG



Data Collection

The data for this analysis came from three sources. First, data came from the three written assignments the U.S. students were asked to complete during the game. These assignments included

1. The hypotheses the students wrote in the pregame phase about how they anticipated the game would play out.
2. The tweets the students composed during the three phases of the game.
3. The reflective essays the students wrote in the postgame phase.

Second, data came from the authors' field notes and their attendant, reflective write-ups. Third, data came from the posts, responses, and exchanges that the U.S. and Indian students composed on Ethics CORE. Due to issues with access to the Indian students, related primarily to the difference in time zones, data from the Indian students was only collected via Ethics CORE. The authors' Institutional Review Board approved the study.

Data Analysis

The authors hypothesized that the U.S. and Indian students would struggle to deliberate and articulate a clear plan for minimizing externalities. In particular, the authors speculated that limited opportunities for traditional face-to-face interaction during the game as well as the 12.5-hour time difference between the two universities would pose significant barriers to successful deliberation. Compounding these two factors was the concern the non-Luxury students had regarding the grade they would earn playing the game. Specifically, the felt lack of control these students would experience over their grades would likely heighten tensions in and between the different

production classes of students and thus ultimately undermine trust between them.

In light of these issues, the authors were uncertain about how the students would interact and deliberate during the game. As such, the authors did not define specific data categories for analysis regarding deliberative challenges prior to the game. Therefore, the authors decided to take a qualitative approach to data analysis. The authors each recorded their observations and impressions of the participants' written and oral deliberative interactions, and then convened after the game was completed to share their observations and develop a coding framework for the deliberative challenges the participants faced.

During the authors' postgame meeting, they noted the limited amount of interaction between the U.S. and Indian students on Ethics CORE and, as a result, determined that there was insufficient data to comment specifically on the Indian students' deliberative practices. Accordingly, the primary focus of the data analysis was the U.S. students' deliberative practices as reflected in their written assignments and in-class discussions. To categorize these practices, the authors shared their observation notes and reflective write-ups and identified 8 categories related to the U.S. students' deliberations about production and sharing decisions. Through further discussion about the 8 categories, the authors identified redundancies between them and narrowed the total down to four:

1. Anticipating and imagining cultural interaction.
2. Coordinating the group decision processes primarily through quantitative means of persuasion.
3. Cultivating trust between game players.
4. Coping with the challenges of articulating fairness.

Discussion

TEG provided many opportunities for deliberation amongst students on several ethical and logistical problems. We intentionally designed the game to allow deliberative conversations to spontaneously emerge as students encountered different problems and disagreements throughout the process of playing the game. However, the four deliberative matters we identified did not receive as much attention from the U.S. students as we expected. These matters therefore could be considered missed opportunities for cultivating high quality deliberative practices in TEG. In the sections that follow, we describe these deliberative challenges and comment on their impact in foreshortening the process of participatory ethical decision-making.

Anticipating and Imagining Cultural Interaction

The U.S. and Indian students tended to treat one another as an aggregate group, preferring to use ambassadors rather than interact as individuals online. Also, during gameplay, there were no international point transfers; all transfers occurred between students at the same institution. Consequently, communication between groups was limited in quantity and focused mainly on game strategy in preparation for the production aspect of TEG. We offer two possible explanations for this limited online interaction between the U.S. and Indian students.

The lack of online discourse may be explained by a well-established social psychology concept known as *evolutionary tribalism*, which describes the human tendency to connect with and act more altruistically with members of an *in-group*, or with people that have something in common with them. Alternatively, members of an out-group may be seen as outsiders or even competitors that do not need to be dealt with cooperatively (Bornstein,

2003). For example, tribalism may be explicitly observed among members or fans of team sports and, at the extreme, may be a driver of racism and religious conflict. Sadowski et al. (2012) discuss the role of in-groups and out-groups in a multiclassroom ethics game modeled after the Tragedy of the Commons where there was a similar tribalism dynamic exhibited among students in different classrooms, but all located within the United States. In TEG, U.S. students originally thought their in-group was their production class and their out-group was the other production classes, but when faced with the out-group of Indian students, U.S. students considered their entire class as their in-group and the Indian classes as an out-group. This in-group/out-group distinction was exemplified in a post from a U.S. student writing:

It will be interesting to see what happens but you don't know that the Indian students will agree with your class on how to work together. Try to brace yourself for any decision or result that may occur, including your own actions. Good or bad.

This student is identifying Indian students as foreign, unknown, and unpredictable, but giving honest advice to U.S. students. Another two posts specifically expressed fear of the Indian students saying, “we did a good job cooperating together today. BUT, i do still have some fears from the Indian side of the world!” and “players can now point to the threat of India and claim that any guarantee of optimization is frivolous at best.” These suspicions were countered partly by other more optimistic posts. One U.S. student wrote:

I think that people in our class especially will be more apt to work as a group since we have experienced proof that it can work. As far as the classes

in India, as I previously stated, I believe that as people & as students we all have very common basic desires.

A second U.S. student wrote: “India may be a problem, but are they not thinking the same thing about us? They will reach out to us as much as we are willing to reach them. Communication is key.”

One Indian student attempted to break down the tribalistic barrier by calling for students at both institutions to introduce themselves in a discussion on Ethics CORE. Unfortunately, the student framed it in a strategic rather than normative way, saying:

It is most important to know how many of us are luxury, intermediate, and subsistence so that exact effect can be calculated and we can jointly decide who will produce how much. So let’s Introduce each other with production role.

Responses to this post were minimal, most including just player ID or production class. The rest of the discussion on Ethics CORE was primarily about strategy for TEG, unfortunately missing an opportunity to humanize the players involved across both institutions¹. Consequently, less formal and conversational dialogue was more natural and comfortable for students in a classroom with students they could identify with in terms of attending the same university and/or pursuing the same degree². We argue that the U.S./ Indian tribalism may have hampered individual interactions and discussions beyond game strategy between the two groups.

Social psychology research also tells us that individuals are more likely to be morally apathetic to geographically distant people than they are with those living nearby. Inrona (2001) reports that individuals tend to

behave morally when they feel morally obligated to others, especially when the others are people that we name and see face to face. Also, Markowitz and Shariff (2012) attribute individual inaction towards climate change in part to the fact that people in developed nations believe—correctly—that climate change will most negatively affect individuals in distant developing nations. Thus, spatial distance may enhance the tribalistic tendency for humans and reduce the ability of humans to perceive climate change as an important moral imperative that inspires life-style changes. Analogously, students at the U.S. and Indian institutions seemed much less concerned about helping individual players at the other university than they were with transferring points to needy students in their own classroom. The geographic distance between the physical classrooms as well as the time difference may have reduced the moral obligation they felt towards both communicating with and helping students at a foreign university.

Ultimately, enhancing the quality of cross-institution deliberation may lie in breaking down the tribalistic and spatially distant barrier that exists between groups. This may involve greater efforts and opportunities to interact before, during, and after TEG is assigned³. Perhaps a video of one group of students can be sent to the other as a form of a pregame “ice-breaker,” or perhaps the students could interact in a series of games and cooperative assignments⁴. Repeated opportunities for interaction will likely build trust and would allow students to identify commonalities that may begin to alleviate the tribalistic tendency and/or spatial disconnect. Furthermore, emphasizing TEG as an exercise in ethical decision-making would likely change the tone and quantity of discourse. It is clear the students at both institutions generally approached the game as a numerical exercise and failed to apply the ethical concepts presented in class. Placing a grade

value on students' ability to apply ethical concepts and reasoning in their online communication would likely encourage more meaningful interactions between groups.

Tension Between Quantitative and Qualitative Persuasion

During the pregame phase, students were slow to work together. Partly, this was due to a lack of familiarity with the game. Also, the students were concerned with how gameplay might impact their grade. Furthermore, there were no predetermined game leaders. Generally, the students sat around waiting for something to happen as was evidenced in one of the student's postgame reflection where she commented "We needed in a way a person who could tell us how to work together." What is most telling about this student's comment is her desire for specificity (i.e., "do this," or "don't do this"). Granted, this reading of the student's comment may be oversimplified, but the student yearned for some form of rule-based framework from which to begin negotiation and decision-making. This yearning was evident in other students' reflections where they offered advice to future students about how to gameplay. More than once, students noted the need to "develop a plan," or "find a way to get everyone on board." Where students turned for such guidelines was their mathematical, quantitative abilities.

During the practice game activity in the pregame phase, students worked in small groups to determine how to proceed in the game. After about ten to fifteen minutes of nervous, quiet chaos—students whispering to one another in their groups, the occasional student branching out to other groups to see what they were doing, and a few tentative leaders standing up and passively proposing a course of action—one student walked to the board to write a production optimization formula. After writing the formula, the

student calmly explained how it would work to optimize everyone's grade so long as all groups abided by the class' collective production decision. What was noteworthy about the student's performance was the sense of collective calm that set over the room after his explanation. It became very quiet and activity stopped until a few minutes later when another student stood up to explain how the class ought to play out the formula in the game. In the writing of hypotheses during pregame, some students commented about how the student's optimization formula was "beautiful" and "perfect." In a way, these comments suggested that math was some kind of therapeutic narcotic; that it settled the unrest in the game. One student even surmised in his hypothesis that, based on this math example, he believed more students would be "apt to work as a group since [they] experienced proof that it can work."

Overall, statements like these dominated the student hypotheses and reflective essays; however, there were a few students who commented about the need for nonquantitative, nonmath forms of persuasion. Though these students' statements were not explicitly framed as "we need nonquantitative persuasion," their instinct for such nonquantitative means can be inferred from the language in their hypotheses. For example, one student flatly noted that, regardless of what was decided regarding the class' production decision, the sheer number of Indian students compared to U.S. students could potentially overwhelm any collective decision the students made. That is, the proposed optimization equation would not even matter if the Indian students decided to produce in a contrary manner. In addition to this example, other U.S. students commented about the limits of the group's mathematical focus. One student remarked in his hypothesis that there were more variables that needed to be addressed besides the optimization issue,

and two other students mentioned in their hypotheses that there would be few moral leaders in the game. In these latter examples, we infer a rhetorical instinct in the students regarding the limits of quantitative reasoning in persuading others to act. As the one student noted, other variables needed to be attended to, yet the student, as is evidenced by his lack of commentary, did not know where to turn to locate the means for addressing such variables. The student in this example was unable to see the available means of persuasion. All that was available or made visible was the class' collective computational ability as expressed in the optimization formula.

The general inability to recognize and develop nonquantitative or qualitative means of persuasion was particularly troubling for us considering that the students were explicitly prompted by one of the teaching assistants to search for other deliberative means. The teaching assistant, outside the direction of the lead instructor, wrote in response to a student hypothesis:

Communication can be a great hurdle to jump when attempting collaboration across different cultures. Unpredictable adversity can arise not only in getting your message halfway across the world but also [in] making sure your message is clear, translatable, and applicable. Small variance in language patterns, tones, use of idioms and many other linguistic variables can serve to open the gap of the communication rather than close it.

Yet, despite this direct call for attention to the qualitative aspects of their communication activities within the game, the U.S. students ignored this dimension of their deliberative activities and relied on math as the primary factor for guiding their thinking about how to produce ethically.

Ultimately, the effects of the observed overreliance on quantitative persuasion played out in two specific ways. First, the students were unable to

see the broad impact of their quantitative decision-making. Put another way, quantitative reasoning did not position students to see the big ethical picture but, instead, prompted them to view decision-making on an individual level (i.e., how would my individual production decision be calculated on the TEG spreadsheet?).

Second, the recognition of leaders in the game stemmed from one's ability to articulate a workable optimization formula. In the hypotheses, students clearly identified the game leaders as those individuals who created and/or planned the execution of the formula. Furthermore, in a number of the reflective essays, students expressed a desire to be leaders in the game, but were unable to do so because they could not formulate a plan—interpreted to mean an equation. One student in particular tied his lack of leadership to his inability to “have a miracle idea” for organizing the group's work. Overall, the tying of persuasive capacity to mathematical savviness short-circuited the students' ability to garner momentum for participatory ethical decision-making. They simply let math do the talking and relied on it to build trust between players in the game⁵.

Cultivating Trust

Given the absence of a third party enforcer and the ability to make anonymous decisions in the game, many U.S. students expected some of their classmates to go against the group for selfish reasons. As one male student explained in his hypothesis, “I believe that towards the end of the game, students that have the opportunity to boost their grade up will take advantage of that because they can act anonymously.” One student even went so far as to characterize as “deviants” those peers that worked against the group because of the promise of anonymity. Theoretically, a student who betrayed the

agreed-upon group plan would not be forced to reveal his or her identity or decision and could not directly be asked to explain his or herself, or attempt to rectify any betrayals of the group consensus.

In anticipation of such betrayal, many U.S. students began insisting on transparency—through players revealing their identifier codes—as an accountability measure. Following the credo of leading by example, students who demanded transparency revealed their own player codes and spent a large portion of their class time arguing for others to do the same. However, as we observed, they were unsuccessful partially due to arguments over the need for privacy for true trust to emerge. The class was divided into two camps—one that argued that trust is only achieved through honesty and transparency, and another that argued that trust means not having to be transparent. Two students addressed this idea in their hypotheses. One female student wrote:

The key to this working though, is transparency: transparency in our position (luxury, intermediate, or subsistence), transparency in our decisions, transparency in our communications The reason that people will be more apt to “defect” . . . is because of the anonymity offered in this setting versus an in-person classroom setting where a person can be called out on their actions. Anonymity breeds suspicion whereas transparency breeds trust.

In this example, we witness the student positively characterizing transparency as a panacea for all deliberative ills that may arise. Taking a more negative tone towards those peers that did not value transparency in the same way, another male student wrote:

Many who were intent on screwing the class over on Thursday were halted by the wave of uninhibited transparency, something which will be much more difficult to achieve across our class this time around.

Ultimately, no hypotheses explicitly attempted to defend the idea of remaining anonymous, possibly because doing so would make other students expect them to use that anonymity to betray the class and open them to arguments against this idea from students advocating for transparency. What was noteworthy for us about the calls against remaining anonymous was the limited manner in which students defined what it meant to be anonymous. Specifically, anonymity was narrowly understood as having never “met” someone formally, or not “knowing” each other fully. In casting anonymity in this manner, the transparency advocates foreclosed themselves to the possibility of cultivating working relationships in the game. That is, they made anonymity too high of a hurdle to overcome and missed opportunities to identify available means for fostering relationship building and working towards group ethical decision-making that limited externalities.

In the end, most students revealed their identifier codes, but several did not—enough so that their anonymity was maintained when they went against the group consensus. This meant that the rest of the class was then unable to hold them accountable for their actions, since they did not know who they were. The only response available to them was to attempt to shame them by addressing the class as a whole, but this was ineffective, as they continued not to reveal their identity or change their decisions.

The Challenges of Fairness

Tied to the relationship between trust and transparency in TEG were competing understandings of what constituted fairness in the game. Specifically, the outcome of the first two deliberative phases of the game led to the emergence of three types of problematic players who either disregarded concerns with fairness, or were in a position wherein they hoped some form of kindness could be extended to them through a sense of fairness in the game. The three types of players were described as followed by the class members:

1. *Cheaters*. Cheaters produced more than what was allowable per the optimization strategy agreed upon by the group, giving themselves more points at the expense of others.
2. *Unfortunates*. Unfortunates attempted to submit production decisions, but technical difficulties with the game technologies resulted in their submissions not being received, resulting in them obtaining no credit.
3. *Screw-ups*. Screw-ups did not submit a decision because they did not understand the game, did not care about the game, or failed to follow the game's instructions.

These three groups of students arose due to the way TEG was set up. There were some basic rules that were enforced, such as student decisions having to be submitted in a certain way by a certain time or they would be invalid, but for the most part we allowed students to create their own norms to operate by in TEG. This allowed cheaters to get away with what they did and allowed the class to react to unfortunates and screw-ups in whatever way they deemed as appropriate. The absence of rules in favor of norms also encouraged leaders to emerge and make persuasive arguments for others to

go along with a plan. If there had been an enforceable agreement system, such arguments would not be as vital—as long as someone agreed to a plan, it could be enforced. Instead, without enforcement, leaders had to make sure they had not only a promise of cooperation but that the promise seemed genuine. This was especially important in the game since an effort to achieve transparency—which would have allowed some rule enforcement—failed. This process helped some students understand what it takes to be a leader and what is effective in guiding people.

The students' responses to these different groups of players were interesting and varied. The primary way that students reacted to the cheaters was by attempting to shame them into rectifying their violation of the social norm that had been established by the group's agreed-upon plan. Examples of the shaming *modus operandi* (MO) included statements made in class such as “don't be greedy,” “do it for the greater good,” and “it's nicer to cooperate than compete.” One female student in her reflective essay characterized the shaming MO as an act of condemning those who cheated in order to bring them back in line with “morality.” What was noteworthy about the shaming MO was how easily it became the default deliberative tactic for students. In fact, only one student noted in a reflective essay that, early in the game, the class should have made “a much greater effort to appeal to the luxury players and convince them to follow along.”

The response to the unfortunates was two-sided. Some blamed the technology or instructors for causing the failure of their production submissions, whereas others blamed the unfortunates themselves for not having better accountability and keeping evidence that they submitted a certain decision. In working with the unfortunates, there was also evidence of a bystander effect. Specifically, through all of the blame-placing, few

students stepped forward to fix the problem and, instead, simply continued along and did nothing to remedy the injustice.

Regarding the screw-ups in the game, they were not given any sympathy from the class since they admittedly failed to follow instructions. In fact, one of the screw-ups seemed to prize that title and wear it as a badge of honor and, in doing so, made it very easy for the students not to extend her any kindness (i.e., point sharing).

Cultivating Sustainable Deliberative Practices for Participatory Ethical Decision-Making in International Contexts

In light of the foregoing discussion of the deliberative challenges students faced in collaboratively making ethical decisions related to externalities, the question before us now centers on the potential impact of these communication challenges to advancing a practice of ethical decision-making for engineers in international contexts. Since we all play a role in educating tomorrow's engineers, in the remainder of this section we will discuss two pedagogical items we believe will position engineering students to successfully adopt this important practice.

One suggestion for advancing a pedagogy of participatory ethical decision-making is to discuss with students the different opportunities that are available for cultivating their authority and asserting their expertise in international contexts. Stated bluntly, equations, schematics, or any other type of computational activity are insufficient for crafting one's credibility when assuming a participatory role in ethical decision-making. Throughout TEG, we witnessed students miss out on various opportunities for crafting a robust and credible identity as they continually deferred to the successful example of the optimization formula both in garnering attention and,

ultimately, in devising a plan of action for proceeding in the game. Granted, as engineers, it is unsurprising that the students gravitated to mathematical expression as their preferred means of expression and persuasion. However, as these students begin to work on the wicked problems (Seager, Selinger, & Wiek, 2011) facing our global society—problems that know and honor no geographical or cultural limits—they will require an ability to recognize the limits of mathematics and seek out supplementary means for furthering their claims and/or arguments for addressing such problems.

Accordingly, we ought to work with students and attune them to discovering other available means for cultivating their credibility as emerging engineering professionals. In doing so, we will improve engineering students' learning experience more explicitly by providing them with a communicative and/or rhetorical language for conducting such inquiry.

An avenue for providing engineering students with such language is their writing. To illustrate, let us look at TEG. In the game, the instructional team created various opportunities for students to communicate and deliberate with their peers via writing (i.e., hypothesis stating, tweets, Ethics CORE), yet students generally missed opportunities for cultivating a robust and credible identity when writing in these activities. That is, they answered the questions in a limited manner and only noted how, or what types of problems would arise in the game.

The question for us as instructors is how could we have cast the writing activities differently so as to prompt students to see their writing as a means for establishing their credibility in the game? For discussion purposes, let's use the hypothesis writing activity. Rather than emphasize the need to make a prediction about how the game would play out (i.e., "I think we will all cooperate"), what would happen if we instead emphasized the

need for students to map the outcome for readers; that is, lay out for readers the different tensions at play in the game as well as comment on the impact of particular types of decisions (i.e., “I anticipate a tension between items A and B and, as such, I think the best way to approach this problem is Avenue Z”). The relevance in this subtle difference in framing the question is that participatory ethical decision-making does not rely on ultimate decisions but, instead, on the coordination of decisions. Put another way, rather than simply allow students to rely on the common saying “the ends don’t justify the means,” we now draw attention to the processes of ethical decision-making, which is just as important as the outcome itself. Furthermore, we prompt students to exercise their connective thinking abilities—the ability to coordinate and link different approaches to outcomes.

As a final suggestion for advancing a pedagogy of participatory ethical decision-making, it became clear through the gameplay that the students had an impoverished notion of what leadership looks like in practice. Repeatedly in the hypotheses and the reflective essays, students attached leadership ability simply to a person’s capacity to stand up and speak. Often couched in terms such as “I stepped up,” or “Person X stepped up,” leadership expressed in this way relies on visible and overt action.

A pedagogical challenge we face with students is learning how to articulate leadership as operating in realms beyond the visible and overt. A mechanism for forwarding the nonvisible aspects of leadership can be found in one of the fundamental canons of ethics expressed by the National Society of Professional Engineers (NSPE). In particular, one of the NSPE’s fundamental canons is for engineers to “act in technical matters for each employer or client as faithful agents or trustees.” Generally, it is understood that trustees have some type of advisory or supervisory role over some

item—trustees hold something in trust for another party. Without playing too much of a semantic game here, let us imagine the students as trustees in TEG and ask ourselves what their leadership behavior might have looked like had it been framed in this manner. In particular, how might the students' actions have differed had we asked them to reflect on what it was exactly they held in trust for their peers at the U.S. institution, their peers at the Indian institution, and even the environment? While any answer to this question would be speculative at this point in time, we are curious about how students might have expressed what it might mean to act and deliberate as a leader without stepping up and speaking in front of an assembled group—as leadership is traditionally understood. Put another way, how do leaders deliberate with a disassembled and dispersed audience in different locations? As with the first suggestion in the opening of this section, we contend that recasting leadership in this way for engineers will draw attention to the processes of ethical decision-making—which is as important as the outcome itself.

A Possible Future for Participatory Ethical Decision-Making in International Engineering

TEG was designed to motivate students to work together, allow leaders to emerge, and give students the opportunity to figure out how to cooperate in the absence of an enforcement mechanism. Though the game was limited by its academic nature in that the students were never able to let go of their concern for their grades, the game was valuable for the manner in which it positioned students in explicitly social settings that required both coordination of decision processes and effective deliberative skills to ensure group success at an international level.

While this example of TEG did not foster the type of cross-cultural collaboration that we hoped for, the students' work was revealing to us in the way it suggested how the students would likely have benefited from additional rhetorical and/or communication training prior to playing the game. Though the call for rhetoric in engineering education is not new, the outcomes of our partnership's TEG game suggest we ought to be more explicit in helping students learn how to recognize and draw from the available means for persuading others to action. Such an ability will be required if we want our engineering students to act as leaders in addressing the wicked environmental problems of the world in international contexts. ■

Notes

- ¹ Greenberg, Greenberg, and Antonucci (2007) argue for the need to encourage more social conversation rather than task-related communication to foster trust in virtual teams. In TEG, there was an absence of social conversation between the U.S and Indian students.
- ² Drawing from Wilson, Straus, and McEvily's (2006) discussion of trust, we attribute the ease of intraclass communication to the availability of social information between the U.S. students.
- ³ To support this claim, we draw from McNair, Paretti, and Davitt's (2010) suggestion that "classroom instruction and assignments directed toward building relationships quickly in virtual settings . . . have the potential to increase the degree of knowledge sharing between students" (245).
- ⁴ Examples of interactions such as these represent the kind of early interaction recommended by Coppola, Hiltz, and Rotter (2004) to foster the development of swift trust.
- ⁵ McNair, Paretti, and Davitt (2010) comment on the necessity of talk and discourse as foundational for building relationships in virtual teams (p. 244). In TEG, talk was limited between the U.S. students after the optimization formula was developed as there was no felt need to develop relationships for the game. Math was enough. Future TEG game play ought to encourage more talk between players so as to facilitate trust and relationship building. Following Coppola, Hiltz, and Rotter (2004) and Jarvenpaa, Shaw, and Staples (2004), the encouragement of talk ought to occur as soon as the game begins.

References

- Bornstein, G. (2003). Intergroup conflict: Individual, group, and collective interests. *Personality and Social Psychology Review*, 7(2), 129–145. http://dx.doi.org/10.1207/S15327957PSPR0702_129-145
- Coppola, N. W., Hiltz, S. R., & Rotter, N. G. (2004). Building trust in virtual teams. *IEEE Transactions on Professional Communication*, 47(2), 95–104. <http://dx.doi.org/10.1109/TPC.2004.828203>
- Greenberg, P. S., Greenberg, R. H., & Antonucci, Y. L. (2007). Creating and sustaining trust in virtual teams. *Business Horizons*, 50(4), 325–333. <http://dx.doi.org/10.1016/j.bushor.2007.02.005>
- Introna, L. D. (2001). Virtuality and morality: On (not) being disturbed by the other. *Philosophy in the Contemporary World*, 8(1), 31–39.
- Jarvenpaa, S. L., Shaw, T. R., & Staples, D. S. (2004). Toward contextualized theories of trust: The role of trust in global virtual teams. *Information Systems Research*, 15(3), 250–267. <http://dx.doi.org/10.1287/isre.1040.0028>
- Markowitz, E. M. & Shariff, A. F. (2012). Climate change and moral judgement. *Nature Climate Change*, 2(4), 243–247. <http://dx.doi.org/10.1038/nclimate1378>
- McNair, L. D., Paretti, M. D., & Davitt, M. (2010). Towards a pedagogy of relational space and trust: Analyzing distributed collaboration using discourse and speech act analysis. *IEEE Transactions on Professional Communication*, 53(3), 233–248. <http://dx.doi.org/10.1109/TPC.2010.2052857>
- National Society of Professional Engineers. (2007). Code of ethics for engineers. Retrieved from <http://www.nspe.org/resources/pdfs/Ethics/CodeofEthics/Code-2007-July.pdf>
- Parmenter, L. (2003). Describing and defining intercultural communicative competence: International perspectives. In M. Byram (Ed.), *Intercultural Competence*. Strasbourg: Council of Europe Publishing, 119–147.
- Sadowski, J., Selinger, E., & Seager, T. P. (2013). Intergroup cooperation in common pool resource dilemmas: The role of ethical leadership. *Human Ecology*. Manuscript submitted for publication.

Sadowski, J., Seager, T. P., Selinger, E., Spierre, S. G., & Whyte, K. P. (2012). An experimental, game-theoretic pedagogy for sustainability ethics. *Science and Engineering Ethics*, 19(3), 1–17. <http://dx.doi.org/10.1007/s11948-012-9385-4>

Seager, T. P., & Spierre, S. (2013, January 17). Negative externalities & Coase Theorem. [Web log post]. Retrieved from <http://sustainableengineeringsystems.com/2013/01/17/negative-externalities-the-coase-theorem/>

Seager, T., Selinger, E., & Wiek, A. (2012). Sustainable engineering science for resolving wicked problems. *Journal of Agricultural and Environmental Ethics*, 25(4), 467–484. <http://dx.doi.org/10.1007/s10806-011-9342-2>

Seager, T. P., Selinger, E., Whiddon, D., Schwartz, D., Spierre, S., & Berardy, A. (2010). Debunking the fallacy of the individual decision-maker: An experiential pedagogy for sustainability ethics. *2011 IEEE International Symposium on Sustainable Systems and Technology (ISSST)* (pp. 1–5). IEEE. <http://dx.doi.org/10.1109/ISSST.2010.5507679>

Spierre, S. G., Seager, T. P., Selinger, E., & Sadowski, J. (2011). Using non-cooperative games to simulate ethical tensions in climate policy negotiations. *2011 IEEE International Symposium on Sustainable Systems and Technology (ISSST)* (pp. 1–5). IEEE. <http://dx.doi.org/10.1109/ISSST.2011.5936882>

Wilson, J. M., Straus, S. G., & McEvily, B. (2006). All in due time: The development of trust in computer-mediated and face-to-face teams. *Organizational Behavior and Human Decision Processes*, 99(1), 16–33. <http://dx.doi.org/10.1016/j.obhdp.2005.08.001>

About the Authors

Dr. Mark A. Hannah is an assistant professor of rhetoric and professional writing in the Department of English at Arizona State University. His research focuses on rhetorics of cross-disciplinarity, specifically the development of rhetorical practices and mechanisms for working through the communication challenges that arise in complex, collaborative work environments.

Email. Mark.Hannah@asu.edu

URL. <https://webapp4.asu.edu/directory/person/931206>

Contact.

Department of English
Arizona State University
PO Box 870302
Tempe, AZ 85287
USA

Andrew Berardy is a PhD student and graduate research associate in the School of Sustainability and a graduate teaching assistant in the School of Sustainable Engineering and the Built Environment at Arizona State University. His primary research is on sustainable consumption. He also performs research regarding expertise and experience.

Email. Andrew.Berardy@asu.edu

URL. <https://webapp4.asu.edu/directory/person/1619586>

Contact.

School of Sustainability
Arizona State University
PO Box 875502
Tempe, AZ 85287
USA

Dr. Susan G. Spierre is a postdoctoral researcher in the School of Sustainable Engineering and the Built Environment and an Instructor in the School of Sustainability at Arizona State University. Her primary research looks at sustainability issues related to international climate change policy, energy, and human development. Dr. Spierre also works in the area of sustainability ethics and engineering education.

Email. Susan.Spierre@asu.edu

Contact.

School of Sustainability
Arizona State University
PO Box 875502
Tempe, AZ 85287
USA

Dr. Thomas P. Seager is an associate professor in the School of Sustainable Engineering and the Built Environment at Arizona State University. He also serves as chair of the International Symposium on Sustainable Systems and Technology and teaches courses in engineering business practices, sustainability ethics, and sustainable engineering systems.

Email. Thomas.Seager@asu.edu

URL. <https://webapp4.asu.edu/directory/person/1628675>

Contact.

School of Sustainable Engineering and the Built Environment
Arizona State University
PO Box 875306
Tempe, AZ 85287
USA