

AC 2007-566: ENGAGING FIRST-YEAR STUDENTS IN ETHICAL ISSUES VIA STAR TREK

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Engaging First-Year Students in Ethical Issues via Star Trek

Introduction

This paper describes the First-Year Seminar (FYS), *The Ethics of Star Trek*, inspired by the book of the same name by Judith Barad and Ed Robertson. It has been taught for the past four years as one of about sixty different FYS's offered by the College of Engineering. Since 1999, all new students must complete one of these one-credit courses as part of the university general education requirement. This specific course is relevant to ASEE members as it represents an engaging, fun, and well-liked way to help students develop their ethical reasoning and moral imaginations.

Even though set in the future where technological marvels abound, the characters of *Star Trek* and the aliens they encounter must still contend with ethical issues and problems that we face today. Do the needs of the many always outweigh the needs of the few? Is it ever right to violate the *prime directive* and interfere in another culture's affairs? Are rational beings the only life-forms worthy of our consideration? How far from the *Ferengi* are we if money is always the bottom line? Is right and wrong dependent on your culture, or are there universal values?

The seminar explores ethical issues that arise in various episodes of *Star Trek*, from *The Original Series* with Captain James T. Kirk and company, through *The Next Generation*, with Captain Jean Luc Picard. Students learn how to methodically approach tough ethical decisions in their current lives as students, and in their future professional lives. This course helps them to identify, understand, and examine their moral values, and especially to plan actions that are consistent with these values. In group and class discussions, the class explores the current thinking on the responsibilities of engineers to society, community, family, and themselves, as well as addressing issues that are relevant to their lives as students. Emphasis is placed on applying key concepts to realistic problems and on developing skills such as team work, argumentation, and communication skills.

Underpinning the biweekly viewing of *Star Trek* episodes, the course starts with a foundation in moral and ethical theory. The ethical issues faced by the *Star Trek* crews lead to consideration of similar situations faced by students and by engineers. Teams analyze and solve progressively more complex ethical cases in engineering and in general. The overall goal of the course is to assist students in developing their moral imaginations and thereby, to understand how to make the best choices in difficult circumstances.

The paper describes the course including the organization, weekly topics, cases, worksheets, activities, and feedback from students that have completed the course. In the author's 23-year academic career, this course has been the most well-liked by students, who not only actively engage in the discussions, but report actually enjoying reading the book. By basing an

introduction to ethics on popular culture, students seem more receptive to the relevance to their own lives and careers.

Moral Imagination

The number one lesson in this course is that ethical issues pervade the practice of engineering. Furthermore, using *Star Trek* and other situations taken from everyday life teaches the larger message that ethics pervades day-to-day life. Awareness of the pervasiveness of ethical issues is the fundamental first step in developing professional and personal integrity. Once we become more aware, the next step is to develop our moral imagination.

Moral imagination is “an ability to imaginatively discern various possibilities for acting in a given situation and to envision the potential help and harm that are likely to result from a given action.”¹ The main skill required is creativity – being able to imagine many possibilities and their effects. There is clear parallel with the engineering design process and like the technological creativity required in design, moral imagination can be developed and enhanced.

The process of being morally imaginative has been described as:²

1. Disengaging from and becoming aware of one’s situation, understanding the mental model or script dominating that situation, and envisioning possible moral conflicts or dilemmas that might arise in that context or as outcomes of the dominating scheme.
2. The ability to imagine new possibilities. These possibilities include those that are not context-dependent and that might involve another mental model.
3. Evaluating from a moral point of view both the original context and its dominating mental models, and the new possibilities one has envisioned.

Students, as with many people, have a tendency to see ethical issues as black and white. That is, they quickly assess the problem and come up with a “right” course of action. In this process, they use habitual patterns and frameworks for their moral assessment. Developing moral imagination requires us to first stop and identify and scrutinize our habitual patterns. The second step is crucial, forcing us to think outside our moral boxes, and considering other ways of thinking about the issue. This is especially relevant to my work in sustainability and incorporating sustainability principles into engineering.

As an example of how other ethical models and principles like sustainability can influence engineering, Interface, a major carpet manufacturer, was designing a piping system for a new facility.³ A conventional design approach resulted in selecting a 95 hp pump. By recognizing the assumptions in that conventional design process, and by considering the impact of the conventional design on energy use and resultant resource use and pollution production, Interface engineer Jan Schilman redesigned the piping system to use only 7 hp, a 92% reduction. This was achieved in two ways, by using larger diameter pipes and by reducing the pipe length and number of turns. It turned out that conventional design wisdom results in relatively small diameter pipes and large horsepower pumps, and does not adequately consider the placement of components to allow for short, straight runs. That wisdom is based on keeping first costs low and to some extent tradition. *It is also based on effectively ignoring the resource and*

environmental consequences. Switching to large pipes allows the pumps to be smaller power and size, thereby reducing their cost and offsetting the higher cost of the piping. Furthermore, the large pipe system uses drastically less operating energy, reducing resource use and the resultant pollution.

By thinking outside the box and considering the moral implications of energy inefficiency, Mr. Schilman designed a system that did not cost more to purchase, saves enormously on energy cost, and reduces resource use and pollution production. And the job of moving the fluid from point to point is achieved.

In this example, the alternative is an all-around winning situation, making it a straightforward decision and not really requiring much evaluation as in step three of the moral imagination process described earlier. One can imagine a similar situation where the more efficient alternative costs more and thus requires a look at the economics such as return-on-investment or payback period, and weighing this with the benefit to the environment and society. One could also take this example and point out other angles that aren't considered in conventional thinking that maybe should be. For example, the larger diameter, more efficient piping system may use more copper or steel, so one may be additionally comparing increased use of one resource with decreased use of another. Maybe the larger diameter piping is only available from a distant source, increasing transportation energy use, truck travel, and decreasing the benefit to the local economy. And so on.

As Gorman *et al* acknowledge:² “Developing this process is, at best, difficult, But not to do so, ..., risks moral and technological bankruptcy, threatens ecological sustainability in some cases, and prevents engineers from exercising their talents in ways that will benefit all of us.” This enlarged role of engineers is recognized as an evolution from the historical occupation of providing employers with competent technical advice “into a profession that serves the community in a socially and environmentally responsible manner.”⁴

Star Trek as a Basis for Introducing Ethics

I have been a fan of Star Trek since *The Original Series* began in 1966 (when I was 10). My family also regularly watched *The Next Generation* which aired from 1987 to 1994. The science fiction context of a future where space exploration is commonplace appeals to the technologist, adventurer, and optimist. It also provides an opportunity to address many of the issues of the day in an engaging and entertaining way.

In 2000, I was involved in efforts in the College of Engineering to integrate ethics into engineering education. As Coordinator of First-Year Seminars, I developed a new seminar called “How Good Engineers Solve Tough Problems.”⁵ This course was offered for three years starting in spring 2000, successfully engaging students in actively learning about ethics and engineering. In 2002, I was browsing the shelves of a discount book store and happened upon the book that inspired the creation of this course: *The Ethics of Star Trek* by Judith Barad with Ed Robertson.⁶

As Barad says in the book's introduction:

“One reason why *Star Trek* has endured from one generation to the next is that most of the stories themselves are indeed moral fables. Though the episodes are obviously self-contained, when taken as a whole they constitute a harmonious philosophy filled with hope.” Barad’s background as a philosophy professor, combined with Ed Robertson’s background as a writer on popular culture, combine to effectively use the *Star Trek* series to lead readers through an introduction to ethics and ethical reasoning.

Why is *Star Trek* a good choice for engaging engineering students in thinking about ethics? The first reason is that it appeals to many engineers, like it appealed to me, with its futuristic vision of advanced technology like warp drives, replicators and holodecks. Second is that the distance between us and life in *Star Trek* allows us to attain a perspective that sheds light on our own situation. Take the example of the Ferengi. They are an extraterrestrial race that is obsessed with profit and trade, guided by the 285 “Rules of Acquisition.” Lying, cheating and stealing are all OK for Ferengi if they lead to more profit and acquisition.

But perhaps the greatest value of *Star Trek* in teaching ethics is that the central characters are all excellent role models and the stories almost always deal with thorny issues. As Barad says: “While our *Star Trek* heroes are far from perfect, they are nonetheless essentially decent beings whose interaction with ‘new life and new civilizations’ is always guided by nobility and morality.”

Consistent with the concept of moral imagination, the book’s authors describe this approach to understanding ethics:

“In order to successfully understand ethics, we need to approach each ethical theory we encounter with the same spirit of objective open-mindedness with which our friends on *Star Trek* approach new civilizations. At the same time, however, our examinations must remain critical, so that our final judgment of each theory is based solely on the weight of the arguments.”

This quote identifies two more important goals of this course, in addition to recognizing that ethical issues pervade engineering – to be open-minded yet critical in our approach to ethical problem solving.

In addition to the pedagogical value of *Star Trek*, I like using it because it is fun. Even though as a boy I was fascinated and impressed with the imagery and sets of the original series, today it appears primitive and campy. That combined with the acting style of William Shatner make for a lot of laughs. All of the series include moments of humor and good-natured teasing.

Course Structure

The course meets once a week for a 75-minute period. The basic weekly pattern is to view a complete episode of *Star Trek* every other week, with the alternating classes for discussions that build upon the issues raised in the episodes, or in related cases or questions. The text is the Barad book which is now available in paperback and often as a used book, keeping student costs low. Students actually report enjoying the readings in the text!

In preparation for viewing the episodes, a relevant chapter is assigned in the text. The text uses specific episodes in each chapter as the context for the ethical discussion. One of these episodes is chosen for the following week's viewing. The book uses the first four of the *Star Trek* series: *The Original Series (TOS)*, *The Next Generation*, *Deep Space Nine*, and *Voyager*. In addition to the reading, a worksheet is handed out that students turn in the following week. This worksheet serves at least two functions. First, it ensures that they read the chapter, or at least the parts required to complete the worksheet. Two, it reinforces the most important concepts and lessons. Sometimes, the worksheet requires the students to extend and apply the concepts. For example, one of the worksheets requires the students to state their opinion and argument on the ethics of eating animals.

Although the text is not necessarily directed at an engineering audience, the ethical principles it develops are generic and readily applied to engineering situations. But equally important, the principles can be applied to the everyday lives as students. Therefore, the problems presented to the students draw both on the current lives as students, and their future roles as engineers. Some of the special responsibilities of engineers are brought out through these cases and discussions.

Students are placed into teams of four on the first day of class based on their majors. Each team is diverse by majors where possible. These teams are used in certain classes to solve engineering-related case studies and to play the ethics game (described later). Teams also are responsible for bringing snacks and refreshments on the days when an episode is watched.

There are no quizzes or exams. Students are evaluated on the basis of their worksheets (4-5) and written analyses of case studies (4-5). Attendance is also required and students are penalized 5% for each unexcused absence, although students seldom miss the class.

Course Philosophy

The overarching goal of this course is to engage the students. Therefore there is very little lecturing with nearly all of the class time spent in discussion. Students are given name placards on the first day of class and these are used on discussion days so that we can get to know each other better. We usually rearrange the seating and tables so that we can all face each other and I sit down with the students.

Encouraging students to talk and share their ideas and reasoning goes a long way toward expanding their moral imaginations. They get to hear opinions and mental models that are different than their own, and learn how to share their own opinions in an objective way. While the discussions are dealing with serious issues, I try to keep the class atmosphere relaxed and friendly. There may be occasional raised voices and strong feelings, but there is often laughter too. I typically do not share my opinions, but instead try to facilitate the discussion and involve as many different people and views as possible.

While the course is intended to benefit students in their future careers as engineers, I think it is important to relate ethics to where they are now, as students, individuals, and members of society. Many of the cases, assignments, and discussion in the class are connected to their current lives.

There is always at least one current event or issue that is used in this way. Topics have included gay marriage, illegal downloading of music, affirmative action, and eating meat.

There is another principle that guides this course and my teaching of ethics: maximalist versus minimalist ethics. I first heard this distinction at the 2002 Gonzaga Ethics Conference, where Father Robert Spitzer, Gonzaga President, gave an inspiring presentation wherein he explained the concept. Minimalist ethics basically is framed as proscriptive statements about what *not* to do, like most of the Ten Commandments. It might be summed up as “being less bad,” or “doing no harm.” While proscriptive rules are useful in establishing boundaries on behavior, I am more interested in prescriptive statements that hold up the good that engineers should strive for, i.e. maximalist ethics. This is a message I share regularly with students: Learning about ethics provides us with the knowledge and abilities to act more in accord with our deepest values and to make the most of one’s life from the standpoint of doing good in the world.

I want students to appreciate that most of what engineers do has ethical implications, and that it is these day-to-day choices that ultimately determine our character as well as the overall benevolence of our work.

First Day of Class

As students come into class on the first day, I play the song “Star Trekking” by The Firm, a parody of the show and cast. This is followed by a Powerpoint slide that has *Star Trek* characters slowly fade in while students are encouraged to shout out the name of the character. This is intended to set the stage for the fun nature of the class. I point out that while there are nerds who like *Star Trek*, called Trekkies, cool people who like the show are Trekkers. We then go around the class giving students a chance to introduce themselves. In addition to the usual information like hometown and major, they are asked to state who is their favorite Star Trek character and why.

Following a quick review of the syllabus, outline and nature of the course, we jump right in to further discussion. Because one of the first topics in the text addresses ethical relativism, I ask the students to get in their teams and then to try to identify moral values that they share in common with their teammates. I suggest “respect for life” might be one that they share to give them an example to get started. This exercise was inspired by the book *Shared Values for a Troubled World* by Rushworth Kidder.⁷ In that book, Kidder interviewed exemplary people from all walks of life all over the globe and arrived at eight shared values: love, truthfulness, fairness, freedom, unity, tolerance, responsibility, and respect for life. After giving the students some time to complete their list, we make a list of their ideas on the board and briefly discuss, trying to arrive at a consensus for the class. Their list is usually very close to the list developed by Kidder. Even if it does not exactly match, the exercise demonstrates that there are some common core values. These values are useful later in the course when we consider case studies and ethical issues.

The last exercise on the first day is watching a video case study, “The Take Home Exam.”⁸ This excellent student-oriented case is used primarily to get students further involved in discussion which it always succeeds in doing. The case involves an engineering take-home exam with

instructions that “work must be your own,” and four students who are in the class. One of them finds an old book in the library that has the identical problem as on the exam, along with its solution. He proceeds to tell a friend after swearing her to secrecy. She then tells her friend, who later tells another friend after the exam has been graded. The last person tells the professor what happened but does not identify the students involved. Prior to viewing the case, students are asked to look for examples of both ethical and unethical behavior, both of which are in abundance in the case. As they contribute their observations, they are also asked to state the ethical principle that applies. After this, they are asked to suggest alternative actions that might have been better. This lively discussion lasts until the end of the first class.

Course Outline

As stated previously, the weekly course outline alternates between viewing entire episodes of Star Trek and discussion. The outline for this past semester is shown in Table 1.

Table 1 Course Outline for *The Ethics of Star Trek* for Fall 2006

Class	Topics	Readings	Assignments
1: 9/7/06	Introductions, teams & photos, Angel, shared values, Case Study: Take-home exam	Intro, Ch. 1 Cultural Relativism	Explore www.engr.psu.edu/ethics
2: 9/14/06	<i>TNG: Cost of Living</i> ; Cultural relativism	Outline from <i>Rulebook for Arguments</i>	Worksheet 1
3: 9/21/06	NO CLASS – GEN ED ASSESSMENT		
4: 9/28/06	An ethical problem solving process; Case Studies; Arguments	Ch. 2 Is Religion Alone the Basis of Ethics?	Case Study 1
5: 10/5/06	Basis of ethics; <i>DS9: Accession</i>	Ch. 3 Justice in a Savage Arena	Worksheet 2
6: 10/12/06	Codes of Ethics; Case Studies	Ch. 4 The Cave, the forms, and Kathryn Janeway	Case Study 2
7: 10/19/06	Origins of ethics; <i>TOS: Plato's Stepchildren</i>	Ch. 5 Plato's Stepchildren and Beyond	Worksheet 3 – Ethics for non-humans?
8: 10/26/06	Discuss animal rights; Open discussion of cases		Case Study 3
9: 11/2/06	Case Studies	Ch. 6 Kirk Finds the Golden Mean	Case Study 4
10: 11/9/06	Virtue ethics and the Golden Mean; <i>TOS: The Enemy Within</i>	Ch. 7 Equity and Friendship in Star Trek	Worksheet 4
11: 11/16/06	NO CLASS		
12: 11/30/06	Dilbert Ethics with Your Cases	Ch. 14 Does the Good of the Many ... ?	Case Study 5
13: 12/7/06	Consequentialist ethics; <i>TOS: The Mark of Gideon</i>		Worksheet 5
14: 12/14/06	Case Studies; Evaluations; Maximalist ethics	Is Ethics Important to Engineers?	

Case Studies

Using case studies is a good way to present problems to students that have some of the complexities of real-world situations. Because most ethics-related problems are complex, it is useful to develop a process for dealing with them. There have been many methodologies proposed in the literature; I use a six-step process that is derived from the nine-step ethical problem resolution process found on the website of the National Institute for Engineering Ethics.⁹ The six-step process is:

1. Determine the facts in the situation.
2. Define the stakeholders.
3. Assess the motivations of the stakeholders.
4. Formulate alternative solutions.
5. Seek additional assistance, as appropriate.
6. Select the best course of action.

The similarity of this process to the engineering design method is stressed to promote comfort, although most first-year students are not yet comfortable with the engineering design process.

Each step in this approach is important and to convey that message to students, most of the cases are done in class in their teams, using a form that leads them through the steps. By managing the time they spend on each step, and commenting on their discussion and notes, I can assist them in effectively applying the process. Perhaps the key step is the fourth one, formulating alternative solutions. Here the form has a table with room for five alternatives (five rows), and four columns labeled “Possible action,” “Ethical principle or code,” “Pros,” and “Cons.” They are instructed that they should always have at least five alternatives, and that all of the other attributes should be thoroughly considered. As with engineering design, a tendency is to jump to one solution without considering alternatives. By forcing them to develop at least five options, it encourages them to be creative and to expand their moral imaginations.

An issue that arises in doing case studies and in ethics in general, is making sound arguments. Students are expected to be able to logically defend their choices by essentially explaining why their proposed course of action is the best. As a guide, they are given a handout that summarizes rules for arguments along with their typical forms and typical flaws, drawn from *A Rulebook for Arguments*.¹⁰ While we do not have much time to adequately develop their argumentation skills, this handout and use of the principles in the discussions and evaluations of their arguments should improve their abilities to defend their decisions, and hopefully to make better decisions by recognizing flaws in their analysis.

There are many excellent engineering case studies available on the internet. Because there are so many, a project was carried out to categorize the cases to aid faculty in selecting ones that meet their needs. The resulting table is available on the ethics web site in the College of Engineering.¹¹

Ethics Games

About ten years ago, the author was given a copy of the *The Dilbert™ Ethics Challenge* that was produced by Lockheed-Martin for their in-house ethics training. The game is similar to Clue™

with a board comprised of several rooms and a grid that connects them; see Figure 1. Teams are represented with a Dilbert™ character and move around the board, collecting tokens when they make it to a room. The number of spaces they get to move is determined by solving multiple-choice ethics cases. Each of the possible answers is awarded points from zero to five, and they move their game pieces accordingly. The “winner” at the end of the class time is the team with the most tokens. Usually some small prizes are awarded to the winning team.



Figure 1 The Dilbert™ Ethics Challenge game board.

This game has been used in this class and in others with success. It provides a fun way to discuss many cases in a short amount of time. After a case is read from the booklets provided, the teams get some time, typically five minutes, to consider the options and make a choice. We then proceed around the room and hear their choices, and most importantly, their arguments for making that choice. The game comes with a Leader’s Guide that has point values designated for each answer along with a brief explanation. They then get to move their game piece and collect a token if possible. Another feature of the game are Dogbert™ spaces that if chosen, lead to a “Coffee Break” card (like a Monopoly™ “Chance” card) that has a mixture of good and bad examples and consequences such as forfeiting a token.

One embellishment to the basic game that I use is for the leader to have the power to change the points awarded based on the quality of the team’s argument. Many of the cases, answers, and points awarded have been chosen to reinforce Lockheed Martin policies. While these are useful

and informative, sometimes students make compelling arguments for other courses of action. It seems that the competitive game situation encourages them to defend and argue their positions.

Over the last several years, a team of students has worked with the author to develop our own ethics game using a similar format. There are several reasons for this. One is that the cases are not necessarily engineering oriented and therefore, engineering cases were developed. Another reason is to include student-oriented cases. A final reason is to make the game more relevant to Penn State students. Our game is called “Happy Valley Values,” using the common nickname for State College, Happy Valley, the home of Penn State. The game board is a map of campus with several key buildings chosen as the rooms containing tokens; see Figure 2. Paths connect the buildings and include spaces with the Nittany Lion paw print leading to “Study Break” cards. At this point we have a library of five engineering cases, five student cases, and a goal of having ten of each. We also have created sixteen Study Break cards; an example is “For not booing at a football game, go to Beaver Stadium and collect a token.”

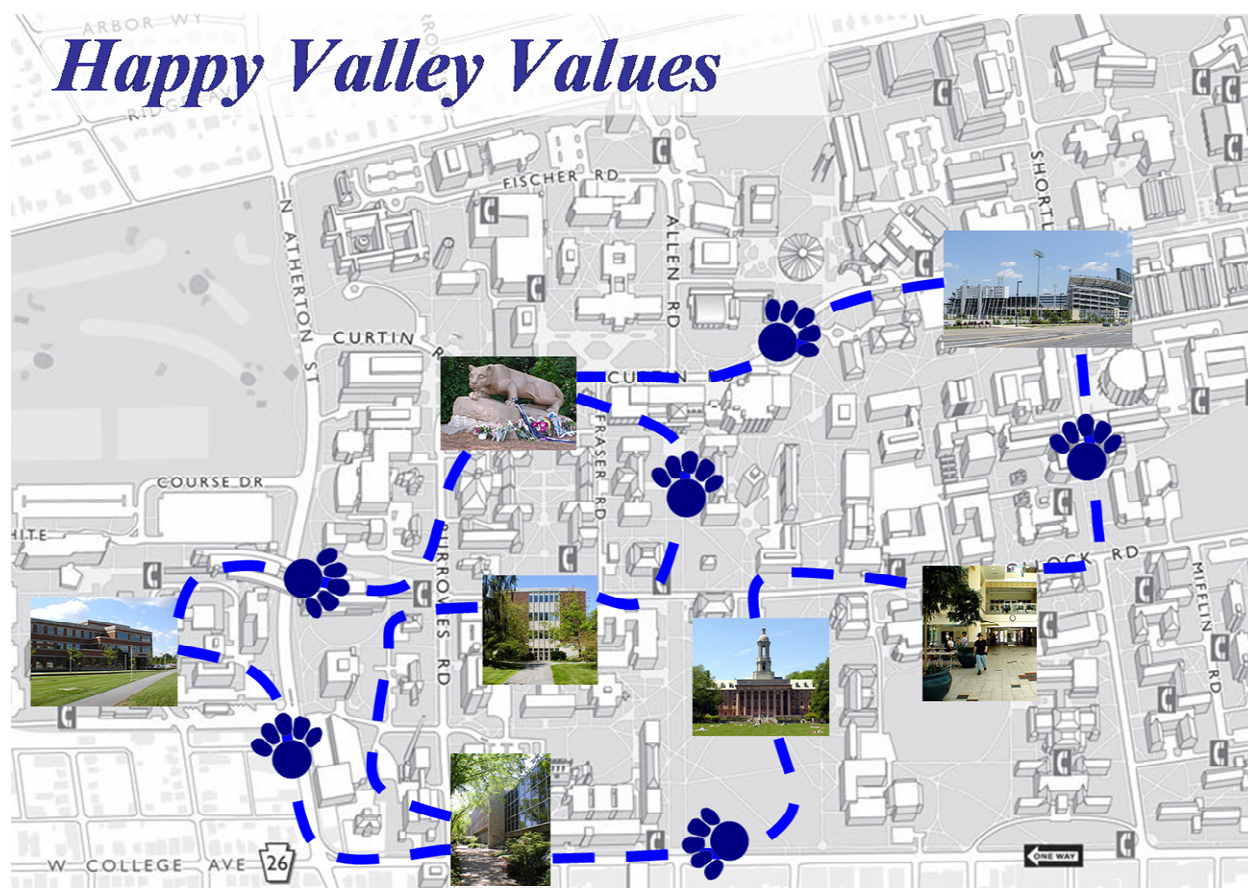


Figure 2 Happy Valley Values game board.

The six characters used for the game are key individuals around campus that were chosen for various reasons but mostly because they are moral exemplars or leaders. In its current form, the game is played via Powerpoint slides. Our intention is to share the cases and game structure with other educators. Faculty who are interested should contact the author.

On one class day we play the *The Dilbert™ Ethics Challenge*. This is followed with an assignment to develop a student-oriented case in a similar format. These cases are intended to be based on an actual experience they have had. As with the game, the cases must present four options and a point value along with an explanation. After these are submitted and evaluated, we play the *Happy Valley Values* game with cases selected from the ones that they have submitted, supplemented with ones from our library. This exercise exposes the students to many issues that their peers have dealt with, as well as helping them see that ethics is relevant now.

Closing Thoughts

Using *Star Trek* to introduce students to ethics is a fun and engaging way to help students become more aware of how to make decisions in their personal and professional lives that are in accord with their values. Furthermore, the diversity of opinions explored via the readings, episodes, and discussions should help them develop their moral imaginations so that they can continue to grow ethically and develop their character and integrity. The application of a problem solving process and critical evaluation of arguments should help them to reason through tough issues and communicate their positions to their associates.

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