

AC 2010-1257: FIRST YEAR ENGINEERING STUDENTS' PERCEPTIONS OF CONTEMPORARY ETHICAL ISSUES

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Introduction

The work of engineers has a profound effect on society, and society in turn places a high level of trust and confidence in engineers. The infrastructure and the products and services that engineers provide can enhance the quality of life and protect lives, and by corollary they can also inadvertently diminish the quality of life and destroy lives. Society expects and needs engineers to be cognizant of potential ethical issues and to act ethically when confronted by these. Engineering ethics is momentarily important, and the study of ethics is fundamental to an engineering education.^{1,2}

The importance of ethics as a key component of modern engineering curricula is demonstrated by the many ethics questions included in both the Fundamentals of Engineering (FE) and Principles and Practice of Engineering (PE) exams. The accreditation organization ABET recommends that students understand professional and ethical responsibilities and recognize the impact of engineering solutions in a broad perspective.

Ethics is not an easy subject to teach. Many professors lack experience in this area and the methods they use can be too theoretical, extraneous, or simplistic.³ Case studies are an effective way to teach engineering ethics, with real cases more likely to captivate and challenge students than hypothetical ones, and contemporary cases more applicable than historical ones. Hypothetical cases can be useful, but reality tends to have an intricacy that is hard to invent, and real cases usually resist obvious and easy solutions. There are many classic historical cases, but contemporary cases allow students to easily place themselves in the situation and claim a sense of ownership. Students may already know the basic facts of some real, contemporary ethical cases, which are in abundant supply. The practice of engineering in the context of today's society is an extremely complex enterprise and presents many ethical issues to study.^{4,5,6,7}

This article presents the findings from a survey given to first year engineering students. The authors developed the survey with the objective to understand what students think about ten contemporary ethical issues, all real cases with great complexity. The ethical issues involve the work of engineers, but the topics also fall within the realms of philosophy, politics, economics, law, sociology, and psychology. The ethical issues are as follows:

1. New transportation corridors through neighborhoods. Commerce depends on an efficient transportation system, but how should society balance public interest and individuals' rights?
2. SUVs. SUVs are very prevalent on roadways now, but should they vanish?
3. Agricultural enhancements. To feed a growing world population, should society employ all available technological agricultural advances or adhere to natural practices?
4. Space program. Is space exploration an essential quest or just an extravagant waste of resources?

5. Weapons of mass destruction (WMDs). Is an arsenal of weapons necessary to maintain peace or will WMDs eventually cause world annihilation?
6. Nuclear power plants. Is nuclear power a realistic replacement of fossil fuels or should society be wary?
7. Violent video games. Do these games corrupt children's minds or are they just harmless entertainment?
8. Dams. Are dams an essential source of water and energy or do they harm the environment irreparably?
9. Reconstruction of New Orleans. Should New Orleans be rebuilt and protected against future hurricanes or should residents be asked to settle elsewhere?
10. Globalization. Should society fully embrace economic globalization or attempt to keep important jobs here?

Students were asked to thoroughly read the summaries of two distinct points of view and then indicate where they stand. There were also questions to determine students' interest in the ethical issues, if students' viewpoints would be likely to change with additional study, and how relevant and important students believe these ethical issues are to them and society. With each question, students were instructed to mark one of five possible choices. The same five questions were attached to each of the ten ethical issues, as follows:

- Where do you stand on this ethical issue? The possible responses were "agree strongly with viewpoint A," "lean toward viewpoint A," "neutral," "lean toward viewpoint B," and "agree strongly with viewpoint B."
- How would you describe your interest in this ethical issue? The possible responses were "high," "significant," "moderate," "little," and "none."
- Do you think your viewpoint would change with thorough study of this ethical issue? The possible responses were "yes," "probably," "maybe," "unlikely," and "no."
- How relevant is this ethical issue to your career plans? The possible responses were "very much," "considerably," "somewhat," "hardly," and "not."
- How important is this ethical issue to society? The possible responses were "very much," "considerably," "somewhat," "hardly," and "not."

The ethical issues can be described as macroethics in the sense that these problems demand the collective actions of engineers and society, as opposed to microethics that typically involves only individuals. Undeniably, the study of macroethics is significantly different from topics that might emerge in a more conventional engineering ethics course and requires new content and pedagogy. Where microethics problems can sometimes be handled methodically like an engineering design process, macroethics cases cannot always be unraveled as neatly. As arduous as macroethics cases may be, they underlie engineering work and consequently students should be exposed to them.⁸

It is anticipated that the information collected with this survey will help improve engineering ethics education. This survey will determine which ethical issues elicit decisive points of view and which ones students feel unsure about. This survey will also determine which ethical issues most appeal to students, which ethical issues students see as most relevant to career plans, and which ethical issues students see as most important to society.

Methodology

This survey was administered in the fall of 2009 to first year engineering students in an introduction to engineering course. All students attend Manhattan College in New York City where the three authors are on the faculty. Two of the authors teach in the Civil and Environmental Engineering Department and the third teaches in the Chemical Engineering Department.

The survey was given to approximately 200 students, though only 189 surveys were usable as several surveys were incomplete or not completed properly and consequently discarded. The 189 students were composed of 21 chemical engineers, 73 civil engineers, 20 electrical/computational engineers, 32 mechanical engineers, and 43 students who had not declared a specific engineering major at the time of the survey. Nearly all of the first year engineering students were traditional college age between 18 to 19 years old.

The introduction to engineering course is divided into several modules, and each module lasts four class periods. The students were given this survey in the module on history of engineering and engineering ethics. At the time of the survey, students had had little or no study of ethics at the college level. In the class periods preceding the survey, students had a brief introduction to ethical theories. The professors who teach the course use the textbook *Engineering Ethics* as a reference.⁹ Students also read and discussed the National Society of Professional Engineers (NSPE) *Code of Ethics*.¹⁰ The NSPE *Code of Ethics* covers professional responsibilities and rules of practice applicable to engineers from all disciplines.

Students were sometimes asked to complete the survey in class as a quiet exercise, but more frequently the survey was read aloud to keep everyone at the same pace. Students' participation on the survey was voluntary and the survey did not count toward students' grades. Individual responses remained anonymous. The survey contained 60 questions in total, with five questions about each of ten ethical issues and ten initial questions about students' academic status and ethics education in general. All questions on the survey had five choices and students were asked to circle one. Students typically needed 30 minutes to complete the survey.

The ethical issues as well as the viewpoints associated with them were selected on the basis of hundreds of student essays in this same course from previous years. The authors attempted to include the main arguments, though the viewpoints are not necessarily comprehensive. Each of the viewpoints is approximately equal in length with about 100 words. The arrangement of the two viewpoints as A and B is arbitrary. Before administration of the survey, the faculty intentionally did not comment on the ethical issues to avoid introduction of bias.

Ethical Issue 1: New Transportation Corridors through Neighborhoods

Commerce depends on an efficient transportation system, but how should society balance public interest and individuals' rights?

Viewpoint A: What is Best for Society as a Whole

When a new roadway must be built, or a new rail line, or new utilities, there are times when the government will force people to leave homes and businesses. By law the government only has the authority to claim private lands if all other options have been exhausted and must compensate owners fairly when it does. Upgrades to the infrastructure may bring inconvenience to some individuals but are necessary to enhance mobility and stimulate economic growth.

Viewpoint B: Protect Individuals' Rights

To displace people to build or expand roadways or the infrastructure is an injustice to local residents. Though immediate property owners are compensated at market values, they must leave behind homes and businesses and also a way of life. Properties close to the new development sometimes decline in value. In New York City we see this now with construction of the Second Avenue subway line. We have a duty to protect individuals' rights even when individuals' rights conflict with what is said to be the public good.

Survey Results

Figure 1 shows where students stand on new transportation corridors. Very few students had extreme viewpoints. Only 5% of students "agree strongly" with viewpoint A, what is best for society as a whole, and only 3% of students "agree strongly" with viewpoint B, protect individuals' rights. Most of the students, 92%, had viewpoints somewhere between these two extremes, which was the highest such mark in the survey. New transportation corridors are a less contentious ethical issue than some of the others.

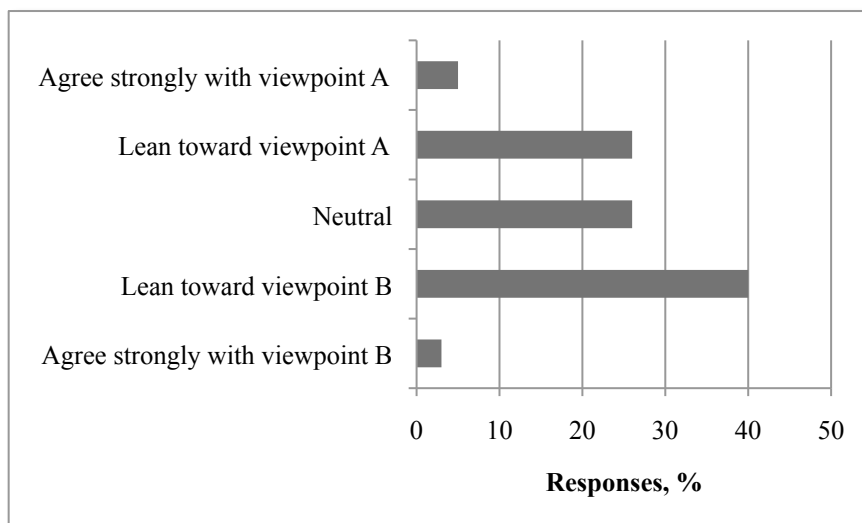


Figure 1
Stance on new transportation corridors through neighborhoods

Ethical Issue 2: SUVs

SUVs are very prevalent on roadways now, but should they vanish?

Viewpoint A: Family Vehicle

SUVs are the ultimate family vehicle. With an SUV you can haul the kids to sports practice during the week and tackle mountain roads on the weekend. SUVs also protect lives in the event of an accident, and how can you put a cost on a life? SUVs do have less fuel efficiency than some vehicles, but improvements are being made. Anyway, if people can afford to buy the gas, they should be able to drive any vehicle they choose.

Viewpoint B: Conspicuous Consumption

SUVs are the very definition of conspicuous consumption. These monstrous vehicles guzzle gas and spew pollution. Sure, SUVs protect lives in the event of a crash, the lives of those who drive SUVs! Those who drive normal vehicles are in jeopardy. New vehicles like the Toyota Prius use much less gas, and yet do not give up much in the way of performance. Most people do not need all the size and power that SUVs can provide.

Survey Results

Figure 2 shows where students stand on SUVs. Some 25% of students had very decisive viewpoints, where 13% of students “agree strongly” with viewpoint A, family vehicle, and a nearly equal 12% of students “agree strongly” with viewpoint B, conspicuous consumption. The use of SUVs appears to be a very contentious ethical issue. Also, the fact that many students chose extreme viewpoints indicates SUVs is an ethical issue in which students have a high level of familiarity.

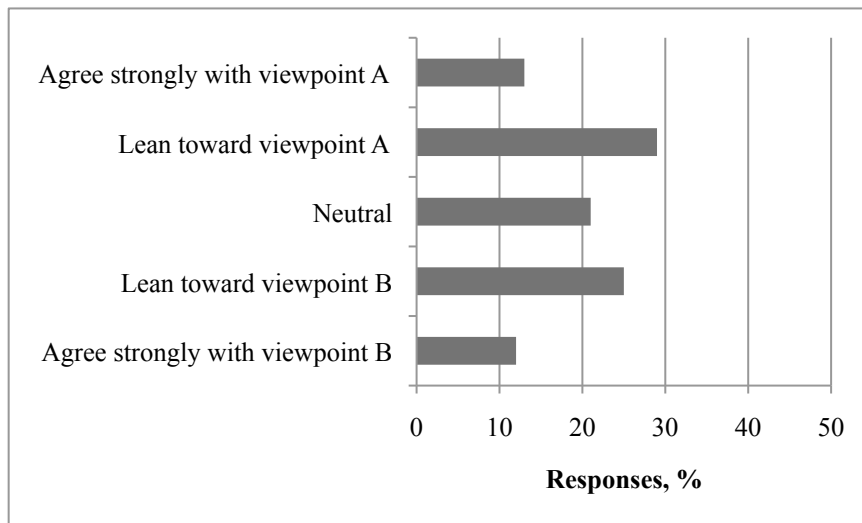


Figure 2
Stance on
SUVs

Ethical Issue 3: Agricultural Enhancements

To feed a growing world population, should society employ all available technological agricultural advances or adhere to natural practices?

Viewpoint A: Abundant Crops

Compared to ordinary crops, biogenetic crops can improve harvest yield, quality, taste, size, resistance to disease, and help plants adapt to diverse climates and conditions. Biogenetic crops also keep food prices low. An inexpensive, robust supply of grains, fruits, and vegetables is what we need to end hunger in poor countries and combat obesity in rich countries. Chemical fertilizers and pesticides are a necessary evil, but to eliminate them completely would be impractical.

Viewpoint B: Grow Organic

To genetically modify foods is to play God and goes against the laws of nature. Because biogenetic foods are so new, there has been no way to test the long term effects on people. Biogenetic crops could also suppress natural varieties of plants and upset biodiversity. We should be wary of biogenetic crops and proceed slowly and cautiously. We should also grow crops organically as much as possible without chemical fertilizers and pesticides, which have an adverse impact on people and ecosystems.

Survey Results

Figure 3 shows where students stand on agricultural enhancements. Some 31% of students were “neutral,” which was the highest “neutral” response in the survey. Such a high “neutral” response could mean that students need additional information about agricultural enhancements. Many of the students who participated in this survey grew up in the urban environment of New York City where they were detached from agricultural concerns. Overall a small edge went to viewpoint A, abundant crops.

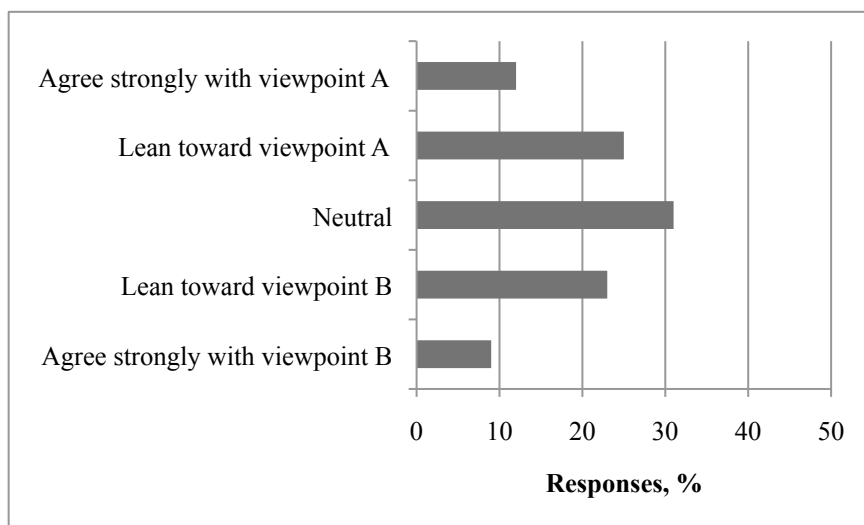


Figure 3
Stance on
agricultural
enhancements

Ethical Issue 4: Space Program

Is space exploration an essential quest or just an extravagant waste of resources?

Viewpoint A: The Final Frontier

Ours is just one planet in a vast galaxy, and it is in our inquisitive and restless mindset to explore. What possibilities wait in space, and what dangers lurk? With a ceaselessly growing population on earth, we may soon need to find new places to live. Already we see space tourism as a potential business. The discoveries that made travel in space possible have also brought us many of the technologies we use everyday, such as the ubiquitous Apple iPhone.

Viewpoint B: A Wasteful Enterprise

With the astronomical financial deficit this country faces, and with so many people in immediate need of government services, we can no longer afford to continue the largely fruitless space program. Sure, we went to the moon and we had many successful space shuttle missions, but what exactly is the purpose? We have already determined that all planets within realistic distance cannot support life as we know it.

Survey Results

Figure 4 shows where students stand on the space program. The majority of students thought favorably of viewpoint A, the final frontier. Some 28% of students “agree strongly” with viewpoint A and an additional 38% “lean toward” viewpoint A. This total of 66% was the highest support of any viewpoint in the survey, which means engineering students largely believe the space program should go forward.

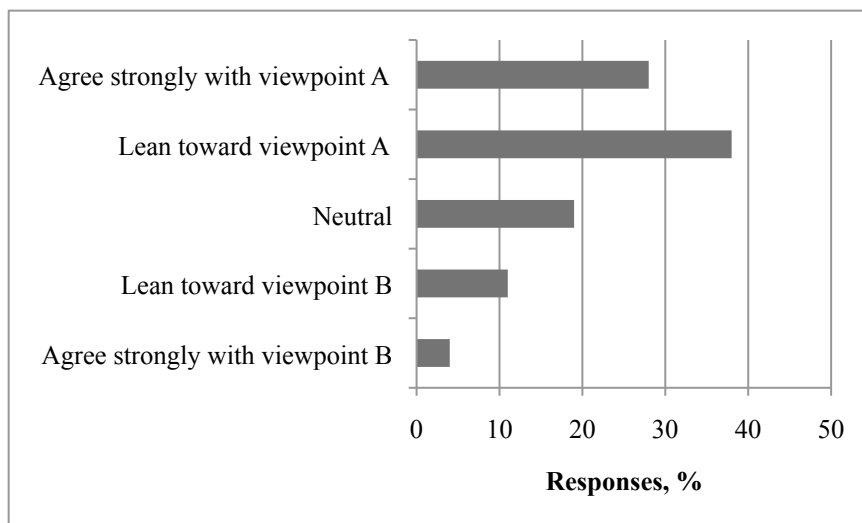


Figure 4
Stance on the
space program

Ethical Issue 5: Weapons of Mass Destruction (WMDs)

Is an arsenal of weapons necessary to maintain peace or will WMDs eventually cause world annihilation?

Viewpoint A: Keep the Peace

As illogical as it may seem, the very presence of WMDs actually secures some level of peace. WMDs are needed as a scare tactic to keep rival countries at bay. If they attack us, they know the response will be swift and lethal. We should view WMDs as a means of national defense. It would almost be suicidal to totally relinquish our missiles at this point. In a perfect world we would not need them, but the world is not perfect and the threat of conflict will always persist.

Viewpoint B: Ban the Bombs

There should be an immediate effort to eliminate WMDs around the world. First of all, WMDs allow countries that have them to bully countries that do not. If the use of WMDs is a crime against humanity, how can the threat of use be justified? The persistent possibility of the use of WMDs, however low the odds, makes the event mathematically inevitable. War could easily be started by accident. With so many unstable governments, when will a terrorist group gain access to WMDs?

Survey Results

Figure 5 shows where students stand on WMDs. More than any of the ethical issues in the survey, the five choices received nearly uniform support. None of the five choices received more than 27% support or less than 12% support. Obviously, WMDs are a very contentious ethical issue. In this survey a small edge went to viewpoint A, keep the peace.

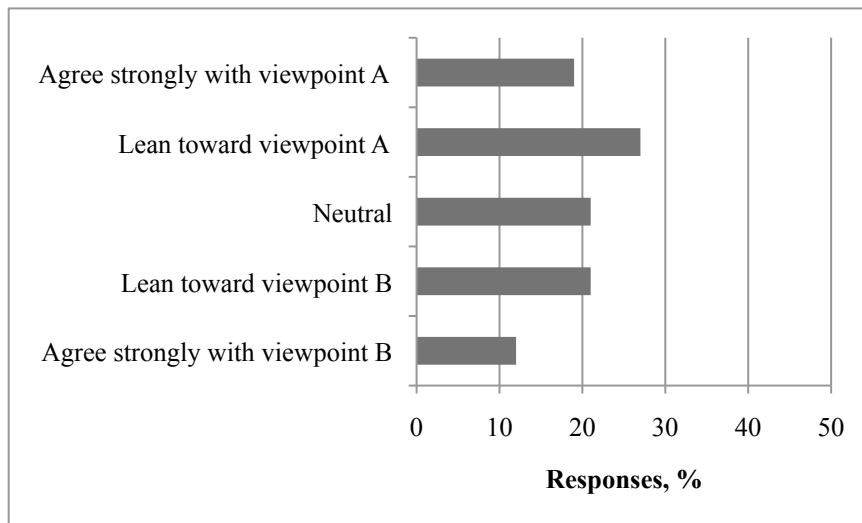


Figure 5
Stance on
WMDs

Ethical Issue 6: Nuclear Power Plants

Is nuclear power a realistic replacement of fossil fuels or should society be wary?

Viewpoint A: Clean and Practical Energy

Most of this country's energy needs are met by burning coal, which is a very dirty process. The harm we are doing to the environment, and the cost to future generations to remediate the mess, is untold. While not perfect, nuclear power does not emit CO₂, a greenhouse gas that contributes to climate change. Nuclear power is reliable and less expensive than alternative energy sources, which are not yet fully practical and have problems as well. Wind farms, as an example, are noisy, ugly, and can kill birds. Nuclear power plants have a bad name because of a few past incidents that are very unlikely to happen again.

Viewpoint B: Potential Catastrophe

Accidents happen, and there have been scares at nuclear power plants before. Everyone remembers Three Mile Island and Chernobyl. A leak or terrorist attack at a nuclear power plant could be disastrous. A toxic cloud emanating from the nuclear power plant at Indian Point, which is in close proximity to New York City, could kill millions of people. To meet growing energy needs, we would have to build more nuclear power plants, and where would we locate these? Where will we bury the hazardous wastes that are a byproduct of nuclear power? More nuclear power plants means more people are put at risk.

Survey Results

Figure 6 shows where students stand on nuclear power plants. Some 37% of students "lean toward" viewpoint A, clean and practical energy, which was the most common response. Nuclear power plants also seem to be a very contentious ethical issue.

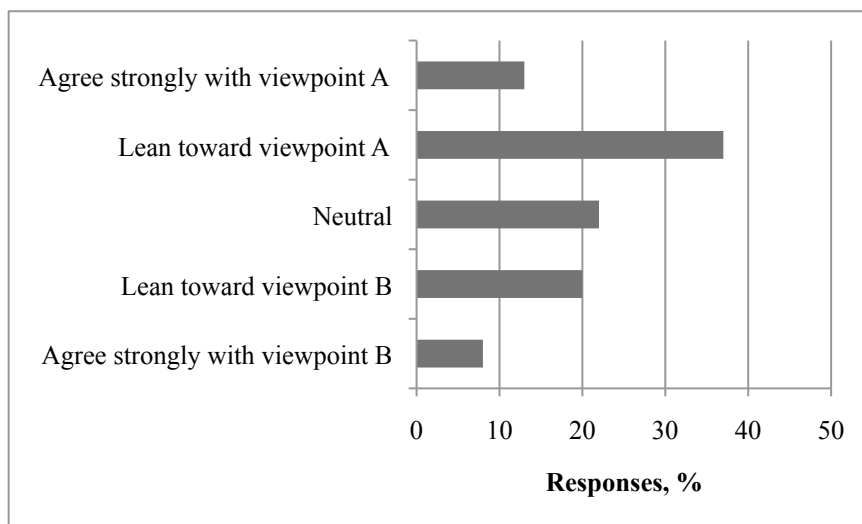


Figure 6
Stance on
nuclear power
plants

Ethical Issue 7: Violent Video Games

Do these games corrupt children’s minds or are they just harmless entertainment?

Viewpoint A: Habituation to Violence

How can it be ethical to make a game that glorifies extreme violence, crime, and gratuitous sex? How can it be ethical to profit on such a terrible premise? Games such as the *Grand Theft Auto* series, which are increasingly graphic, give kids aggressive thoughts that could manifest themselves someday. These games do not teach people the consequences of immoral actions. On the contrary, if you cause mayhem and kill people in a game, instead of going to jail, you are actually awarded points! Kids should be reading books and playing outdoors instead.

Viewpoint B: Harmless Entertainment

Quite simply, these kinds of games are made because they sell. People may get a thrill playing games that contain some unlawful acts, but that does not mean they will behave maliciously in society. Kids understand that playing these games is merely a fantasy. These games may actually help kids release hostilities in a passive, healthy way. It is the parents’ responsibility to teach kids values and morals, and restrict games to kids who are old enough to know the difference between a game and real life.

Survey Results

Figure 7 shows where students stand on violent video games. Some 36% of students “agree strongly” with viewpoint B, harmless entertainment, which was the highest support of any extreme viewpoint in the survey. An additional 27% of students “lean toward” viewpoint B. Only 12% of students said they were “neutral” on this ethical issue, which was the lowest such mark in the survey and suggests that students have a high level of familiarity with violent video games.

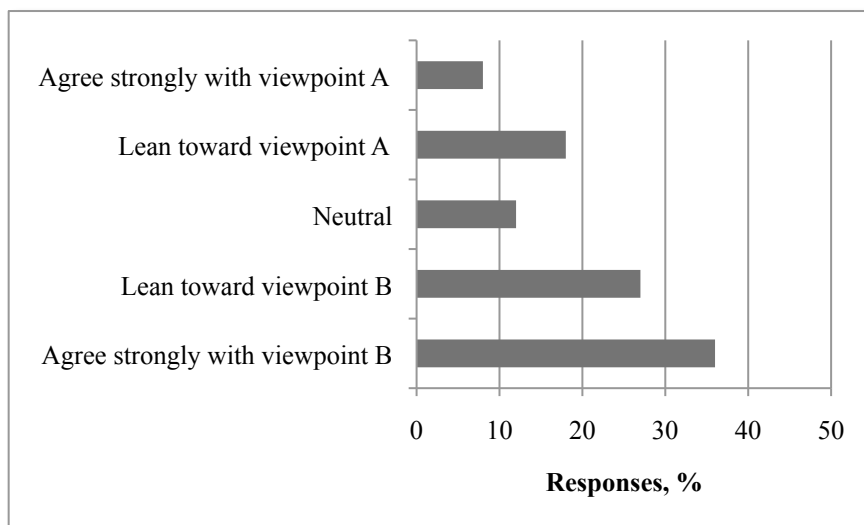


Figure 7
Stance on
violent video
games

Ethical Issue 8: Dams

Are dams an essential source of water and energy or do they harm the environment irreparably?

Viewpoint A: A Source of Water and Energy

Beavers have always built dams, and people have always built dams too. Dams provide renewable, clean energy, reduce the risk of floods, and they are also a valuable source of water, especially to people who live in arid places. Dams transform the environment, but not necessarily in a bad way. Reservoirs provide new habitats for wildlife and opportunities for recreation.

Viewpoint B: Destruction of the Ecosystem

Beavers dam streams and creeks, not huge rivers such as the Colorado and Yangtze. Dams prevent the natural flow of sediment and nutrients, eradicate upstream and downstream habitats, disrupt the migration of wildlife, and vary the temperature and oxygen levels of the water. In short, dams destroy the ecosystem, and when we hurt the environment, we ultimately hurt ourselves.

Survey Results

Figure 8 shows where students stand on dams. Some 44% of students “lean toward” viewpoint A, a source of water and energy, which was the most common response, and an additional 14% “agree strongly” with viewpoint A. Only 1% of students “agree strongly” with viewpoint B, destruction of the ecosystem, which was the lowest support of any extreme viewpoint in the survey.

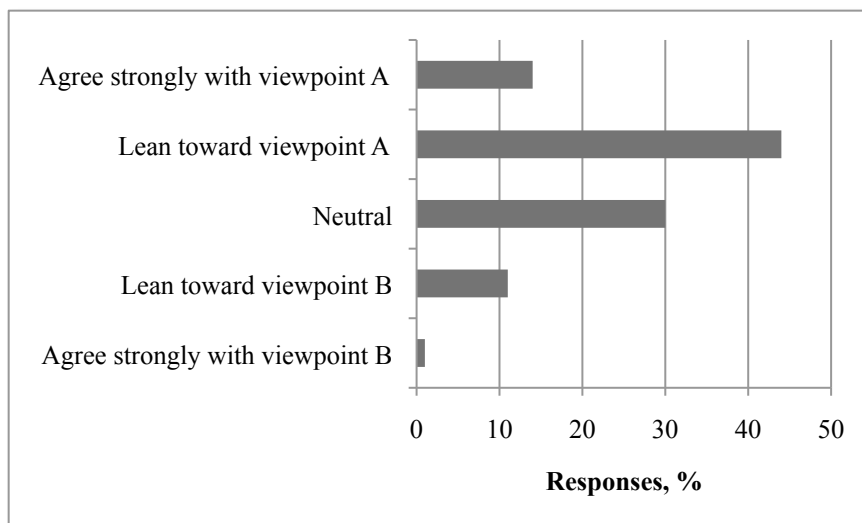


Figure 8
Stance on dams

Ethical Issue 9: Reconstruction of New Orleans

Should New Orleans be rebuilt and protected against future hurricanes or should residents be asked to settle elsewhere?

Viewpoint A: Move to a Safe Place

Since Hurricane Katrina hit the Gulf Coast, it became apparent that New Orleans is not a safe and viable place to live. How can a city survive in such a hazardous location, when it is next to the sea and yet below sea level? At what lengths should we go to protect New Orleans from future hurricanes? Why should the federal government, at such tremendous expense, construct a huge system of levees and pumps? The residents of New Orleans should simply move to high ground.

Viewpoint B: Preserve Way of Life

New Orleans must be rebuilt to maintain its rich history, culture, and industry. People have a right to live where they choose regardless of the risks, as well as the costs necessary to safeguard against those risks. Besides, New Orleans is not the only major city susceptible to natural disasters. Los Angeles and San Francisco, as two examples, sit on huge earthquake faults and it would be preposterous to ask residents of those cities to leave.

Survey Results

Figure 9 shows where students stand on reconstruction of New Orleans. Some 45% of students “lean toward” viewpoint B, preserve way of life, which was the most common response, and an additional 14% of students “agree strongly” with viewpoint B. Still, viewpoint A, move to a safe place, was not without support as well.

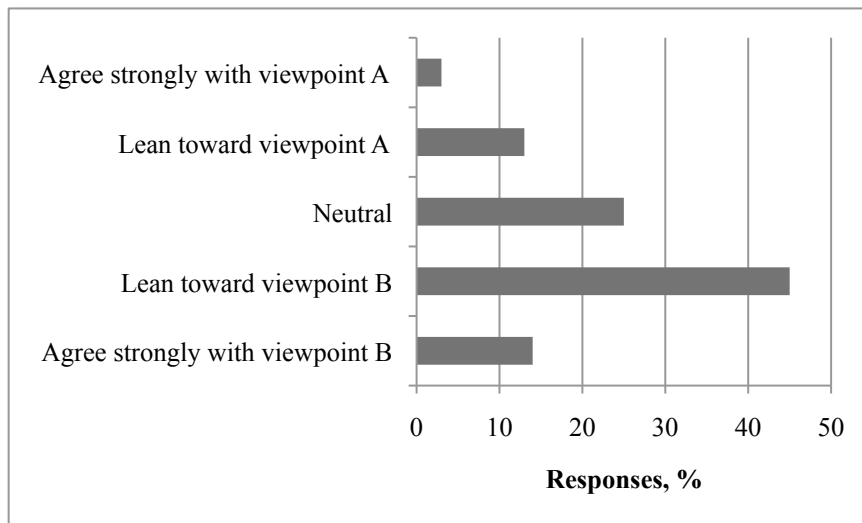


Figure 9
Stance on
New Orleans
reconstruction

Ethical Issue 10: Globalization

Should society fully embrace economic globalization or attempt to keep important jobs here?

Viewpoint A: Uplift all Countries and Ourselves

We should accept globalization. Economic policies of protectionism have historically been unsuccessful. Without globalization, so many of the goods and services we use everyday would be much more expensive. Additionally, without globalization, we would potentially miss out on the unique ideas that may originate in other countries. The more people searching for answers to today's challenges increase the probability of optimum solutions. Globalization uplifts the economies of other countries so they might become equal partners with us, to the enhancement of everyone's quality of life.

Viewpoint B: Lose Our Lead

We should keep most work in this country and employ our own citizens. Operations in foreign countries do not typically practice the same level of quality assurance as us and intellectual property laws are sometimes loose. Companies who outsource work are only concerned with immediate profits. At first, only lowly, routine tasks were sent to China and India, but now workers in those countries have the ability to design innovative new products. It is only a question of time until foreign companies sprout to supplant the companies in this country. Where will we be then?

Survey Results

Figure 10 shows where students stand on globalization. Some 31% of students were "neutral," which was the highest "neutral" response in the survey. (This same amount of students chose a "neutral" response to agricultural enhancements.) Such a high "neutral" response could mean that students need additional information about globalization. Overall a small edge went to viewpoint B, lose our lead.

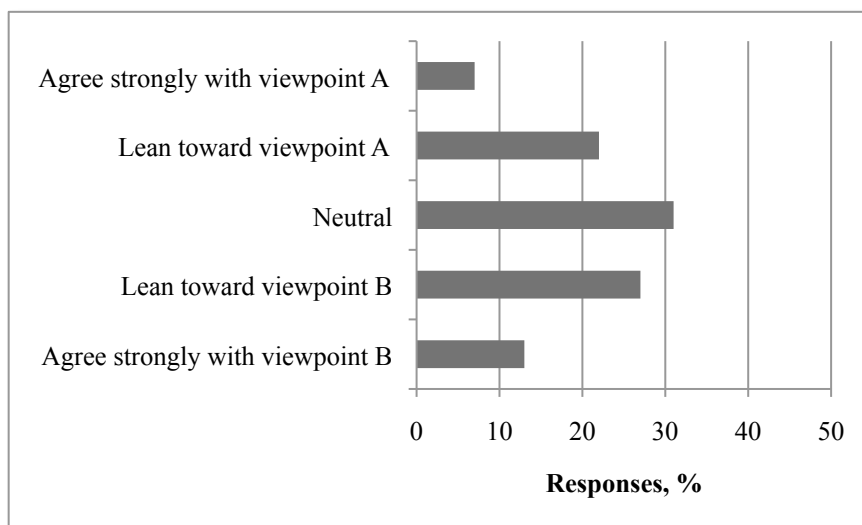


Figure 10
Stance on
globalization

Interest in Ethical Issues

Figure 11 depicts students' interest in these ethical issues. Students were asked to describe their interest in each ethical issue as "high," "significant," "moderate," "little," or "none." The chart shows the "high" and "significant" responses to this survey item. Some 52% of students had "high" or "significant" interest in WMDs, the most of all the ethical issues. Interest in WMDs was followed by nuclear power plants at 47% and the space program at 44%. The ethics of dams attracted the least amount of support as only 23% of students had "high" or "significant" interest. Some 19% of students had "high" interest in the ethics of violent video games, the highest such mark in the survey, which suggests the traditional college age group has much awareness of this topic.

Knowledge of what ethical issues most interest students could help faculty choose appropriate case studies. Ethics initially appears to be a dry and dull subject, and professors certainly want to be able to reach students. If students have a definite interest in an ethical issue they will be more likely to think critically, learn the complexities of the problem, and express themselves freely in class discussions.

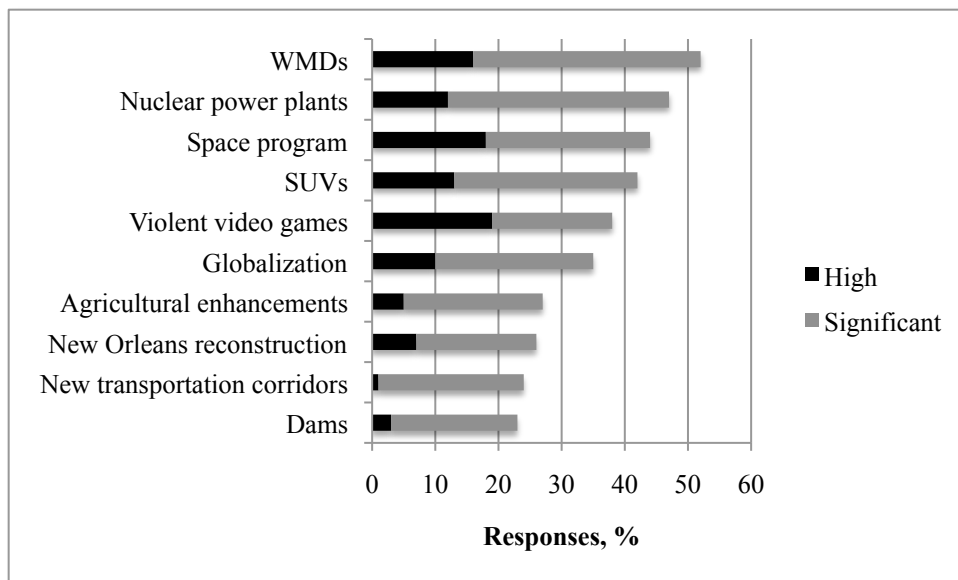


Figure 11
Interest in
ethical issues

Likelihood of Viewpoint Change with Study

Figure 12 depicts the likelihood that students would change viewpoint with thorough study of the ethical issues. Students were asked to assess the chances of a viewpoint change as “yes,” “probably,” “maybe,” “unlikely,” or “no.” The chart shows the “yes” and “probably” responses to this survey item. Some 27% of students said “yes” or “probably” to a viewpoint change with thorough study of the ethics of new transportation corridors, the highest such mark in the survey. Agricultural enhancements and nuclear power plants at 26% had the next highest level of “yes” or “probably” responses to viewpoint change. The lowest total of “yes” or “probably” responses to viewpoint change went to violent video games at 9%. Some 7% of students said “yes” to a viewpoint change with thorough study of the ethics of nuclear power plants, the highest such mark in the survey.

Some correlation was found between the “neutral” responses to the ethical issues (Figures 1 through 10) and the likelihood of viewpoint change (Figure 12). Students with “neutral” responses frequently said “yes” or “probably” to viewpoint change with thorough study.

The ethical issues in which students have less than a firm viewpoint could be excellent case studies and inspire healthy discussions. Students may be less open in discussions when they have already developed rigid viewpoints, or the discussions may become less productive and more argumentative.

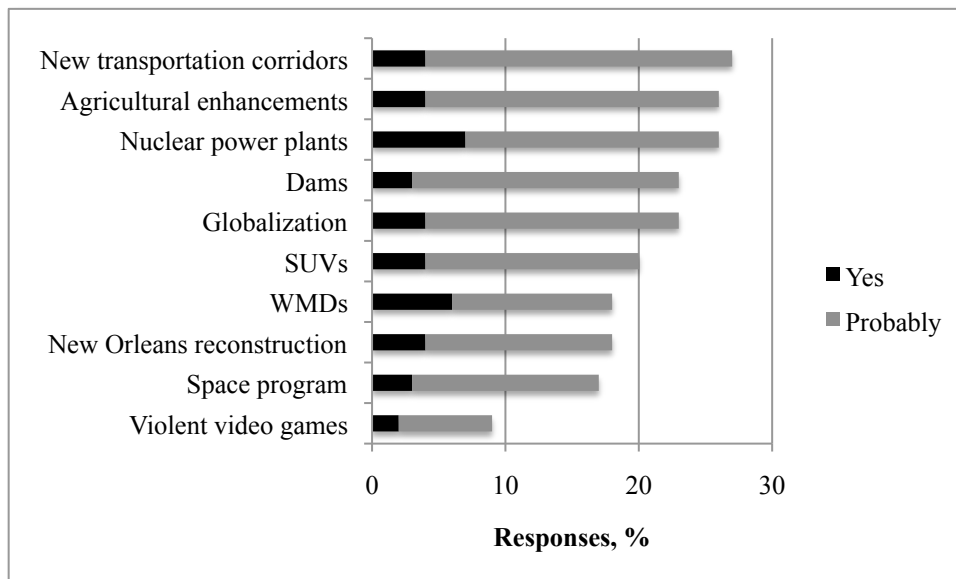


Figure 12
Likelihood of
viewpoint
change with
study

Relevance of Ethical Issues to Career Plans

Figure 13 depicts the relevance of these ethical issues to students' career plans. Students were asked to assess the relevance as "very much," "considerably," "somewhat," "hardly," or "not." The chart shows the "very much" and "considerably" responses to this survey item. Some 50% of students said the ethics of new transportation corridors is "very much" or "considerably" relevant to career plans, the highest such mark in the survey. With the prevalence of civil engineering students in the survey sample, this discovery does not come as a surprise.

Nuclear power plants and globalization followed new transportation corridors with marks of 45% and 37%, respectively. Violent video games attracted the least amount of support as only 8% of students said this ethical issue is "very much" or "considerably" relevant to career plans.

Some 16% of students said the ethics of nuclear power plants and globalization are "very much" relevant to career plans, the highest such marks in the survey.

There was some disconnect between the ethical issues students found to be of high interest (Figure 11) and those most relevant to career plans (Figure 13). As an example, while 50% of students said new transportation corridors are "very much" or "considerably" relevant to career plans, only 24% of students found this ethical issue to be of "high" or "significant" interest. By contrast, the ethics of WMDs were found to be of "high" or "significant" interest to 52% of students, but only 17% of students said WMDs are "very much" or "considerably" relevant to career plans. These observations prompt two questions. Do students want to discount ethical issues that might impact them professionally, and instead find appeal in ethical issues that have less immediacy? And, more provocatively, do students purposely avoid careers they see as troubled with contentious ethical issues?

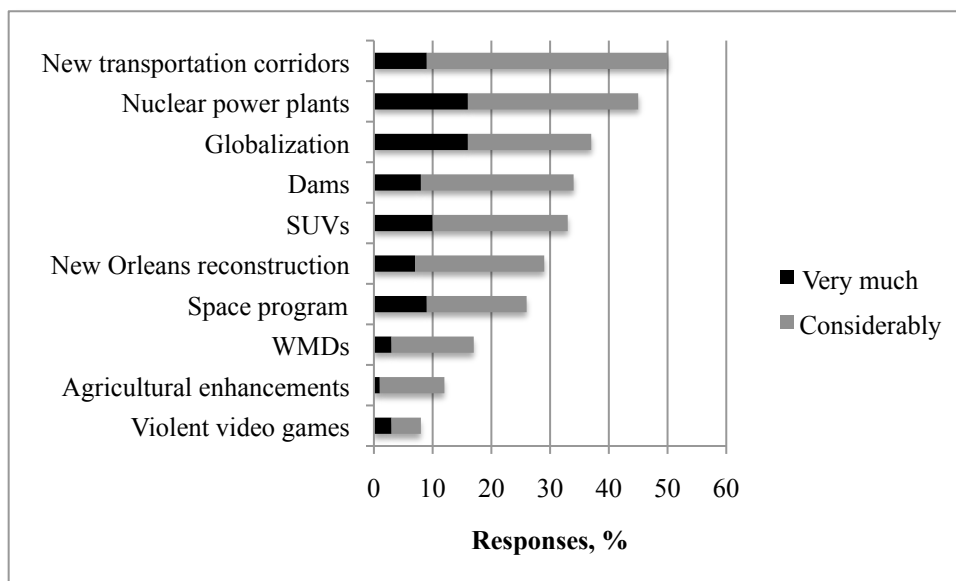


Figure 13
Relevance of
ethical issues
to career plans

Importance of Ethical Issues to Society

Figure 14 depicts the importance of these ethical issues to society. Students were asked to assess the importance as “very much,” “considerably,” “somewhat,” “hardly,” or “not.” The chart shows the “very much” and “considerably” responses to this survey item. Some 84% of students said the ethics of WMDs is “very much” or “considerably” important to society, followed by new transportation corridors with 81% and nuclear power plants with 79%. Violent video games attracted the least amount of support as only 31% of students said this ethical issue is “very much” or “considerably” important to society. Some 49% of students said the ethics of WMDs is “very much” important to society, the highest such mark in the survey.

Students found all ten ethical issues more important to society (Figure 14) than relevant to career plans (Figure 13). This observation is easy to comprehend with WMDs, where 84% of students said this ethical issue is “very much” or “considerably” important to society, while only 17% said the same about WMDs’ relevance to career plans. But students may be overly optimistic when 71% said globalization is “very much” or “considerably” important to society, while only 37% said the same about globalization in terms of career plans.

As time passes, surely the importance of these ethical issues to society will change and others will emerge. It would be curious to see in a few years what students perceive to be the most important ethical issues. Do students’ perceptions of the importance of ethical issues shift as rapidly and whimsically as the news headlines?

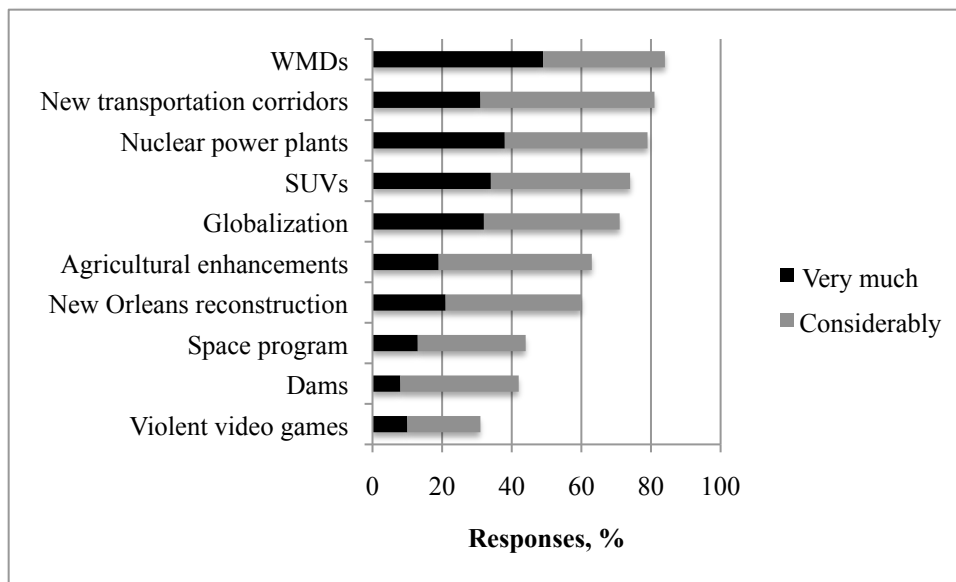


Figure 14
Importance of ethical issues to society

Summary and Future Goals of the Study

The ten contemporary ethical issues in this survey confront all members of society, but they challenge engineers in a more direct way because engineers work in these areas. These cases were found to interest first year engineering students. The ethical issues that would likely elicit viewpoint change could be the best ones to discuss since students are open to new information and ideas. It is only logical that students would want to study ethical issues that are relevant to career goals and also important to society.

In the spring of 2010 the authors plan to give this same survey to students of all levels and majors. In a subsequent article with this additional data, the authors will address the following questions:

- Do engineering students at different levels in the program have different opinions of the ethical issues?
- Do engineering students of different majors have different opinions of the ethical issues?
- Do engineering students think differently about the ethical issues than other students?

The authors hope this information will be useful to faculty who teach engineering ethics. The goal is to have students leave campus with an awareness of how engineering ethics touches everyone and to think critically about what they do on the job.

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