Getting Students to Explore Engineering Ethics through Debate-Style Presentations

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Chizhong Wang received the B.S. degree in Electrical Engineering from Harbin University of Science and Technology, Harbin, China, in 2013 and an M.S. degree in Electrical Engineering from New Jersey Institute of Technology, Newark, NJ, US in 2015.

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Dr. Moshe Kam P.E., New Jersey Institute of Technology

Moshe Kam serves at present as Dean of the Newark College of Engineering at the New Jersey Institute of Technology (NJIT). Earlier he served as the Robert Quinn Professor and Department Head of Electrical and Computer Engineering at Drexel University. His education is in Electrical Engineering (B.S., Tel Aviv University (1976); M.S.(1985) and Ph.D. (1987), Drexel University). Kam's professional interests are in detection and estimation, multi-sensor systems, data and decision fusion, and engineering education. He served as IEEE's Vice President for Educational Activities (2005-2007), and as President and CEO (2011). Kam is a Fellow of IEEE "for contributions to the theory of decision fusion and distributed detection." He received the IEEE Haraden Pratt Award and the HKN C. Holmes MacDonald Award "for the Outstanding Young Electrical Engineering Educator."

Dr. Jaskirat Sodhi, New Jersey Institute of Technology

Dr. Jaskirat Sodhi is interested in first-year engineering curriculum design and recruitment, retention and success of engineering students. He is the coordinator of ENGR101, an application-oriented course for engineering students placed in pre-calculus courses. He has also developed and co-teaches the Fundamentals of Engineering Design course that includes a wide spectra of activities to teach general engineering students the basics of engineering design using a hands-on approach which is also engaging and fun. He is an Institute for Teaching Excellence Fellow and the recipient of NJIT's 2018 Saul K. Fenster Innovation in Engineering Education Award.

GIFTS – Getting Students to Explore Engineering Ethics through Debate-Style Presentations

Implementation:

This activity was covered across six weeks (one lecture per week). To introduce students to engineering ethics, the Fundamentals of Engineering Design 101 instructional team at New Jersey Institute of Technology (NJIT) planned the engineering ethics module in three parts – Part 1 - background theory, Part 2 - a mock debate, and Part 3 – student debate presentations to demonstrate their grasp on the topic. Details of all three parts are given in the table below.

Table 1. Engineering Ethics Debate Activity Breakdown [1-4]

Activity Breakdown (No. of Lectures)	Description
Part 1 – Theory (3 Lectures)	• Students were introduced to engineering ethics and ethical dilemma often faced by practicing engineers through real life examples and case studies from across the globe. Students also learned about some of the ethical theories and tests such as: the Basic Duties/Obligations by W.D. Ross [1-2], Bernard Gert's Ten Moral Rules [3], and Utilitarian Theory [4] etc. Overall, the lectures provided the students with the knowledge and ethical decision guidelines to help them analyze and make a decision on the problems. • At the end of the lecture series, students were divided in groups (2 per group) and were assigned case study topics that contained fictional scenarios based on real-life examples and a binary question to debate on. • The case study topics included ethical dilemmas associated with various commonplace topics including, automation, clinical drug trials, accidental eavesdropping, and political interference etc.
Part 2 - Mock Debate (1 Lecture)	• The instructors picked a topic similar to those assigned to student groups and performed a mock debate. The mock debate presentation concluded with tips on making effective presentations and improving oral presentation skills.
Part 3 – Student Debate Presentations (2 Weeks)	• The class was split into four rooms and each room was assigned 10-12 groups. • Each group within a classroom had all unique topics (no repetition within a classroom). • All debate presentations were designed to be 6-8 minutes of presentation time followed by 2-3 minutes for a Q&A session. All groups were given oral and written feedback on their presentations. • All groups made debate-style presentations that were graded based on a pre-decided rubric. The grading rubric focused on how well the debating groups explored the conflict, applied the knowledge they acquired during the lecture to pick sides based on facts and how well they supported their arguments with credible references. • In addition to faculty/staff/TA judges, all students in the classroom also had the opportunity to grade and comment on each presentation.

General Advice for Planning the Activity:

1. Reserve a few minutes at the end of mock debate presentation to make sure all students are clear on expectations and steps they have to follow to deliver an effective debate.
2. Coming up with fictional scenarios based on real life example for case studies can be a time consuming effort.
3. Students often misunderstand and impulsively make a presentation based on emotions – it is important to iterate multiple times that the aim here is to analyze the ethical dilemma using the theories and tests learned in class.
4. Share the action plan, grading rubric, class breakdown, expectations, and tips to avoid common presentation mistakes as early as possible.

References:

[1] J. Garrett, "A Simple and Usable (Although Incomplete) Ethical Theory Based on the Ethics of W. D. Ross." 10, Aug, 2004.

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[2] W. D. Ross, "The right and the good," Oxford, Clarendon Pres, 1965.

[3] C. Strong, "Gerts Theory Of Common Morality," *Metaphilosophy*, vol. 38, no. 4, pp. 535–545, 2007.

[4] C. B. Fleddermann, "Engineering ethics," Harlow, Essex, England: Pearson Education Limited, 2014, pp. 38-41.