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TWO CRITICISMS OF ENGINEERING ETHICS ASSESSMENT

The importance of behaviors and culture

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Introduction

Ethics is central to engineering. Highlighting the importance of engineering ethics assessment, it is crucial to assess the effectiveness of engineering ethics education, ensuring it has its intended effects. As previous chapters have noted, the intended impact of ethics education has tended to involve moral cognition, including ethical knowledge, awareness, sensitivity, judgments, reasoning, attitudes, values, and so on.[1] Initiatives conducted to date, although useful as first steps, have had three related shortcomings: it is unclear whether (1) measures meant to assess the effectiveness of engineering ethics education measure what they should, namely, *behaviors* and whether, therefore, these measures are *valid*; (2) these measures can be used across different *cultural* groups or are, hence, *reliable*; and (3) such measures adequately incorporate insights and methods from moral and cultural psychology.

This chapter is divided into three parts to address these issues. First, it explains why ethical behaviors should be (but have not been) the goal of engineering ethics education. Next, it outlines why using measures of engineering ethics assessment across different cultural groups would be problematic. Finally, it explores how insights and methods from moral and cultural psychology shed light on and could be used to address these shortcomings, mentioning examples of such work in China and Japan.

Engineering ethics assessment and behaviors[2]

As previous chapters have noted, assessment in engineering ethics education has focused on moral cognition. Here, 'moral cognition' refers to cognitive processes and contents related to morality and ethics, including ethical knowledge, awareness, sensitivity, judgments, reasoning, attitudes, values, and so on. However, adopting these as the goal of engineering ethics education is misguided, and therefore, these measures would be invalid insofar as they fail to measure what they should. Although moral cognition is often conceived as precipitating and resulting in ethical behavior, research into moral psychology calls into question this common-sense understanding of their relations.

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This section argues that moral cognition should not be the ultimate goal of engineering ethics education and, therefore, that these measures are invalid, broadly conceived.[3] Rather, the ultimate goal of engineering ethics education should be ethical behaviors. To support this claim and point towards an alternative, this section explains why ethical behaviors should be adopted as the goal of engineering ethics education. We then outline why ethical behaviors have not been adopted as the goal of engineering ethics education. How ethical behaviors might connect to cognitive aspects mentioned before – like values and attitudes – is further discussed near the end of this chapter.

Why should behaviors be the goal of engineering ethics education?

Behaviors should be the goal of engineering ethics education since it is only through behaviors and actions that engineering and engineers affect the world. For example, the ethical knowledge that a mechanical engineer possesses regarding the case of the Ford Pinto counts for nothing if that engineer, nevertheless, designs a compact car with a poorly insulated gas tank. Similarly, a lack of moral awareness among a team of nuclear engineers about the case of Chernobyl would be insignificant if that team still successfully carried out routine tests of a nuclear reactor without incident. Ultimately, it is only through behaviors and actions that engineering and engineers affect the world. This is reflected in professional codes of ethics.

Professional codes of ethics emphasize behaviors and action – for instance, *using* knowledge and skills, *performing* services, *acting* in professional matters, and so on (ASME, 2012). Although engineering ethicists have emphasized the importance of *virtues* – in other words, the importance of not only *behaving* but also of *being* a certain way (Frigo et al., 2021; Harris, 2008) – it is hard to see why one should care about virtues in the absence of the behaviors they produce, for instance, why one would care about *honesty* as a virtue aside from the fact it results in *truth-telling* (Greene, 2014).[4] Presumably, the behaviors and actions of engineers are also what the public cares about. This claim is supported by understandings of 'professions' and 'professionalism' used in engineering ethics and other branches of professional ethics, such as medical, legal, and educational ethics (Davis, 2021).

Professions mediate the public's relationship with engineers. Like professional bodies for doctors, lawyers, and teachers, professional engineering organizations mediate the relationship between individual professionals and society, for example, through the establishment of technical guidelines, professional licensing, and educational accreditation (Luegenbiehl & Clancy, 2017). Although professional organizations and formation vary by country and field of engineering (Didier & Derouet, 2013; Iseda, 2008; Luegenbiehl, 2004), in places with and fields having professions, professions must be responsive to the concerns of citizens in the work they do.[5] In the absence of this concern, the field of engineering would cease to exist, and engineers would be unemployed; if engineers and engineering did not, overall, make the world a better place, then no-one would want the products, processes, and services for which they are responsible (Davis, 2021). Hence, insofar as this concern motivates the engineering profession and professional codes are meant to address these concerns, the behaviors and actions of engineers are what the public ultimately cares about, rather than their ethical knowledge, awareness, and so on.

If the behaviors and actions of engineers are what matter, then why haven't ethical behaviors and actions been adopted as the goal of engineering ethics education and, therefore, assessment? Why have different forms of moral cognition been adopted as the goal of engineering ethics education and assessment?

Why haven't ethical behaviors been adopted as the goal?

There are at least two reasons ethical behaviors and actions have not been adopted as the goal of engineering ethics education and assessment. The first is the assumption that ethical behaviors follow naturally and unproblematically from moral cognition (Fleddermann, 2012) – that ethical behaviors would follow by adopting moral cognition as the goal of engineering ethics education. However, a growing body of work from the psychological and behavioral sciences has called into doubt any simple or straightforward causal relation between antecedent moral cognition and subsequent ethical behaviors.

If moral cognition resulted in more ethical behaviors, then professional ethicists – arguably the most knowledgeable about ethics and capable of ethical reasoning – would behave the most ethically. However, research has consistently failed to find evidence to support this conclusion (Schönegger & Wagner, 2019; Schwitzgebel & Rust, 2014). Not only is ethical reasoning not associated with ethical behaviors (Harding et al., 2007), but it is also associated with more unethical behaviors (Bay & Greenberg, 2001; Ponemon, 1993). Further, considerable research has found that ethical judgments are associated with 'moral intuitions,' closer in nature to emotions than to reasoning (Greene, 2014; Haidt, 2012; Roeser, 2018), and that behaviors are often affected by unconscious, environmental factors (Bazerman & Tenbrunsel, 2012; Doris, 2005). Rather than conscious, rational, and reflective processes, individual behaviors are often driven by implicit expectations regarding what others do and what others think others should do (Bicchieri, 2016; Kahnemann, 2011). Failing to account for these (somewhat counter-intuitive) characteristics of ethical behaviors and moral cognition is one of the main reasons that behaviors have not been adopted as the goal of engineering ethics education and assessment.

The second main reason concerns difficulties associated with adopting ethical behaviors as the goal of engineering ethics education and assessment. These difficulties are both theoretical and practical, having to do with the nature of ethical behaviors and how they would be assessed.

Regarding the first, what it means to 'behave ethically' regarding engineering is ambiguous. People often disagree about what it means to behave ethically, a position known in academic philosophy as descriptive ethical relativism (Rachels, 2001). Further, conceptions of ethics – understood in terms of what should or should not be done and what it means to be good – are affected by social and cultural factors (Henrich, 2020; Nisbett, 2010; Rachels, 2011). This is especially important to engineering ethics since engineering is increasingly cross-cultural and international, with people from different backgrounds working together as never before (Clancy & Zhu, 2022; Wong, 2021). Hence, because of the global environments of engineering and cultural differences, conceptions of ethics are likely to clash. The extent to which there is something fundamental and, therefore, global to ethics in engineering, or whether cultural differences segment conceptions, is an open, ongoing debate between what Clancy and Zhu (2022) have termed 'universalist' and 'particularist' approaches to engineering ethics. In addition to these cultural differences, there are reasons specific to engineering that would make it difficult to specify the nature of ethical behaviors in engineering.

From the perspective of common-sense ethics – in other words, understandings of right and wrong in non-professional, lay terms – what it means to 'behave ethically' in engineering could be counter-intuitive (Stappenbelt, 2013). This counter-intuitive character stems from the nature of engineering, first and foremost, the specific duties and obligations that follow from and are attached to the professional roles engineers occupy. What it means to 'behave ethically' as an engineer could differ from and demand more than what it means to 'behave ethically' as a non-professional layperson. For example, given their tremendous potential impact on public safety, it is essential that engineers only perform within their areas of competence – this is a typical entry within professional engineering codes, even across national and cultural groups (Luegenbiehl, 2010; Luegenbiehl & Clancy, 2017). Failure to do so could have negative impacts on public safety. For similar reasons, engineers must engage in lifelong learning. However, these types of duties are different from and could appear counter-intuitive from the perspective of common-sense ethics. The relation between not harming people, lifelong learning, and only performing within one's area of competence might not be clear. Perhaps as a result, engineering students have ranked these as the least important professional duties (Stappenbelt, 2013). However, they are undoubtedly among the most important from the perspective of professional codes and, therefore, the organizations, practitioners, and public they represent. The same could be true of technical and regulatory guidelines, where very small, seemingly insignificant differences could have vast and dire consequences (Luegenbiehl & Clancy, 2017; Zhu et al., 2022). Similar difficulties stem from the intrinsically novel nature of engineering, the fact that engineering involves technology, and that technology brings into existence situations that did not exist before.

As a result, it is difficult to specify what it would mean to 'behave ethically' in these novel situations, a problem associated with the 'engineering as social experimentation' paradigm (Van de Poel, 2016, 2017). As a result of these difficulties, some have argued it would be impossible to know or, therefore, teach ethical behaviors, which is why ethical behaviors should not be adopted as the goal of engineering ethics education (Baum, 1980; Van de Poel et al., 2001).[6] However, even if the nature of engineering ethical behaviors could be precisely specified, practical difficulties are involved in adopting behaviors as the goal of ethics education.

The most important of these difficulties would be the ability to track long-term ethical behaviors, assessing how they are affected by different kinds of engineering education. Ideally, groups of engineering students could be separated into experimental and control groups during their first year of university. Students in the experimental group would receive ethics education, whereas those in the control group would not. They would then be tracked throughout their university and professional careers, seeing which ones engaged in more (un)ethical behaviors, while controlling for other potentially confounding factors. Obviously, such a procedure would be both unethical and untenable: unethical as it would deny ethics education to one group of students, and untenable as such a procedure would require a tremendous expenditure of resources. In sum, those are additional practical difficulties associated with adopting 'ethical behaviors' as the goal of engineering ethics education.

Engineering ethics assessment and bias

In addition to problems of *validity* discussed above, measures of engineering ethics assessment potentially have problems of *reliability*.[7] This section argues that measures of engineering ethics assessment are unlikely to be reliable because of cultural biases. These biases stem from where and how engineering ethics has developed – the ways it has been conceived and the people by and with whom these measures have been developed. To support this claim and begin to delineate alternatives, this section starts by identifying sources of bias within engineering ethics education, and moves on to locate sources of potential bias in the populations by and with whom measures of engineering ethics assessment have been developed.

Why and how is engineering ethics biased?

As a systematic and reflective study discipline, engineering ethics began in the United States and has evolved (primarily) in the Western world (Clancy & Zhu, 2022; Davis, 1995). This is problematic since there are features of engineering in the United States that are not true elsewhere and do not easily transfer – for example, the professional nature of engineering (Iseda, 2008; Luegenbiehl, 2004) – even within exclusively Western contexts (Didier & Derouet, 2013; Van de Poel & Royakkers, 2011).

Engineering ethics education has tended to be professional and applied, familiarizing students with professional codes of ethics and/or philosophical, ethical theories (Clancy & Zhu, 2022; Harris et al., 1996; Hess & Fore, 2018). Principles contained in these codes and theories are then applied to resolve ethical issues that appear in engineering case studies, typically involving disasters and taking place in the United States (Barry & Herkert, 2015; Harris, 2008; Harris et al., 2018; Van de Poel & Royakkers, 2011). However, this way of thinking about and teaching ethics is particular to a relatively recent Western cultural tradition. By contrast, in Eastern and ancient Western philosophy, the focus has been on what it means to be and *become* good (Ivanhoe & Norden, 2005; Pierre Hadot, 1995). In recent years, the Western professional and applied case-study approach to engineering ethics has begun to change. Engineering ethicists have increasingly emphasized virtue and care ethics and non-Western ethical theories and perspectives (Fleddermann, 2012; Van de Poel & Royakkers, 2011; Zhu, 2010). Additionally, more case studies are now available that focus on incidents and engineering work that has occurred and is occurring outside the United States (Luegenbiehl & Clancy, 2017; Van de Poel & Royakkers, 2011). Such efforts could be understood as attempts to decolonize the engineering curriculum (Fomunyam, 2017, 2019). Additionally, more recent case studies have been 'aspirational' in nature, focusing on engineers doing the right thing (Harris et al., 2018).

How and why are measures of engineering ethics assessment biased?

Due to the biases noted above, measures to assess engineering ethics education could be similarly biased. Measures of ethical knowledge, awareness, and so on have been developed by and with scholars working primarily in the United States. However, there are good reasons for thinking that individuals who belong to this group are poorly representative of global populations and, therefore, that using such measures with non-US groups would be problematic. It is unclear whether measures of engineering ethics would assess the same things with non-US groups or, therefore, whether these measures would be reliable.

The United States is what some have called a 'WEIRD' (Western, educated, industrialized, rich, and democratic) culture. Relative to global populations, samples from WEIRD cultures are consistently outliers on various psychological and social factors, including self-concepts, thought styles, and ethical reasoning (Henrich, 2020). Versus WEIRD cultures, East Asian populations, for instance, tend to think of themselves in interdependent rather than independent terms, reason holistically rather than analytically, and make ethical judgments based on the outcomes of behaviors rather than the intentions of agents (Feinberg et al., 2019; Nisbett, 2010). These general cultural differences provide good reasons for thinking that significant differences regarding engineering ethical knowledge, awareness, and so on would also exist.[8]

Where comparative data is available, it has been found that non-US students perform worse on measures of engineering ethical reasoning than their US counterparts and that they make smaller gains because of ethics education (Borenstein et al., 2010; Canary et al., 2012). However, it has been unclear whether this results from cultural differences, linguistic competence, or some combination of both. Addressing these and related questions is extremely important, given the increasingly cross-cultural and international nature of engineering.

Engineering ethics assessment and improvement

To address the issues of validity and reliability discussed above, those working in engineering ethics should draw from insights and methods from moral and cultural psychology. These fields have resources that could be used to address issues related to ethical behaviors and cultural biases in engineering ethics education and assessment. This third section outlines how these insights and methods could be used to address such issues and areas where they have already been applied and are being applied.

What role can moral and cultural psychology play?

Moral and cultural psychology have resources that could be used to address both theoretical and practical difficulties associated with adopting behaviors as the goal of engineering ethics education. Moral and cultural psychology are empirical, descriptive disciplines concerned with conducting research to describe what and how people think about matters of right and wrong and how these are affected by culture (Doris, 2010; Doris et al., 2017; Heine, 2016). The process of studying and describing what and how people think about right and wrong can be understood in contrast to those of philosophical and applied ethics, which are theoretical and prescriptive, concerned with engaging in reflection to prescribe how and why people *should* think and behave. As such, moral and cultural psychology have resources for addressing the natures of and differences between conceptions of right and wrong behaviors across cultures, addressing both theoretical and practical difficulties explained above (see Chapter 10 for more).

Theoretically, insights and methods from moral and cultural psychology can assess what people think about issues of right and wrong, as well as similarities and differences between cultural and professional groups. This is one of the ways these fields, their insights, and their methods would be relevant to engineering ethics education assessment cross-culturally. For example, large-scale research has found that individuals who identify as politically liberal and are from WEIRD cultures tend to prioritize care and fairness when they think about what it means to be ethical. In contrast, individuals who identify as politically conservative and are from non-WEIRD cultures tend to prioritize not only care and fairness but also loyalty, authority, and sanctity (Graham et al., 2009; Graham et al., 2011; Kim et al., 2012; Talhelm et al., 2015; Zhang & Li, 2015). Although care and fairness appear to be universal features of moral cognition, how people conceive of and practice these could differ between cultural and professional groups. Understanding the effects of professional education/training in general could help to understand and assess the impact of engineering ethics education specifically.

For instance, when confronted with dilemmas involving the allocation of scarce resources to care for patients, hospital administrators are more likely to make outcome-based, 'consequentialist' decisions than doctors and members of the public – sacrificing one individual to allocate more resources among many (Ransohoff, 2011). Similarly, rates of reported cheating are higher among business students than engineering students and higher among engineering students than humanities and social-sciences students (Harding et al., 2012; McCabe et al., 2001). This indicates that professional education and formation can affect ethical judgments like culture can. However, where, how, and why this occurs are unclear; the effects of professional cultures on ethics are understudied. Additional work would be necessary to determine if and how conceptions of ethics among engineers are different from those of the public, as well as how these are affected by national cultures. Such research has been carried out with Chinese engineering students.

China is now a significant engineering country, graduating and employing more science, technology, engineering, and mathematics (STEM) majors than any other country. In recent years, China has invested significantly in engineering ethics education. The Ministry of Education (MOE) now requires the course 'Engineering Ethics' in all engineering Master's programs (Ministry of Education PRC, 2018). Additionally, many engineering universities now offer courses related to engineering ethics at the undergraduate level. Coupled with the increasing influence of China on the world stage, understanding the ethics of Chinese engineering students is essential.

To do so, teams have translated and administered measures of engineering ethical reasoning, such as the Engineering and Sciences Issues Test (ESIT) (Borenstein et al., 2010), and moral intuitions, like the Moral Foundations Questionnaire (MFQ) (Graham et al., 2011), to groups of Chinese engineering students (Clancy, 2020, 2021; Clancy & Hohberger, 2019; Clancy et al., 2022). The results of these studies have been significant.

For example, previous results mentioned above – showing smaller gains in ethical reasoning among non-US students – seem to result from linguistic competence rather than cultural differences. In two recent studies, non-native but high-level English-speaking Chinese students made significant gains in their ethical reasoning abilities, similar to their US counterparts (Clancy, 2020, 2021). These results are supported by the fact that the structure of ethical reasoning among Chinese students is similar to that of their foreign counterparts: one can discern in responses to the ESIT the same structure of pre-conventional (self-based), conventional (rule- and law-based), and post-conventional (universal principles–based) reasoning that one finds in responses to the ESIT from the culturally WEIRD, US participants with which the instrument was developed. This is even though cultural psychologists have called into question the existence of this pre-conventional/conventional/post-conventional taxonomy of ethical reasoning among East Asian populations (Hwang, 2012).

Just as the fields of moral and cultural psychology have resources that could help address theoretical difficulties associated with adopting behaviors as the goal of engineering ethics education, so too do they have resources for addressing practical challenges. Work on moral and cultural psychology could do so by better understanding relation(s) between ethical behaviors and other relevant factors that measurements have been developed to assess, such as ethical knowledge, reasoning, and so on. Such research would be helpful beyond engineering ethics – since engineering ethics is not the only field that neglects the relation between ethical behaviors and other relevant factors.

There is a lack of study regarding the relationship between ethical behaviors and moral cognition in moral psychology, where studies tend to focus on ethical behaviors or moral cognition and less on the relations between them (Ellemers et al., 2019; Villegas de Posada & Vargas-Trujillo, 2015). Although the field of engineering ethics education currently lacks theoretical and empirical resources for addressing this gap, moral psychology has such resources. In recent years, scholars in moral psychology have begun to address the gap by, for example, pairing psychological measures of moral cognition with economic games to precisely quantify and assess the behaviors of individuals (Miranda-Rodríguez et al., 2023). Moreover, simply because ethical knowledge, reasoning, and other facets of moral cognition are insufficient conditions of ethical behaviors does not mean they are unnecessary. Future research should further study these relations, for instance, identifying proxies for or predictors of ethical behaviors. Engineering ethics and education scholars would be well positioned to do so by studying lab spaces and attending workshops in universities.

Labs and workshops in universities can be conceived and studied as microcosms of larger engineering work environments. Although these spaces are smaller and simpler than their corporate or government counterparts, they involve technical work, its practical applications, deadlines and budgets, and social relations and hierarchies that affect technical work. As such, university labs and workshops could be used as touchstones to pilot and assess different kinds of engineering ethics interventions, where (quasi) real-world behaviors could be observed and assessed. In addition to quantitative assessment measures, engineering ethicists and educators could adopt methods from Science and Technology Studies (STS) and anthropology, such as ethnographies of researchers working in engineering labs. Engineering labs and workshops could provide an alternative to manufactured experimental protocols, such as economics games, sometimes used to assess ethical behaviors.

What role can moral and cultural psychology play in making engineering ethics less biased?

Just as moral and cultural psychology have resources to address difficulties with adopting behaviors as the goal of engineering ethics education, so do these fields have resources for mitigating biases associated with measures of engineering ethics assessment.

First, moral and cultural psychology findings support the importance of including larger, more culturally and nationally diverse samples in research on engineering ethics education. Similarities in ethical presuppositions involving knowledge, awareness, and other facets of moral cognition cannot be taken for granted since culture can affect these in unexpected and counter-intuitive ways. Exploring similarities and differences between samples from different cultural and professional groups could help understand if and how this is the case. Again, such work is underway.

In a series of empirical studies, researchers from Malaysia and Japan have explored the ethical perspectives and impact of education on engineering students. These are significant since they use samples of underrepresented engineering students from Malaysia and Japan (Balakrishnan et al., 2018; Balakrishnan et al., 2021, also featured as case studies in Chapter 27). Results from this kind of work can help to mediate debates between 'universalists' who think that professional and disciplinary cultures are more important to the ways people think about ethics than national cultures, and 'particularists' who think that national cultures are more important (Clancy & Zhu, 2022; Davis, 2021). Such debates rest on competing assumptions about the universality of professional standards and ethical understanding between different national and cultural groups and, therefore, if and how engineering ethics education is biased. These methods could also help determine whether psychological or social factors are specific to/distinctive of different professional or disciplinary groups. Such findings could help educators recognize and better respond to these differences.

These differences could be addressed by tailoring curricula in engineering ethics to the cultural backgrounds and professional aspirations of students, for instance, curricula in ethics for civil engineering students from China versus ones for mechanical engineering students from France. Disciplinary specialization is a best practice within education for Responsible Conduct of Research (RCR) (Phillips et al., 2018). Although professional organizations and regulatory bodies might have common ethical expectations of engineers and engineering work, engineers come from diverse backgrounds. Understanding and responding to these backgrounds is necessary to meet common ethical expectations.

Conclusion

Ethics is central to engineering, but ways of assessing engineering ethics education are problematic. These problems concern the *validity* and *reliability* of measures assessing engineering ethics education since these measures do not assess long-term ethical behaviors and are based on biased samples. To address these problems and, thereby, increase the validity and reliability of these measures, the field of engineering ethics education must use insights and methods from moral and cultural psychology to better understand relations between ethical behaviors and moral cognition and how these are affected by culture.

Notes

1 'Ethics,' 'morality,' and their variants are used interchangeably throughout this chapter. For a different understanding of the natures of and relations between these terms regarding engineering and technology, see, for example, (Davis, 2021; Van de Poel & Royakkers, 2011).
2 This section is based on materials included in (Clancy & Gammon, 2021) and expanded on in (Clancy & Zhu, 2023). The interested reader is encouraged to consult that article for a fuller explanation of this argument/line of thought, as well as responses to objections, which could not be addressed here because of restrictions related to space.
3 A reviewer has pointed out that measures are developed according to the objectives of those who define them, such that the measures could be valid even if the objectives defined are questionable. It seems as though the objectives defined in developing measures of engineering ethics education assessment are ultimately ethical behaviors – a point further discussed and justified below – although this might not be the case. Were this not the case, then '(in)valid' and its variants are being used in a looser sense throughout this chapter.
4 One might well wonder whether one could behave or act ethically in the absence of moral cognition. This is a point to which we return below – regarding whether moral cognition might be a *necessary*, if not *sufficient*, condition of ethical behaviors – but, again, the interested reader is encouraged to consult (Clancy & Zhu, 2023) for a fuller consideration of this point.
5 Not all fields are organized as professions, nor is the organization of fields into professions the same across countries. For example, although the field of law has traditionally been organized as a profession, it has fallen into disrepute in recent years, weakening its status as a profession; although engineering seems to be a profession in Canada, for instance, this is less clearly the case elsewhere.
6 It should be pointed out that 'teaching ethical behaviors' is different from 'adopting ethical behaviors as the ultimate goal of engineering ethics education.' One could well think the former is absurd while endorsing the latter. Again, see (Clancy & Zhu, 2023) for more on this point.
7 As with the previous section, the points included here have been dealt with at greater length elsewhere. For instance, see (Clancy & Zhu, 2022) and (Luegenbiehl & Clancy, 2017).
8 However, others disagree about the strength of this evidence – whether *general* cultural differences provide reasons for thinking *specific* differences in engineering ethics would exist. For an extensive, well-reasoned articulation and defense of that view, see (Davis, 2021).

References

ASME. (2012, February 1). Code of ethics of engineers. Retrieved April 26, 2023, from https://www.asme.org/wwwasmeorg/media/resourcefiles/aboutasme/getinvolved/advocacy/policy-publications/p-15-7-ethics.pdf

Balakrishnan, B., Tochinai, F., & Kanemitsu, H. (2018). Engineering ethics education: A comparative study of Japan and Malaysia. *Science and Engineering Ethics*, *23*, 1–15. https://doi.org/10.1007/s11948-018-0051-3

Balakrishnan, B., Tochinai, F., Kanemitsu, H., & Altalbe, A. (2021). Engineering ethics education from the cultural and religious perspectives: A study among Malaysian undergraduates. *European Journal of Engineering Education*, *46*(5), 707–717. https://doi.org/10.1080/03043797.2021.1881449

Barry, B. E., & Herkert, J. R. (2015). Overcoming the challenges of teaching engineering ethics in an international context: A U.S. perspective. In C. Murphy, P. Gardoni, H. Bashir, C. E. Harris, & E. Masad (Eds.), *Engineering ethics for a globalized world* (pp. 167–187). Springer. https://doi.org/10.1007/978-3-319-18260-5

Baum, R. J. (1980). *Ethics and engineering curricula*. The Hastings Center.

Bay, D. D., & Greenberg, R. R. (2001). The relationship of the DIT and behavior: A replication. *Issues in Accounting Education*, *16*(3), 367–380. https://doi.org/10.2308/iace.2001.16.3.367

Bazerman, M. H., & Tenbrunsel, A. (2012). *Blind spots: Why we fail to do what's right and what to do about It*. Princeton University Press.

Bicchieri, C. (2016). *Norms in the wild*. Oxford University Press.
Borenstein, J., Drake, M. J., Kirkman, R., & Swann, J. L. (2010). The Engineering and Science Issues Test (ESIT): A discipline-specific approach to assessing moral judgment. *Science and Engineering Ethics*, *16*(2), 387–407. https://doi.org/10.1007/s11948-009-9148-z
Canary, H. E., Herkert, J. R., Ellison, K., & Wetmore, J. M. (2012). *Microethics and macroethics in graduate education for scientists and engineers: Developing and assessing instructional models*. ASEE Annual Conference and Exposition, Conference Proceedings.
Clancy, R. F. (2020). *Ethical reasoning and moral foundations among engineering students in China*. In Proceedings of the American Society for Engineering Education Annual Conference & Exposition.
Clancy, R. F. (2021). *The relations between ethical reasoning and moral intuitions among engineering students in China*. In Proceedings of the American Society for Engineering Education Annual Conference & Exposition.
Clancy, R. F., & Gammon, A. (2021). *The ultimate goal of ethics education should be more ethical behaviors*. ASEE Annual Conference and Exposition, Conference Proceedings.
Clancy, R. F., & Hohberger, H. (2019). The moral foundations of Chinese engineering students: A preliminary investigation. In *Proceedings of the American Society for Engineering Education Annual Conference & Exposition*.
Clancy, R. F., & Zhu, Q. (2022). Global Engineering Ethics: What? Why? How? and When? *Journal of International Engineering Education*, *4*(1). https://digitalcommons.uri.edu/jiee/vol4/iss1/4?utm_source=digitalcommons.uri.edu%2Fjiee%2Fvol4%2Fiss1%2F4&utm_medium=PDF&utm_campaign=PDFCoverPages
Clancy, R. F., & Zhu, Q. (2023). Why should ethical behaviors be the ultimate goal of engineering ethics education? *Business and Professional Ethics Journal*, *42*(1), 33–53. https://doi.org/10.5840/bpej202346136
Clancy, R. F., Zhu, Q., Streiner, S., Gammon, A., & Thorper, R. (2022). Exploring the relations between ethical reasoning and moral intuitions among first-year engineering students across cultures. In *ASEE Annual Conference and Exposition*.
Davis, M. (1995). An historical preface to engineering ethics. *Science and Engineering Ethics*, *1*(1), 33–48.
Davis, M. (2021). *Engineering as a global profession: Technical and ethical standards*. Rowman & Littlefield Publishers.
Didier, C., & Derouet, A. (2013). Social responsibility in French engineering education: A historical and sociological analysis. *Science and Engineering Ethics*, *19*(4), 1577–1588. https://doi.org/10.1007/s11948-011-9340-9
Doris, J. M. (2005). *Lack of character: Personality and moral behavior*. Cambridge University Press.
Doris, J. M. (Ed.). (2010). *The moral psychology handbook*. Oxford University Press.
Doris, J. M., Stich, S., Phillips, J., & Walmsley, L. (2017). Moral psychology: Empirical approaches. In *Stanford encyclopedia of philosophy*.
Ellemers, N., van der Toorn, J., Paunov, Y., & van Leeuwen, T. (2019). The psychology of morality: A review and analysis of empirical studies published from 1940 through 2017. *Personality and Social Psychology Review*, *23*(4), 332–366. https://doi.org/10.1177/1088868318811759
Feinberg, M., Fang, R., Liu, S., & Peng, K. (2019). A world of blame to go around: Cross-cultural determinants of responsibility and punishment judgments. *Personality and Social Psychology Bulletin*, *45*(4), 634–651. https://doi.org/10.1177/0146167218794631
Fleddermann, C. (2012). *Engineering ethics* (4th ed.). Pearson.
Fomunyam, K. G. (2017). Decolonising teaching and learning in engineering education in a South African university. *International Journal of Applied Engineering Research*, *12*(23), 13349–13358. http://www.ripublication.com
Fomunyam, K. G. (Ed.). (2019). *Decolonising higher education in the era of globalisation and internationalisation*. Sun Press.
Frigo, G., Marthaler, F., Albers, A., Ott, S., & Hillerbrand, R. (2021). Training responsible engineers. Phronesis and the role of virtues in teaching engineering ethics. *Australasian Journal of Engineering Education*, *26*(1), 25–37. https://doi.org/10.1080/22054952.2021.1889086
Graham, J., Haidt, J., & Nosek, B. A. (2009). Liberals and conservatives Rely on different sets of moral foundations. *Journal of Personality and Social Psychology*, *96*(5), 1029–1046. https://doi.org/10.1037/a0015141
Graham, J., Nosek, B. A., Haidt, J., Iyer, R., Koleva, S., & Ditto, P. H. (2011). Mapping the moral domain. *Journal of Personality and Social Psychology*, *101*(2), 366–85. https://doi.org/10.1037/a0021847

Greene, J. D. (2014). *Moral tribes: Emotion, reason, and the gap between us and them*. Penguin Books.
Haidt, J. (2012). *The righteous mind*. Vintage Press.
Harding, T. S., Carpenter, D. D., & Finelli, C. J. (2012). An exploratory investigation of the ethical behavior of engineering undergraduates. *Journal of Engineering Education*, *101*(2), 346–374.
Harding, T. S., Mayhew, M. J., Finelli, C. J., & Carpenter, D. D. (2007). The theory of planned behavior as a model of academic dishonesty in engineering and humanities undergraduates. *Ethics and Behavior*, *17*(3), 255–279. https://doi.org/10.1080/10508420701519239
Harris, C. E. (2008). The good engineer: Giving virtue its due in engineering ethics. *Science and Engineering Ethics*, *14*(2), 153–164. https://doi.org/10.1007/s11948-008-9068-3
Harris, C. E., Davis, M., Pritchard, M. S., & Rabins, M. J. (1996). Engineering ethics: What? Why? How? And when? *Journal of Engineering Education*, *85*(2), 93–96. https://doi.org/10.1002/j.2168-9830.1996.tb00216.x
Harris, C. E., Pritchard, M., Rabins, M., James, R., & Englehardt, E. (2018). *Engineering ethics: Concepts and cases* (6th ed.). Cengage Learning.
Heine, S. J. (2016). *Cultural psychology* (3rd ed.). Norton and Company.
Henrich, J. (2020). *The WEIRDest people in the world: How the west became psychologically peculiar and particularly prosperous*. Farrar, Straus and Giroux.
Hess, J. L., & Fore, G. (2018). A systematic literature review of US engineering ethics interventions. *Science and Engineering Ethics*, *24*(2), 551–583. https://doi.org/10.1007/s11948-017-9910-6
Hwang, K.-K. (2012). *Foundations of Chinese psychology: Confucian social relations* (Vol. 1). Springer New York. https://doi.org/10.1007/978-1-4614-1439-1
Iseda, T. (2008). How should we foster the professional integrity of engineers in Japan? A pride-based approach. *Science and Engineering Ethics*, *14*(2), 165–176. https://doi.org/10.1007/s11948-007-9039-0
Ivanhoe, P. J., & Van Norden, B. W. (Eds.). (2005). *Readings in classical Chinese philosophy* (2nd ed.). Hackett Publishing.
Kahnemann, D. (2011). *Thinking fast and slow*. Macmillan.
Kim, K. R., Kang, J.-S., & Yun, S. (2012). Moral intuitions and political orientation: Similarities and differences between South Korea and the United States. *Psychological Reports*, *111*(1), 173–185. https://doi.org/10.2466/17.09.21.pr0.111.4.173-185
Luegenbiehl, H. C. (2004). Ethical autonomy and engineering in a cross-cultural context. *Techné: Research in Philosophy and Technology*, *8*(1), 57–78. https://doi.org/doi:10.5840/techne20048110
Luegenbiehl, H. C. (2010). Ethical principles for engineers in a global environment. In I. Van de Poel & D. E. Goldberg (Eds.), *Philosophy and engineering: An emerging agenda* (pp. 147–159). Springer.
Luegenbiehl, H. C., & Clancy, R. F. (2017). *Global engineering ethics*. Elsevier.
McCabe, D. L., Treviño, L. K., & Butterfield, K. D. (2001). Cheating in academic institutions: A decade of research. *Ethics and Behavior*, *11*(3), 219–232. https://doi.org/10.1207/S15327019EB1103_2
Ministry of Education PRC. (2018). *Notice on forwarding the "guidance on formulating the training program for engineering masters" and its explanation (in Chinese)*. http://www.moe.gov.cn/s78/A22/tongzhi/201805/t20180511_335692.html
Miranda-Rodríguez, R. A., Leenen, I., Han, H., Palafox-Palafox, G., & García-Rodríguez, G. (2023). Moral reasoning and moral competence as predictors of cooperative behavior in a social dilemma. *Scientific Reports*, *13*(1), 1–11. https://doi.org/10.1038/s41598-023-30314-7
Nisbett, R. E. (2010). *The geography of thought: How Asians and Westerners think differently and why*. Free Press.
Phillips, T., Nestor, F., Beach, G., & Heitman, E. (2018). America COMPETES at 5 years: An analysis of research-intensive universities' RCR training plans. *Science and Engineering Ethics*, *24*(1), 227–249. https://doi.org/10.1007/s11948-017-9883-5
Pierre Hadot. (1995). *Philosophy as a way of life*. Wiley-Blackwell.
Ponemon, L. A. (1993). Can ethics be taught in accounting? *Journal of Accounting Education*, *11*(2), 185–209. https://doi.org/https://doi.org/10.1016/0748-5751(93)90002-Z
Rachels, J. (2001). Subjectivism in ethics. In J. Rachels (Ed.), *The elements of moral philosophy* (pp. 1–14).
Rachels, J. (2011). The challenge of cultural relativism. In J. Rachels (Ed.), *The elements of moral philosophy* (pp. 12–24). McGraw-Hill Education.
Ransohoff, K. J. (2011). *Patients on the trolley track: The moral cognition of medical practitioners and public health professionals*. Harvard University.
Roeser, S. (2018). *Risk, technology, and moral emotions*. Routledge.

Schönegger, P., & Wagner, J. (2019). The moral behavior of ethics professors: A replication-extension in German-speaking countries. *Philosophical Psychology*, *32*(4), 532–559. https://doi.org/10.1080/09515089.2019.1587912

Schwitzgebel, E., & Rust, J. (2014). The moral behavior of ethics professors: Relationships among self-reported behavior, expressed normative attitude, and directly observed behavior. *Philosophical Psychology*, *27*(3), 293–327. https://doi.org/10.1080/09515089.2012.727135

Stappenbelt, B. (2013). Ethics in engineering: Student perceptions and their professional identity development. *Journal of Technology and Science Education*, *3*(1), 86–93. https://doi.org/10.3926/jotse.51

Talhelm, T., Haidt, J., Oishi, S., Zhang, X., Miao, F. F., & Chen, S. (2015). Liberals think more analytically (more "WEIRD") than conservatives. *Personality and Social Psychology Bulletin*, *41*(2), 250–267. https://doi.org/10.1177/0146167214563672

Van de Poel, I. (2016). An ethical framework for evaluating experimental technology. *Science and Engineering Ethics*, *22*(3), 667–686. https://doi.org/10.1007/s11948-015-9724-3

Van de Poel, I. (2017). Society as a laboratory to experiment with new technologies. In D. M. Bowman, E. Stokes, & A. Rip (Eds.), *Embedding new technologies into society: A regulatory, ethical and societal perspective*. Pan Stanford Publishing. https://doi.org/10.1201/9781315379593

Van de Poel, I., & Royakkers, L. (2011). *Ethics, technology, and engineering: An introduction*. Wiley-Blackwell.

Van de Poel, I., Zandvoort, H., & Brumsen, M. (2001). Ethics and engineering courses at Delft University of Technology: Contents, educational setup and experiences. *Science and Engineering Ethics*, *7*(2), 267–282. https://doi.org/10.1007/s11948-001-0048-0

Villegas de Posada, C., & Vargas-Trujillo, E. (2015). Moral reasoning and personal behavior: A meta-analytical review. *Review of General Psychology*, *19*(4), 408–424. https://doi.org/10.1037/gpr0000053

Wong, P.-H. (2021). Global engineering ethics. In D. Michelfelder & N. Doorn (Eds.), *Routledge handbook of philosophy of engineering* (pp. 736–744). Routledge - Taylor & Francis Group.

Zhang, Y., & Li, S. (2015). Two measures for cross-cultural research on morality: Comparison and revision. *Psychological Reports*, *117*(1), 144–166. https://doi.org/10.2466/08.07.PR0.117c15z5

Zhu, Q. (2010). Engineering ethics studies in china: Dialogue between traditionalism and modernism. *Engineering Studies*, *2*(2), 85–107. https://doi.org/10.1080/19378629.2010.490271

Zhu, Q., Martin, M., & Schinzinger, R. (2022). *Ethics in engineering* (5th ed.). McGraw-Hill.