2018 ASEE ANNUAL CONFERENCE & EXPOSITION
JUNE 24–27, 2018
SALT PALACE CONVENTION CENTER
SALT LAKE CITY, UT

Paper ID #22824

The Value of Ethics in Engineering: Hypotheses and Preliminary Data

Dr. Jonathan Beever, University of Central Florida

Jonathan Beever is Assistant Professor of Philosophy and faculty with the Texts & Technology Ph.D. Program at The University of Central Florida. Dr. Beever is the Division Chair of ASEE Engineering Ethics Division, the Secretary for the International Association for Environmental Philosophy, and the Environmental Bioethics Affinity Group leader for the American Society for Bioethics and the Humanities. Dr. Beever works and publishes at the intersection of environmental ethics and bioethics, focusing on questions of ethics, science, and representation. He teaches a wide variety of undergraduate and graduate courses on related topics.

The Value of Ethics in Engineering: Hypotheses and Preliminary Data[1]

Introduction

What value does ethics and the work of philosophical ethicists add to the practices of engineering ethics education? A substantial body of existing literature embodied in general education requirements at institutes of higher learning supports the intuitive hypothesis that topics in the social sciences, humanities, and the arts play important roles in engaging engineering students in professional and academic development. In the context of ethics specifically, philosophers and the philosophical ethics that derive from their work have regularly helped shape the theories, direction, and practices of many applied domains. On questions of patient and health care in the U.S., philosophers formed the core of early ethical work that developed into the robust domain of bioethics [1], [2], [3]. On questions of animal health and welfare, philosophers led the charge in theorizing and arguing against an uncritical anthropocentrism [4], [5], [6]. On questions of the environment, philosophers again have played an early seminal role in setting the conceptual stage and framing the landscape of ethics-related positions [7]. Similarly, business ethics arose from philosophers' interest in understanding what constitutes right and wrong behavior in the context of competitive financial transactions [8]. As a program of inquiry, some have dated the historical roots of business ethics to the mid 1970's, when the first academic conference in business ethics was held [9]. Indeed, some of the same philosophers interested in applied and practical ethics crossed contextual boundaries, applying the same structures of thought to several disciplinary realms. Bioethicist Tom Beauchamp is a good example of such cross-overs, having published one of the earliest anthologies in business ethics [10] just a few years after publishing his major work in bioethics.

The same holds for engineering ethics education, the latest in this trajectory of practical ethics. One clear example is Michael Davis' ongoing and thoughtful work since at least the early 1990's that has helped engineers understand their own relationships to codes of ethics [11], integrating ethics into engineering curricular space [12], and the necessary role of non-engineers in defining and asking essential questions [13]. Several key textbooks on engineering ethics have been penned by philosophers, including Mitcham and Duval's 2000 "Engineering Ethics," [14] and "Engineering Ethics: Concepts and Cases" first co-authored by Harris, Jr., Pritchard, and Rabins also in 2000 [15]. Contemporary textbook treatments of engineering ethics have heavily involved philosophers as well. Of the nine such texts published between 2015 and January 2018, all but one are authored or edited by philosophers. Three of the nine are co-authored/co-edited by a team of philosophers and engineers.[2] Philosophers continue to take up leadership positions in engineering ethics as well, directing centers, founding programs, and serving the Engineering Ethics Division of ASEE.

[1] Acknowledgements to Dr. Lorraine Kisselburgh (Purdue University) and Dr. Justin Hess (IUPUI) for their help in data analysis and in unpacking what results we can legitimately draw from the data. Data was collected as part of an NSF funded project (2012-2015 #1237868, Professor Andrew Brightman PI).
Thanks also to anonymous ASEE reviewers for their thoughtful comments on the draft of this paper.
[2] Data collected from a Jan 8, 2018 Google Books search for "engineering ethics" sorted by date and including engineering and ethics in the title, published between 2015 and 2018. See Appendix A.

Yet, ethicists trained in philosophy do not have an exclusive contract on the teaching of or theorizing about ethics. Within engineering and across numerous other disciplines, ethics training and education also takes place under the leadership of professionals within those disciplines. The nature of this disparity – between ethics and ethicists – has been largely ignored in the literature for the sake of an over-simplified conceptual of the domain of ethics. In this paper, I develop the argument that engineering graduate students value ethics as integral parts of the practices of engineering, but mean by "ethics" something narrow and implicitly exclusive, focused on intuitively-developed individual values and responsible conduct of research of the engineer. In preliminary support of this theoretical claim, I present initial empirical evidence gathered from a unique pilot survey instrument paralleling the PRESCOR scale for management [16], [17] in its intent. This survey was administered to graduate engineering students, many of whom had responsible conduct training previously, and all of whom were enrolled in a single credit graduate seminar in engineering ethics at a major research university. I then argue that, for reasons of coherence and reasons of practicality, ethics should be conceived of as much broader than merely responsible of professional conduct. The expertise of professional ethicists articulates the ways in which ethics is broader and deeper than the mere development of intuitions, and is thus a necessary component of engineering ethics education. I conclude that there is a need for more careful study of the nature and place of ethics – and ethicists – in the teaching and training of graduate students in engineering.

Toward that end, the next section of this paper more differentiates between questions about the value of ethics and questions about the value of ethicists. Next, I describe the methods of an empirical pilot study before discussing the results of that study. Finally, I draw preliminary conclusions that are warranted by the data and by the argument.

The Value of Ethic(ist)s

In what follows I anticipate some possibilities about the place of philosophers within engineering. Doing so takes for granted that philosophers have held a place of privilege in ethics – and that assumption warrants some initial support. Historically, ethics has been a domain of philosophy: the connection the nature of the work and the human experience of it. Metaethics asks about the nature of fundamental concepts like good and bad, right and wrong. Normative ethics frames those concepts within consistent and coherent theories of or approaches to value claims (including deontology, consequentialism, virtue ethics, and ethics of care). Applied ethics connects those normative approaches to real-world problems. And the view from philosophy is that metaethics and normative ethics are necessary conditions for the work of applied ethics. Thus, philosophers' expertise in ethics gives them some ownership over the work of ethics.

But since at least the mid 20th century, a view like this has been problematized as the term "ethics" has taken on diverse and specialized meanings. Michael Davis argued, in 1998, that the term ethics had at least three common uses: referring to ordinary morality, to the philosophical study of morality, and/or to special group standards like in the context of professional ethics [18]. That term now applies not only to the work of philosophical ethics, but also regulatory, legal, and other professional works across disciplines, including within engineering ethics. This diversification or specialization of ethics jeopardizes a consistent view of what the term "ethics"

means.

Starting from that premise of the historical relationship between ethics and philosophy, there is a range of possible perspectives one might take in evaluating this impact of professional philosophers within engineering ethics. Some might see philosophers as an invasive species, getting in the way of traditional engineering practice and altering the ecosystem into something unrecognizably other. On this view, engineers – not philosophers – have the relevant expertise and disciplinary knowledge that enables them to teach and train in ethics. The content of ethics is particular to individual disciplines: the engineer could no better teach ethics in a business course than the philosopher could teach ethics in an engineering course. Take, for example, a 2001 blog post from a self-described engineer that claims philosophers are "annoying brats" [19]. This perspective supposes to ignore the historical development of ethical inquiry (coming from normative theory applied to professional contexts) much like it denies the common historical origin of critical thinking in the western context (coming from a love of knowledge from which we get the term philosophy). It so ignores for the sake of privileging the professionalization and specialization that has defined much of the work of engineering education. Unlike the "soft" liberal education, the "hard" training of engineering exists to train future professionals in the culture and technical skills of professional practice. The "soft" work of ethics is seen as important, but secondary to and contingent upon the technical skills of the profession. This idea is embodied in the work of the National Society of Professional Engineers, a "nontechnical" organization established in the 1930's with the goal of providing accountability and ethical practice of engineers [20]. NSPE's central commitment is to "hold the public health, safety, and welfare above all other considerations" [21]. This is not a broadly-conceived view of ethics attempting to theorize a coherent normative approach to questions of right and wrong; instead, it is imminently practice, seeking to support professional engineers' obligations and prevent harms that would damage the profession. Thus, philosophers – who do not often if ever have technical training in engineering – are equivalent to an invasive species in an otherwise stable, self-regulating environment. They threaten to change and complicate the ecology of engineering.

Others might see philosophers as a necessary condition for ethical engineering, without which engineers would flounder about in an unfamiliar, uncomfortable world of soft concepts and value claims. On this view, engineers are technically specialized and hyper-focused. They are given neither the training nor time to dedicate to understanding the social and ethical implications of their work. They are trained to be technicians, not thinkers. If engineers do engage critically in thinking about the broader context of engineering, it is late in their careers once their technical expertise and professional engineering identity has been secured. Such late-career faculty have time to begin work on what is, functionally, a second specialization, but neglect to see it as such. And given this neglect, philosophers may tend to see the perspectives of these engineer-philosophers as Socrates viewed his interlocuters: as naïve though importantly informed by experience. Thus, philosophers are a necessary condition for ethical engineering, since their primary specialization is in critical conceptual analysis and problem-identification, if not in ethics specifically. Interestingly, it is exceedingly difficult to find a champion of this line of argument: even philosophers seem to suggest by their silence that while *philosophy* might be important for engineering, they themselves *as philosophers* play no necessary role. Michael Davis, in his well-cited 1998 *Thinking Like an Engineer* written from his perspective as a

"trespassing" [22] philosopher, argues at least implicitly for this view position. "Philosophers," he articulates in the introduction to his work, have long made themselves useful by pointing out the obvious in fields not their own - which is all I intend to do" [23]. On these views, it is more important that engineers come to identify, reason through, and resolve issues with their own work than it is to bring collaborating philosophers to the table to do it. But rather than philosophers as collaborators, philosophers' place of necessity is in its historically traditional role of trespassers or gadflies to the practical and professional processes of others.

Of course, we might intuit that only the most stringent purists would hold onto one or another of these hypothetical polar positions. It is more likely that most engineers and most philosophers consider their roles within engineering ethics as collaborative, integrative, and constructive: space for working together on complex epistemic and ethical problems. For example, a 2007 blog post on business strategy argues for the importance of collaborative expertise between philosophers and engineers. The authors write, "[w]ithout the philosopher, the engineer's work has no anchor and no clear sense of direction. Without the engineer, the philosopher's new concept is just another form of preaching, and it won't change anyone's actual behavior" [24]. SRPoiSE, a regional organization devoted to supporting engagement in STEM by philosophers, states that their mission is to "improve the capacity of philosophers of all specializations to collaborate and engage with scientists, engineers, policy-makers, and a wide range of publics to foster epistemically and ethically responsible scientific and technological research" [25]. Supported by positions like these, more and more of the professionalization of both philosophers and engineers includes an appreciation of the value of interdisciplinary work that crosses those traditional boundaries of hard and soft skills, evidencing just such a constructive view of the relationship between philosophers and engineers. An important variant on a view like this is the claim that engineers can and must learn to be philosophers, rather than rely on philosophers. Such a view was proposed by philosopher Carl Mitcham in 1998, when he argued that while "philosophy has not paid sufficient attention to engineering, engineers should not use this as an excuse to ignore philosophy" [26], and "[p]hilosophy is of critical and increasing significance to engineering" [27]. What is importance is not that philosophers can contribute to engineering, but that " [e]ngineers are… the unacknowledged philosophers of the postmodern world" [28]. In statements like these, the privilege is given to engineers as capable of building up the knowledge and skills of philosophy on their own, becoming engineer-philosophers independent of the role or expertise of professional philosophers. Apart from variants like this, this third possible perspective on the relationship between philosophers and engineers exists in the middle of the polar positions I outlined above, as a space for some sort of integrative and constructive collaboration. And while there is a limited landscape of hypothesizing and indirect partial arguments about that relationship in various literatures, there exists no empirical evidence of their nature and perceived value.

The value of *ethics* (beyond the value of *ethicists*) has been more widely studied. Especially in the context of business ethics, views of ethics are a topic of regular inquiry. Lau and Haug, for example, found in 2011 that undergraduate student perception of ethics was influenced by sex (males less ethical than females), major (business students more prone to cheat than non-business students), and discipline (non-science students thought that education and their faculty play a more important role in shaping ethical beliefs than science students) [29]. An earlier study found that in several international contexts, the number of years of studying business was negatively

correlated to the perception of ethical problems [30]. Haug and Lau define student ethics as "a multidimensional construct" [31] that focuses, primarily, on cheating. No other definition of ethics is offered. Ahmed, Chung, and Eichenseher consider ethics to be "acceptable/expected norms of behavior" in business and explicitly avoid defining ethics. Instead, they see the "value of the research presented here is not in defining ethical business behavior per se or in drawing links between ethical business norms and economic development, but rather in presenting evidence as to the extent that individuals in different national environments currently share expectations as to what is acceptable in normal business transactions" [32].

The question about how ethics is valued has been given substantially less attention by researchers in engineering. Yet part of the reason for this lack of empirical evidence might be the wealth of observational evidence. Ethics is at least an included component of engineering accreditation and professional organizations, is given a growing voice in many if not most engineering curricula, and is a focus of federal funding agencies and programs. But empirical evidence can offer a clearer picture than mere observational evidence or theoretical argument of what exactly is perceived as the nature and value of ethics and ethicists.

Some Initial Empirical Evidence

As an argument alone, the idea that philosophers and philosophizing bring something essential to engineering ethics education is a compelling one. But empirical evidence would strengthen the conclusion and its implications. Toward that end, colleagues and I piloted the addition of a brief series of quantitative Likert-based questions about the value of ethics and ethicists to a survey instrument designed to examine satisfaction and engagement in a novel approach to engineering ethics graduate coursework. This instrument was designed as part of an NSF Ethics Education in Science and Engineering (EESE) funded grant project (2012-2015 #1237868, Andrew Brightman PI) designed specifically to look at the impact of engineering ethics education on graduate students. The satisfaction and engagement survey was distributed to Ph.D. and Ph.D/M.D. students enrolled in multiple sections of a graduate engineering ethics course over sequential semesters. Yet, the more specific "value of ethics" questions were added part way through the larger project; thus, our survey population was relatively small. We collected a total of 50 responses over the course of three semesters of a one-credit hour ethics-dedicated graduate seminar via a pre-test survey, given before the students had received any course content. Participants could offer responses on a five-point Likert scale, where 1 was "strongly disagree/not at all" and 5 was "strongly agree/very much."

Table 1: Value of Ethics (collected Spring 2013, Summer 2013, Spring 2014, Summer 2014)

		pre-test (n=50)	
		Mean	**SD**
How important do you feel learning about ethics is to your overall education?		4.32	1.4
Indicate how strongly you agree that the following statements reflect your own perspective on ethics:			
rc	I do not need to study ethics to do the right thing in my job	3.90	1.1
	Ethics is an important part of my profession	4.42	0.88

rc	Ethics has nothing to do with engineering	4.64	0.72
rc	Ethics is not important in how others practice their professions	4.72	0.50
	Ethics is an important part of my personal life	4.56	0.79
rc	Values play no role in good science	4.46	0.89
	Ethicists should be treated as professional peers	3.84	0.79
	Ethics expertise informs an important component of my work	3.86	0.86
	My instincts about right and wrong often guide my actions in my work	4.38	0.67
rc: question was reverse coded			

A nine-item scale was created with the nine questions following the overall question to see if we could create an overall index. As identified in the table, the question "How important do you feel learning about ethics is to your overall education?" is not included in that nine-item scale, and was left to stand alone. We did not provide them a definition of ethics pre-test, since we wished to examine their perception of ethics and ethicists without adding our bias.

The pre-test scale is reliable (alpha=.732), based upon 50 responses over four semesters. Table 1 offers the mean and standard deviation (SD) for each item. The question "ethics is not important in how others practice their professions" had the highest mean value, meaning that most people strongly agree with this statement, and the question consistently elicits this response.

We found that our engineering graduate student participants felt more strongly than not that learning about ethics was important to their education (mean 4.32, SD 1.336), but that this was a feature unique to engineers – or to themselves as engineers. I note that the idea that this result may have been unique to this particular student population might find support in the fact that ethics was seen as an important part of their personal lives at a mean score of 4.56 (SD 0.787). These same students consistently strongly agreed with the claim that "ethics is not important in how others practice their professions" (mean 4.72, SD 0.497). If ethics is not important to others but strongly important to them as engineering graduate students, this suggests something unique about the engineering sciences. Indeed, students felt strongly (mean 4.64, SD .722) that ethics does not have nothing to do with engineering (recall from Table 1 that this question was reverse coded: I know that sounded ridiculous). Additionally, students felt just slightly less strongly that values do play some role in good science (mean 4.46, SD 0.885) and that ethics is an important part of their profession (mean 4.42, SD 0.883).

Yet, while this preliminary data set suggests that ethics is important, it is less clear what these students mean by ethics: does it involve more than just regulatory guidelines and professional norms? On average, they felt strongly (mean 4.38, SD 0.667) that their instincts about right and wrong often guide their actions in their work. This question was included specifically to identify the perceived place of instincts or ethical intuitions which we take to be independent of and prior to ethical training and education. Agreeing strongly on this question may conflict with a view of ethics that depends on education and *not* merely intuition. Students feeling much less strongly about the claim that "I do need to study ethics to do the right thing in my job" (mean 3.90, SD 1.111) supports this hypothesis: a strong or very strong agreement with this claim would suggest that these students see something important in ethics education that they did not have intuitively or by instinct. Further, students were in weaker agreement still with the claim that ethics

expertise informs an important component of their work (mean 3.86, SD .857). One conclusion we might draw is that "ethics" is taken to mean the intuitive feelings about right and wrong that individuals brings to the table, and that "ethics" doesn't have much to do with their work as professionals. This conclusion suggests that engineering ethics education, at the graduate level is seen, by this population of students at least, as an unnecessary component of professionalization. Instead, their sense of right and wrong is something developed implicitly through the process of engineering professionalization – and hence there is no need for philosophical-ethical examination of those value claims.

Evidence from that small survey sample suggests that this population of engineering graduate students think that ethics (of that professional sort) is important to professional practice and that values (as developed intuitively) play at least some role in good science. However, it was unclear whether they also thought that professional *ethicists* played an important role in consideration of ethics within engineering: that is, engineers may value ethics but not ethicists. This distinction between ethics and the ethicist represents an expertise gap in engineering ethics. This question of the value of ethics and ethicists has been asked sparingly in other disciplines, from accounting [33], to marketing [34], to international management [35], yet has not been discussed within engineering or engineering education. In engineering ethics, making this distinction clearer is paramount, given the ongoing collaborations among philosophers, social scientists, and engineers on questions of ethics – collaborations that engineering ethicists like Michael Davis have argued are essential [36]. This current pilot study of the value of ethics posed only one statement directly relevant to the questions of the value of ethicists; specifically, "ethicists should be treated as professional peers." Yet it was this statement, among all others, that received the weakest agreement from our student participants (mean 3.84, SD .792). Again, since this population was self-selected having enrolled in a graduate course in engineering ethics, this finding was particularly interesting. It suggests that, among this group, ethicists were not seen as collaborators in Davis' sense despite this same group agreeing that ethics itself was important to the work of engineering. Of the three ways of viewing this relationship between engineers and ethicists that I outlined above, this position is most like the "invasive species" view, seeing ethicists as somehow interrupting the natural course of engineering ethics. Yet this data set is inconclusive, both due to its small sample size but also because it does help us understand *why* students' perception of ethicists is middling. It might be a function of these students' relative unfamiliarity with professional ethicists (philosophers or bioethicists, specifically): if students have had little to no experience interacting with them, they are likely to be poor judges of the value of their contributions.[3] Future versions of this study will focus more specifically on this difference between the value of ethics and the value of ethicists.

Conclusions and Future Steps

Through the arguments offered here and the preliminary data analyzed, I have offered initial evidence for the working hypothesis that engineering graduate students value ethics as important parts of the practices of engineering, but mean by "ethics" something narrow and implicitly exclusive, focused on individual values and professional responsible conduct. They are less inclined to think that ethics, broadly construed in its philosophical context, has much place in the professionalization of engineers, nor that ethicists play collaborative roles in the maintenance

[3] Thanks to an anonymous reviewer of the draft of this paper for suggesting this potential confounding factor.

and theorizing of engineering ethics.

Yet there are important caveats to these conclusions. I have consistently made effort to temper this conversation by acknowledging this data set as merely preliminary. It suffers from a relatively small sample size (a larger sample of students would strengthen results). Additionally, it suffers from self-selection bias: these students enrolled in an engineering ethics graduate course. Expanding research projects like these would help to more clearly understand and articulate perceptions of ethics by target populations, like graduate students in engineering.

I conclude that this preliminary data set encourages us to push for stronger empirical evidence how those involved in engineering ethics perceive ethics and ethicists, and whether or not philosophical ethicists do indeed add to the practices of engineering ethics education. Philosophers working in engineering education have work to do in further clarifying their roles and unique expertise. Future versions of studies like this, expanded to examine broader groups of engineering students and faculty and to more robustly unpack perceptions of ethicists, will offer important clarification and expansion of the arguments I've outlined above. I propose that engineering ethics educators can overcome this expertise gap by focusing on collaborative partnerships between scientists and ethicists toward these goals of understanding.

References

[1] W.T. Reich, "The 'Wider View': Andre Hellegers's Passionate, Integrating Intellect and the Creation of Bioethics." *Kennedy Institute of Ethics Journal* 9(1): 25-51, 1999.
[2] T.L. Beauchamp and J.F. Childress. *Principles of Biomedical Ethics: Seventh Edition*. New York: Oxford University Press, 2013.
[3] D. Callahan. *Bioethics and Policy: Hastings Center Bioethics Briefings*. https://www.thehastingscenter.org/briefingbook/bioethics-and-policy-a-history/, 2018.
[4] P. Singer, *Animal Liberation*. New York: Random House, Inc, 1975.
[5] T. Regan, *The Case of Animal Rights*. Berkeley: University of California Press, 1983.
[6] B. Rollin, *Science and Ethics*. New York: Cambridge University Press, 2006.
[7] J.B. Callicott, "Whither Conservation Ethics?" *Conservation Biology* 4(1):15-20, 1990.
[8] O.C. Ferrell and L. Ferrell, "Historical Developments of Business Ethics: Then and Now." Available https://danielsethics.mgt.unm.edu/pdf/Historical%20Development%20of%20Business%20Ethics.pdf, 1990.
[9] N.E. Bowie, "Business Ethics," in *New Directions in Ethics*, ed. Joseph P. DeMarco and Richard M. Fox, New York: Routledge & Kegan Paul, 1986.
[10] T. Beauchamp and N. Bowie, *Ethical Theory and Business*. New York: Prentice Hill, 1979.
[11] M. Davis, "Thinking Like and Engineering: The Place of a Code of Ethics in the Practice of a Profession." *Philosophy and Public Affairs* 20(2): 150-167, 1991.
[12] M. Davis, "Introduction to a Symposium Integrating Ethics into Engineering and Science Courses." *Science and Engineering Ethics* 11: 631-634, 2005.
[13] M. Davis, "The Professional Approach to Engineering Ethics: Five Research Questions." *Science and Engineering Ethics* 7: 379-390, 2001b.
[14] C. Mitcham and R.S. Duval's *Engineering Ethics*. New York: Prentice Hall, 2000.
[15] C.E. Harris, Jr., R.S. Pritchard, M.J. Rabins, R. James, and E. Englehardt, *Engineering*

Ethics: Concepts and Cases, Boston: Wadsworth, 2000.
[16] A. Singhapakdi, S.J. Vitell, K.C. Rallapalli, K.L. Kraft, "The Perceived Role of Ethics and Social Responsibility: A Scale Development." *Journal of Business Ethics* 15: 1131-1140, 1996.
[17] W.E. Shafer, K. Fukukawa, G.M. Lee. "Values and the Perceived Importance of Ethics and Social Responsibility: The U.S. versus China". *Journal of Business Ethics* 70: 265-284, 2006.
[18] M. Davis. *Thinking Like An Engineer: Studies in the Ethics of a Profession*: 16 and 174. New York: Oxford University Press, 1998.
[19] S. Teller. "An Engineer's View on Philosophy." Available at https://swizec.com/blog/an-engineers-view-on-philosophy/swizec/1333, 2010.
[20] NSPE.org. "Who We Are and What We Do." https://www.nspe.org/membership/nspe-who-we-are-and-what-we-do, 2018.
[21] ibid.
[22] M. Davis. 1998.
[23] *ibid*: 4.
[24] V. Couto, N. Mourkogiannis, and G.L. Neilson. "Culture Change: Calling out Philosophers and Engineers." https://www.strategy-business.com/article/li00025?gko=e6693, 2007.
[25] SRPoiSE. "SRPoiSE: The Consortium for Socially Relevant Philosophy of/in Science and Engineering." http://srpoise.org, 2018.
[26] C. Mitcham. "The Importance of Philosophy to Engineering. *Teorema: International Journal of Philosophy* 17(3): 27-47, 1998.
[27] Ibid: 28.
[28] C. Mitcham. 1998: 28.
[29] L.K. Lau and J.C. Haug, "The Impact of Sex, College, Major, and Students Classification on Students' Perception of Ethics." *Mustang Journal of Business and Ethics*: 92-105, 2011.
[30] M.M. Ahmed, K.Y. Chung, J.W. Eichenseher, "Business Students' Perception of Ethics and Moral Judgement: A Cross-Cultural Study." *Journal of Business Ethics* 43: 100, 2003.
[31] L.K. Lau and J.C. Haug: 92, 2011.
[32] Ibid.
[33] N. Ahadiat and J.J. Mackie, "Ethics Education in Accounting: An Investigation of the Importance of Ethics as a Factor in the Recruiting Decisions of Public Accounting Firms." *Journal of Accounting Education* 11: 243-257, 1993.
[34] A. Singhapakadi, K.L. Kraft, S.J. Vitell, and K.C. Rallapalli. "The Perceived Importance of Ethics and Social Responsibility on Organizational Effectiveness: A Survey of Marketers." *Journal of the Academy of Marketing Science* 23(1): 49-56, 1995.
[35] W.E. Shafer, K. Fukukawa, and G.M. Lee, "Values and the Perceived Importance of Ethics and Social Responsibility: The U.S. versus China." *Journal of Business Ethics* 70: 265-284, 2006.
[36] M. Davis. 2001b.

Appendix A

Title	Author/Editor	Publication Date	Author terminal degree
Engineering Ethics for a Globalized World	Colleen Murphy, Paolo Gardoni, Hassan	2015	two philosophers, two engineers, one
Engineering Identities, Epistemologies, and Values: Engineering…	Steen Hyldgaard Christensen, Christelle Didier, Andrew Jamieson	2015	one philosopher, one aero eng, one chem eng, one STS, one electrochem
Ethical Engineering for International Development	Marion Hersh	2015	electrical engineering.
Contemporary Ethical Issues in Engineering	Sundar Sethy Satya	2015	philosophy
The Ethically Responsible Engineer: Concepts and	Robert McGinn	2015	philosophy
Engineering Ethics	Michael Davis	2017	philosophy
Global engineering Ethics	Heinz Luegenbiehl and Rockwell Clancy	2017	2 philosophy
Engineering Ethics: Real World Case Studies	Steve Starrett, Amy L. Lara, Carlos	2017	civil/envr eng, philosophy, philosophy
Engineering Ethics: Concepts and Cases Sixth	Charles E. Harris, Jr., Michael S.	2018	3 philosophy
Jan 8 2018 google books search for "engineering ethics" sorted by date and including "engineering" and "ethics" in the title, published between			