

Human Rights as a Lens for Engineering Ethics?

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Abstract

This paper illustrates how the United Nations *Universal Declaration of Human Rights* can be used to frame engineering ethics discussions. Examples are provided for how engineering ethics relates to the rights to: nondiscrimination, life and security of persons, privacy, property ownership, work, and a basic standard of living. The recent *Statement on Scientific Freedom and Responsibility* from the American Association for the Advancement of Science was rooted in the right to science and recognizes the important link between freedom and responsibility. This philosophy includes attention to the broader impacts of research activities and argues against higher education tenure and promotion criteria that preference self-serving academic outcomes over real-world benefits and engagement. The practices of engineering education itself are probed in relation to Article 26 on the right to education, in terms of accessibility and promoting peace. The paper provides many ways in which engineering ethics can be examined through the lens of universal human rights. This framework may resonate with students interested in care and helping people and society. Educators may wish to examine whether a human rights lens is relevant to their teaching.

Introduction

This paper will illustrate how the United Nations' 1948 *Universal Declaration of Human Rights* (UDHR) [1] can be used to frame ethics discussions in engineering. Engineering ethics in the U.S. are not typically taught or framed through the lens of human rights. A few notable exceptions include calls from Lynch [2] and Hoole [3] near the end of the United Nations' *Decade on Human Rights Education* (1995-2004). A human rights framework may be useful and bring engineering more in line with traditions in other professions. The paper first discusses professional ethics through a human rights lens, briefly comparing and contrasting different professions. Next the paper discusses how engineering relates to specific human rights articulated in articles from the UDHR. For each of these rights, cases suitable for engineering ethics education are provided. The paper concludes with a consideration of limitations and broader issues.

Human Rights and Professional Ethics

It has been asserted that “the concept of human rights is widely recognized but perhaps poorly understood in the United States” [4, p. 3]. Americans tend to think more narrowly of “civil and political rights defined in the U.S. Bill of Rights” [5], rather than the more extensive rights encompassed within the UDHR. Human rights education (HRE) is a movement:

...in 1974 the United Nations Educational, Scientific and Cultural Organization (UNESCO) adopted a document explicitly supporting education for human rights (UNESCO 1974), it took two more decades before interest in HRE would be revived in any serious manner within the United Nations... [such as] the United Nations Decade for Human Rights Education 1995–2005. In 2011, ...the UN Declaration on Human Rights Education and Training (DHRET) [was passed] ... [4, p. 6]

HRE seems most rooted in legal education, but has been expanding “so that it is no longer the purview of only lawyers” [4, p. 5]. Marks [6] explored the relationship between professional ethics and human rights, but focused primarily on law, medicine, and psychology. The

disciplines of social work, health sciences (medicine, nursing), and teacher education were the most common among 64 peer-reviewed articles that were identified using a search in the *Web of Science* citation index using the search terms “human rights education” and “university” (Jan. 20, 2019). None of the 64 abstracts included the word “engineer*”; comput* only appeared once, related to faculty in a Computer Education Department participating in a workshop on HRE. The majority of the 64 articles originated from authors and contexts at higher education institutions outside the U.S. (e.g. Korea n=22, U.S. n=7 (but 2 of these authors studying non-U.S. contexts), Brazil n=5, Turkey n=3, Canada n=3, China n=2, South Africa n=2, Colombia n=2, Germany n=2; 1 each: Algeria, Australia, Iran, Israel, Jordan, Malaysia, Mexico, Norway, Peru, Philippines, Portugal, Spain, Sweden, Switzerland, Thailand, Uruguay). This country-based analysis supports the assertion that HRE is less common in higher education in the U.S.; individuals with an interest in HRE may need to look outside the U.S. for models. A search in *Web of Science* using the topics *ethics AND education AND “human rights”* yielded 822 results, but the majority of these were in K-12 contexts rather than higher education.

Human Rights and Engineering Ethics

Within engineering, ethics education is grounded in multiple ethical theories. A review of ten engineering ethics textbooks and three introduction to engineering textbooks that included ethical theories found utilitarianism in all thirteen, virtue ethics in eleven, rights ethics and duty ethics in nine, ethical egoism in five, and care ethics in two [7]. Thus, rights ethics are among the more common theories used to ground ethics education. However, this does not always translate into calling on the UDHR. In regards to rights-based theories, Catalano [8] briefly discussed notions of justice, Locke’s “life, liberty, and property” and cited “universal human rights”. However, further elaboration was not provided, since the intent of the chapter that discussed theoretical foundations was to provide alternative frameworks (e.g. morally deep world, love, globalism). Fledderman [9] frames rights ethics as individuals possessing “fundamental rights that others have duties to protect”, again citing Locke and the Declaration of Independence. This puts a somewhat U.S.-centric spin on rights ethics. The UDHR is not mentioned. Challenges that arise when individual rights come into conflict are discussed through examples. Thus, the rights foundations applied within engineering ethics education in the U.S. do largely conform to the narrower civil and political rights common in U.S. schools as described by Tibbets [4].

Human rights and engineering education intersections have been examined by a number of individuals. The number of peer reviewed publications found via different search processes are summarized in Table 1. Some of these papers represent theoretical considerations, while others are examples of applications in teaching settings. The *Web of Science* results analysis characterized the 357 references from the search on “*human rights AND engineering*” into the categories of: sociology 189; genetics heredity 166, medical ethics 141, government law 113, social issues 96, philosophy 89, psychology 88, health care sciences services 86, behavioral sciences 81, and engineering 69. This indicates that other disciplines commonly explore intersections among engineering / technology and human rights. Comparing the number of articles published in the *European Journal of Engineering Education* with the *Journal of Engineering Education* (affiliated with the American Society for Engineering Education, ASEE), those outside the U.S. seem to more frequently explore intersections among human rights and engineering.

Table 1. Literature Search Results Summary

Source	Search Terms	n	HR in Title, n	Years
Web of Science	“human rights education” + university	64	42	2004-2019
Web of Science	“human rights” + engineering	357	46	1972-2019
Web of Science	“human rights” + engineering + education	41	4	1974-2018
EJEE - <i>European Journal of Engineering Education</i>	“human rights”	23	0	1985-2019
JEE - <i>Journal of Engineering Education</i>	“human rights”	2	0	1996-1998
ASEE PEER	“human rights”	119	2	1996-2018
<i>Science & Engineering Ethics</i> journal	“human rights”	200	7	1995-2018

Publications exploring intersections among human rights and engineering over the past two decades are increasing (Figure 1). Illustrative of increased interest is a postdoctoral fellowship on *human rights for engineering* at the University of Connecticut [10]. The American Association for the Advancement of Science (AAAS) is actively exploring intersections between engineering and human rights [11]. Wyndham’s 2012 webinar is an excellent overview [11]. During that webinar, the majority of individuals participating in a live poll felt that “engineers and applications of engineering may negatively impact human rights” (94%) with somewhat fewer agreeing that “engineers can apply their skills to human rights” (89%).

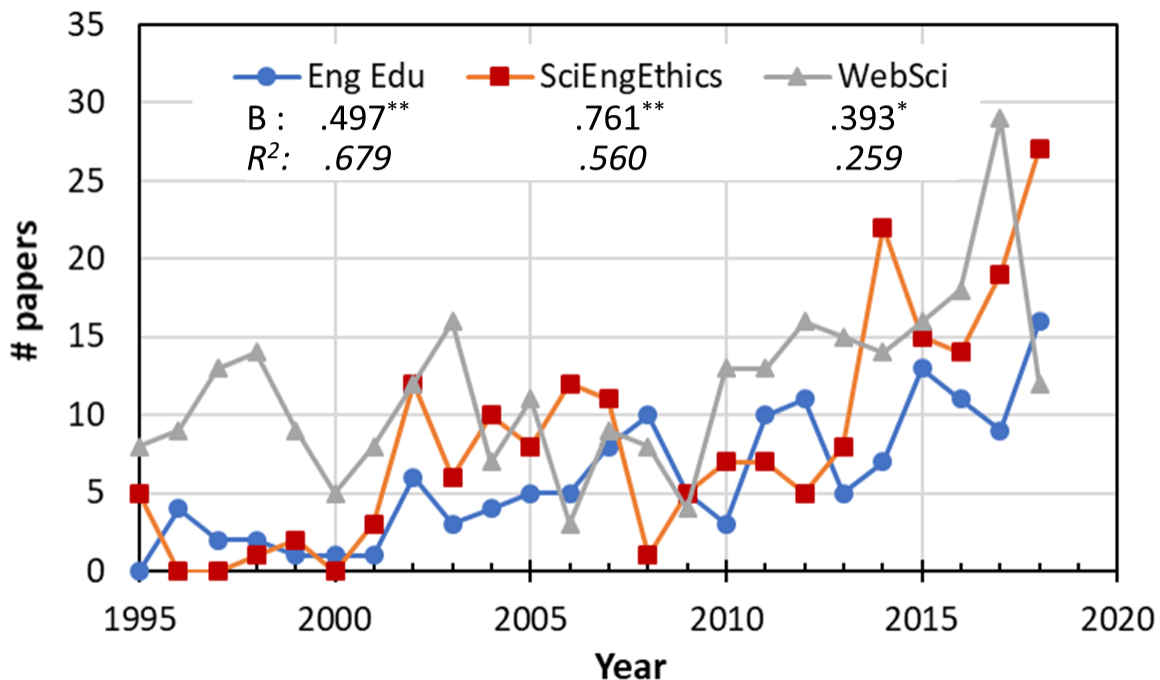


Figure 1. Number of papers published per year, using sources and search terms in Table 1 (Eng Edu = ASEE PEER + EJEE + JEE; WebSci = “human rights” + engineering); linear regression coefficients and R² shown, ** sig. < .001; * = sig. .011

Despite the characterization of the UN UDHR as “universal human rights” not all of the articles are uniformly accepted across all countries as legally guaranteed rights. The UDHR was the basis for two international laws (*International Covenant on Civil and Political Rights* and *International Covenant on Economic, Social, and Cultural Rights*; adopted 1966, entry in force 1976; ratified by 172 and 169 countries, respectively) and subsequent treaties from the United Nations have further elaborated on human rights related to race, women, children, torture, disabilities, and others [12]. Comparison among human rights perceptions / conditions in different countries is relevant given the increasingly global nature of engineering activities [13-15]. Acknowledging and discussing these differences is also appropriate given the different backgrounds and nationalities of students in our engineering classes; international students earned 9.6% of engineering Bachelor’s degrees and 58.1% of engineering Master’s degrees in 2015-2016 [16]. Cheng [17] also discusses differences among the UN declaration and determinations in U.S. courts, which have not uniformly supported the rights in all of the articles (e.g. “standard of living adequate for health”, Article 25).

The following sections review selected individual articles within the UDHR, exploring relations to engineering and how these ideas might be integrated into teaching.

Nondiscrimination – Article 2

The second article in the UDHR states that “everyone is entitled to rights and freedoms... without distinction” based on various demographic factors including race, sex, and other factors [1]. Engineering has been examining its practices related to diversity and inclusion for many years, including access to education (described more fully below) and equity in design. Recently, this idea has found its way into engineering codes of ethics from the American Society of Civil Engineers (ASCE) [18], the Institute for Electrical and Electronics Engineers (IEEE) [19], and the American Institute of Chemical Engineers (AIChE) [20]. Other groups have endorsed ideas around diversity, but not yet situated these responsibilities within their code of ethics (e.g. the National Society of Professional Engineers, NSPE [21, 22]; American Society of Mechanical Engineers, ASME [23, 24]).

If instructors wish to address issues of discrimination or diversity in their courses, there are teaching cases available. The ASCE cases related to discrimination in the workplace and among faculty [25-27] may serve as good teaching cases and/or discussion topics. Design-related choices can also impact equity, in ways that are generally unintentional but nevertheless important. Examples of equity and non-discrimination in design relate to transportation planning (civil engineering) [28], assistive technology [29], universal accessibility for people with physical limitations [30], and artificial intelligence [31]. These design-related issues could be readily integrated into a number of technical courses for a wide array of engineering disciplines.

Right to Life and Security of Person – Article 3

Article 3 of the UDHR states, “Everyone has the right to life, liberty and security of person” [1]. Technology is being used to document human rights abuses via tools including satellite imagery, remote sensing, and machine learning. Artificial intelligence, autonomous agents, and machine learning can also be applied in numerous ways that have potential benefits and harms with respect to human rights [32, 33]. For example, autonomous weapon systems have the potential to

be used in violating this right to life and personal security [34]. Students can be encouraged to consider the trade-offs of these technologies in light of the UDHR Article 3.

Right to Privacy- Article 12

Article 12 indicates that “no one shall be subjected to arbitrary interference with [their] privacy” [1]. Privacy concerns are significant in relation to electronic data (particularly in terms of how this data can be accessed via the internet) and biometric technologies applied to security/surveillance cameras. Privacy issues are garnering lots of attention [31, 35, 36]; for example, 76 papers in the *Science and Engineering Ethics* journal were found using a keyword search on “human rights” AND privacy. Privacy is also a key issue in computing education, being required under the ABET Computing Accreditation Commission’s criteria (5. Curriculum, (a)2.d. Human security) [37] and recommended for computer engineering education (e.g. in the ACM/IEEE’s Curricular Guidelines [38], privacy is found among the *Preparation for Professional Practice* outcome 9, contemporary issues). A general discussion of scenarios and issues related to ethics and privacy is provided by Britz [39] from the perspective of an information professional. Human rights are discussed as one of three ethical norms applicable to privacy (also including truth and freedom). The paper is written in a style that should be interesting and accessible to students and is not overly long. However, it is somewhat dated. The paper could form the basis for in-class discussion or a written reflection if an instructor generated appropriate prompts. There are also more detailed case studies related to privacy that would be good vehicles for instruction, including Google Street View [40, 41] and “optimizing schools” [42]. These cases do not explicitly discuss a human rights perspective, so this framing would need to be added by the instructor.

Right to Property – Article 17

Article 17 relates to the right to own and not “be arbitrarily deprived of [] property” [1]. This relates to civil engineering and the use of eminent domain for projects, which is of global concern [43]. Eminent domain is often examined from a legal perspective [e.g. 44, 45]. There are generally design alternatives that can avoid taking property for infrastructure projects, but these options may not be exercised equally in locations of different affluence [44]. The NSPE [46] has a short (3 page) case study which includes issues of eminent domain that could be suitable for educational purposes. The official analysis cites the NSPE code of ethics, but the instructor could broaden the discussion to bring in the notion of the human right to property. A current events approach could be more relatable to students, using timely examples in the local community to spur discussion. One example is a recent situation in Seattle where eminent domain was being used by the local transit authority to take land to build a parking garage [47]. The article discusses “four of those [six] alternatives did not involve taking any land from the lodge”, which allows engineers to see how their analysis is impactful.

Right to Work – Article 23

Article 23 broadly encompasses the right to fair and decent work. Automation, robotics and artificial intelligence (AI) may impact this right [36, 48-50]. An extensive and critical analysis of the broad issues of how technology impacts the right to work was recently published [48]. A particularly relevant section explores the “impact of technology on the number and quality of jobs” [48, p. 27-30], and is a reasonable reading assignment for students. It offers multiple perspectives, including that technological progress will result in “massive job losses and

exacerbate inequality”, and the opposing perspective that the result will be “more and better jobs.” These assertions are supported with numerous citations to other studies. A more narrow approach was taken by McGregor et al. [49], who discussed three ways that “AI can create or exacerbate inequality in access to the right to work” [p. 19-21]. This portion of the larger document could be used as a reading to stimulate student discussion. By comparison, the popular press pieces offer limited depth [36, 50].

Article 23 also includes the right to equal pay for equal work. Explorations have found that women engineers earn about 90% of the salary of their male peers [51]. The differences vary by discipline, being very small in biomedical (98%) and the largest in civil, aerospace, electrical engineering and software development (86%) [US Census Bureau 2016 data cited in 51]. This may be an uncomfortable conversation in a typical engineering course, but the issue is certainly appropriate in a co-curricular setting such as a meeting of the Society of Women Engineers. Students could read [51] and discuss. This could be complemented by highlights from Cech’s paper that studied differences among job roles within engineering [52].

Right to a Basic Standard of Living – Article 25

Article 25 states, “Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing and medical care ...” [1]. This right is relevant to engineering in a number of ways. It can be argued that a large portion of the world’s population is below an adequate standard of living, and engineering can play a role in providing these basic services like access to clean water, sanitation, and housing [53, 54]. Kaminsky et al. [55] recently framed their water and wastewater infrastructure services work in the context of human rights. While the previous issues are largely the domain of civil, architectural, and environmental engineering, biomedical and mechanical engineering are directly applicable to the right to medical care. Lynch [2] discusses the importance of acknowledging this right as a foundation for the engineering profession.

Enjoy the Benefits of Scientific Advancement – Article 27

Article 27 includes the “right... to share in scientific advancement and its benefits” [1]. It formed the basis for the 2017 *Statement on Scientific Freedom and Responsibility* from the American Association for the Advancement of Science (AAAS) [56, 57]. The statement defines scientific freedom and notes that it “is inextricably linked to and must be exercised accordance with scientific responsibility.” Given the potential for social benefits and harms from scientific and engineering endeavors, acknowledging the linkage between responsibility and freedom is important [57, 58]. The AAAS identified a number of themes that they believe are relevant to the statement including the ethical conduct of science, science integrity, freedom to conduct research, and responsibilities, highlighting particular topics such as bioethics, conflict of interest, reproducibility, bioterrorism and security, peer review, etc. [59]. Articles published in *Science* from 1986 to present that map to each of these themes are compiled on a website [59], with earlier articles indexed in a separate list [60]. These articles are typically short and could provide good readings for students to stimulate discussion.

The link between freedom and responsibility is particularly important with reference to research, and aligns with attention to the broader impacts of research activities that are a necessary consideration in funding awarded by the *National Science Foundation* [61]. More broadly, these

responsibilities argue against higher education tenure and promotion criteria that preference self-serving academic outcomes (e.g. citations by other academics) over real-world benefits and engagement [62]. Discussing these issues would be particularly relevant in graduate-level courses. This could spark more robust debate than responsible conduct of research topics that are more typically discussed in graduate-level engineering courses.

Responsibility – Article 29

Article 29 has been characterized as *responsibility* [63], based on the notion that “everyone has duties” to others [1]. This aligns with the notion of social responsibility and engineers’ beliefs about their responsibilities to others [64-66]. Groups such as *Engineers for Social Responsibility* in New Zealand support this idea [65]. In addition, broader initiatives demonstrate the commitment of engineering to this idea, such as IEEE’s *Ethically Aligned Design* [67] and the *Internet Engineering Task Force and Human Rights* [68]. Fostering these feelings of social responsibility among engineering students is described more fully below in reference to Article 26.

Right to Education – Article 26

The practices of engineering education itself can be probed in relation to Article 26 on the right to education. On the plus side, online learning such as massive open online courses (MOOCs) and the use of technology can help expand both access to education and the quality of education [36, 69]. But a broader array of factors warrant consideration. Higher education costs in the U.S. have been rising at a rate outpacing inflation [70, 71], reducing affordability. This has led to an examination of the worth of college degrees from the perspective of return on investment for individuals, society, and colleges [71-73]. These analyses tend to neglect the non-monetary benefits of education. However, cost considerations are important given that engineering degrees tend to require more credits, which may translate into longer average time to degree [74, 75]. Adding in widely varying costs [71, 76], higher education institutions can critically examine whether its practices make it equally accessible to those of varying socio-economic status.

Another element in the right to education is that “higher education should be equally accessible to all on the basis of merit” [1]. Engineering may or may not generally be meeting this goal, considering that admissions practices frequently rely to a large extent on standardized tests known to be biased against some groups [77, 78]. Bias can operate both for and against under-represented or historically marginalized groups in both admissions and support programs [79 - 81].

Is engineering education “directed to the full development of the human personality”? [1] One could interpret this as liberal education, and attention to the whole person [82,83]. However, engineering education has been criticized as being narrowly focused on technical facets and job skills at the detriment of this wider perspective [74, 84].

To what extent do most engineering programs contribute “to the strengthening of respect for human rights and fundamental freedoms”? [1] Do our programs “promote understanding, tolerance and... the maintenance of peace”? [1] Some individuals and groups are dedicated to these aims, including *Engineering Social Justice and Peace* and others [2, 3, 65, 66, 85-87].

However, the culture of disengagement characterized in engineering education seems counter to these aims [88].

Critique

There are a number of limitations of using the original UDHR as the basis for grounding ethics education within engineering. First, the UDHR has a primarily individualistic focus, seeming to neglect collective rights, such as those of indigenous peoples and cultures grounded in holistic community over the individual [4]. It also fails to acknowledge the importance of the environment and considering the natural ecosystem upon which all life relies. This is not surprising given that the document originated in 1948 – just after World War II and pre-dating a recognition of the impact of environmental degradation on human health and well-being and broader environmental ethics movements. As such, students should be encouraged to consider the historical context of the UDHR and this should not be the sole grounding of engineering ethics education. The human rights context can draw attention to the social aspects of sustainability, but critically considering stewardship of natural resources [2] and ecocentric ideas should also be embraced.

Given the age of the UDHR, newer documents that embrace human rights perspectives should also be explored. Hertel and MacKay [89] included the UN *Guiding Principles on Business and Human Rights* and sustainability themes within an interdisciplinary course for students in engineering, social sciences, and humanities. A comparative approach to teaching human rights may also be effective [90]. A large array of resources are available to help instructors with an interest in integrating human rights perspectives into their teaching, including examples in engineering (Table 1) and beyond; international models are more common. Engineering students may also learn about human rights via humanities and social science electives, and integrating this language into engineering courses may help bridge these areas.

Conclusion

Engineering ethics can be readily taught using a human rights lens. Some provisions are more relevant to particular engineering disciplines. A human rights approach could be compared to other ethical perspectives (e.g. utilitarianism). The language of human rights is well aligned with other professions such as law. Teaching a human rights framework in engineering might make it easier when engineers interact with other professions (e.g. biomedical engineers and doctors working together in the field of medicine). The current paper is not exhaustive in terms of examples of how human rights issues relate to engineering and engineering education. However, it is intended to give educators issues to consider and resources to get started if they are interested. Beyond considering how we can teach engineering students about human rights, we may also wish to more broadly examine educational practices in engineering at our institutions in alignment with the aims of the right to education in Article 26.

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