

Constructing a Role Ethics Approach to Engineering Ethics Education

Abstract

This paper is concerned about the gap between the ideology of “autonomous individualism” deeply embedded in Western-centric engineering ethics education and the social and relational nature of engineering practice. The so-called “individualistic approach” to engineering ethics often treats students as fully rational and autonomous individual decision-makers. Such an approach mainly emphasizes teaching students moral reasoning skills, including the skills of applying dominant Western ethical theories (mainly deontology and consequentialism) into hypothetical cases. What might be overlooked or could be further emphasized in dominant approaches to engineering ethics education is what philosophers would call the “role ethics” of engineers or the moral obligations derived from the specific roles engineers assume and the relationships they have developed with others in communal contexts. This paper aims to construct a role-based approach to teaching professional ethics to engineering students. This paper draws extensively on the role ethics theories from the Confucian philosophical tradition. It first provides a short introduction to the fundamentals of Confucian role ethics. It then discusses what a role-based approach to engineering ethics might entail. Finally, this paper briefly explores how the insights from role ethics can inform future engineering ethics education.

Keywords: Role Ethics; Engineering Education; Engineering Ethics; Confucian Ethics; Asian Philosophy

Autonomous Individualism in Western-Centric Engineering Ethics Education

Engineering is a social enterprise. A successful engineering career depends on how engineers manage their relationships with diverse stakeholders including managers, clients, contractors, and the public (Johnson 2020). However, there has been a theory-practice gap between engineering ethics education for engineering students and the ethics realities of engineering practice (McGinn 2018). In particular, this paper is concerned about the gap between the ideology of “autonomous individualism” deeply embedded in Western-centric engineering ethics education and the social and relational nature of engineering practice.

The prevalent teaching approaches for professional ethics and social responsibility to engineering students in the Western context largely prioritize individual engineers as rational agents (Conlon and Zandvoort 2011). The so-called “individualistic approach” to engineering ethics often treats students as fully rational and autonomous individual decision-makers. Such an approach mainly emphasizes teaching students moral reasoning skills, including the skills of applying dominant Western ethical theories (mainly deontology and consequentialism) into hypothetical cases (Zhu and Jesiek 2017). In this regard, as rational moral agents, professional engineers are encouraged to “act individually and independently in relation to a client” and such a “paternalistic frame for the professional assumes control over the client’s decision” (Luegenbiehl 2004, 58). Philosophers such as Michael Davis consider human acts to be autonomous only if these acts “derive in the appropriate way from desires, motives, or the like” (Davis 1996, 443). Arguably, the concept of “professionalism” in engineering ethics entails engineers being cognizant that their engineering judgment should remain unbiased and unaffected by personal relationships. That is partly why it should not be surprising to notice that

some engineering ethics textbooks and instructors may tend to contrast professional ethics with personal ethics (Balakrishman 2015).

A few engineering ethics scholars have advocated for a departure from the individual engineer as the unit of ethical analysis. Richard Devon proposes that the social relations of expertise or engineering “social ethics” is a more appropriate unit of analysis because engineers work for companies and engage with technologies that are socially constructed (Devon 1999, 87). Similarly, Joseph Herkert (2005) calls for broadening the scope of engineering ethics to include “macroethical” perspectives or the social responsibilities of engineers as a collective and the societal impacts about technical decisions. The latest edition of Harris et al.’s (2019) book marked a significant expansion of the scope of engineering ethics, encompassing a wide range of topics that address the diverse social and cultural contexts of engineering practice. These topics include aspirational ethics, professional conduct within organizational and corporate settings, engineering in the global context, and the social context of engineering. However, these studies primarily emphasize the broader social contexts of engineering practice, often overlooking the relational nature of professional responsibilities within engineers' day-to-day work.

In other words, dominant approaches to engineering ethics education often neglect the aspect known as “role ethics,” which encompasses the specific ethical responsibilities and obligations of engineers. The role ethics approach to engineering ethics focuses on the moral obligations derived from the *specific roles* engineers assume and their relationships with others in communal contexts. To a large extent, role ethics bridges (1) the traditional, individualistic approach that perceives engineers as solely autonomous and rational decision-makers that are decontextualized from their social relationships; and (2) the macro, social ethics approach that

places an exclusive focus on the contexts of engineering while overlooking the moral agency of engineers.

In contrast to the individualistic perspective that views engineers as isolated individuals, the role ethics approach recognizes engineers as individuals who exist within a network of social relationships and are influenced by them. This approach acknowledges that engineers are not decontextualized entities but rather "role-bearing" individuals who operate within specific roles and responsibilities, shaped by the enabling and constraining factors of their social context. Therefore, from the role ethics perspective, rather than an abstract concept, morality is a context-dependent, relational, and communal concept which is often developed in our everyday interactions and relationships with others. As noticed by Alasdair MacIntyre, "it is general only within a community that individuals become capable of morality, are sustained in their morality and are constituted as moral agents by the way in which other people regard them and what is owed to and by them as well as by the way in which they regard themselves" (MacIntyre 1984, 10). In other words, what MacIntyre suggests is a *relational* approach to responsibility and moral agency. Our responsibilities and moral agency are often cultivated in specific, everyday interactions with other members in the community and they are always role-specific and relational. For instance, on a daily basis, in my family, I develop the virtue of filial piety through interactions with my parents in which my moral agency in this regard is constituted and sustained. According to MacIntyre, my moral development can be evaluated based on two important factors: the perspective of my parents and my own personal reflections on how well I fulfill the role of a child.

In the workplace, engineers need to live in diverse professional roles and navigate different relationships associated with these roles. According to Wade Robison (2016) who has

recently formally introduced “role morality” into engineering ethics, engineers need to manage “a set of role-specific relations connected to the practice of engineering” and “additional moral relations required by other ‘non-engineer’ roles one assumes such as employee, contractor, or manager” (Robison 2016, 15-16). Engineers are not merely isolated individuals, but they also fulfill roles such as children, parents, employees, citizens, and active participants in various communities. These relationships together define who engineers are, constitute the venues where they cultivate morality and develop moral experience and expertise, and prescribe the specific responsibilities engineers hold toward fellow community members.

We argue that the role ethics of engineers is a missing dimension of engineering ethics education. Reexamining engineering ethics from the perspective of role ethics can illuminate essential dimensions of the engineering experience that have been considerably overlooked by traditional engineering ethics approaches. For instance, understanding engineers as “flesh-and-blood,” “role-bearing” persons allows us to consider the role of relationships in diversifying engineers’ ethical decision-making strategies and broadening their sources of moral creativity and imagination. It also allows us to explore the *human* elements of engineering ethics such as the role of values, virtues, emotion, and intuition in ethical decision-making (Snieder and Zhu 2020). In addition, it can help engineers bridge their personal values or commitments and professional obligations (Martin 2000).

More specifically, this paper attempts to construct a role ethics approach to engineering ethics education that focuses on developing role-based moral obligations for engineers in collaboration with others in the communities they serve. It deals with two kinds of role-based moralities that are associated with engineers’ everyday life. The two kinds of role ethics are what Tim Dare calls institutional roles and social roles. Institutional roles refer to the roles that exist in

“large, more or less formally constituted practices, such as law or medicine” (Dare 2020, 35). Institutional roles can include roles such as employee, engineer, lawyer, and doctor. In contrast, social roles are roles “created in the absence of authoritative designers” (Dare 2020, 35) such as father and friend. Compared to institutional roles, social roles lack a “process of authoritative institutional design that has attached a set of role-norms to [various] roles” (Dare 2020, 35). This paper draws extensively on the role ethics theories from the Confucian philosophical tradition. It first provides a short introduction to the fundamentals of Confucian role ethics. Subsequently, the paper explores the potential components and implications of a role-based approach to engineering ethics. Finally, this paper will briefly explore how the insights from role ethics can inform future practices in engineering ethics education.

Confucian Role Ethics: A Comparative Philosophical Perspective

Role ethics is a recent effort in philosophy scholarship to question the fundamental idea of “autonomous individualism” in Western ethics. Roles have received very limited attention from mainstream Western philosophers, particularly those within the analytic traditions whose major interests include defining and clarifying fundamental rights of individuals (Dare and Swanton 2020). Arguably, analytic philosophers have not thoroughly derived human moral obligations from specific roles or relationships. Role ethics suggests that we as humans should be viewed as “flesh and blood role-bearers” rather than “abstract rights-holders” (Rosemont and Ames 2016, 8). Ethics should be theorized and practiced “from the standpoint of humans as teachers, parents, doctors, friends, and the like” rather than “humans as humans” (Dare and Swanton 2020, 1). Thus, ethics or responsibility becomes an inherently “social” concept that is based on the conscientious fulfillment of one’s roles in specific relationships (e.g., son, father, and official) in the community (Gardner 2014).

As briefly summarized in John Ramsey's critical review, role ethics "denotes a constellation of views ... that promote a relational conception of persons and employs this to emphasize how a person's roles and relationships are the source of ... ethical obligations and growth" (Ramsey 2016, 235). Leading works by Confucian scholars Roger T. Ames (2011) and Henry Rosemont Jr. (2015) present role ethics as an alternative to rule following theories (whether deontology or consequentialism) and as a distinctive type of ethics (i.e., distinctive from that found in Hegel). However, no one has attempted to use role ethics to think about any field of professional ethics, especially not engineering ethics.

In the Confucian approach to role ethics, our moral actions in different situations are shaped by the specific roles we take in these situations. We as humans all assume various roles which are determined by the relationships we have with others. These different social relationships and roles affect the ways we choose to interact with others. For instance, the tone we use to speak to our parents is different than the one we use to communicate with strangers. The nature of a particular role relationship often evokes feelings and expectations characteristic of that relationship (Ames 2011). Roles do not simply describe the social relationships we have with others but also provide normative expectations about the ideal forms of these relationships. Through living and reflecting on these social roles, we get to cultivate virtues that define the ideal forms of these social roles. For example, to live and reflect on the role as a medical doctor, one gets to cultivate virtues (e.g., benevolence) that are required by an ideal medical doctor. Nevertheless, such a process of cultivating virtues cannot be solely completed by the doctor themselves. It needs to be done by both the doctor and the patients they take care of. Therefore, Confucian role ethics advocates a kind of relational moral epistemology: becoming benevolent is something we either do together, or not at all (Ames 2011) .

Therefore, role ethics defines humans as “the sum of the roles we live in consonance with our fellows” (Ames and Rosemont 2016, 112). Role ethics appeals to the actual life experience we are living with others both cognitively and affectively. A critical way of becoming virtuous persons in the Confucian tradition is to observe how others practice *li* (rituals, 礼) that are required by the social roles they assume. Within Confucian ethics, roles assume a crucial and fundamental significance within the framework of *li*. For instance, in *Analects*, roles serve as the structure through which rituals are built, enabling rituals to prescribe appropriate behavior for individuals in a manner that is mediated by their assigned roles (Stephens 2018).

Therefore, practicing rituals appropriately can be conducive to the reinforcement of human relationships and associated communal roles. Ritual practices require us to both physically and emotionally engaged (Hagen 2010). Emotions and feelings are thus critical for us to demonstrate our commitment to the practice of rituals and the fulfillment of our role-based moral obligations. A truly caring nurse can never be someone who only knows how to follow rules. They develop their virtue of benevolence by feeling what their patients are suffering. Arguably, their emotion engagement with patients’ experience allows them to develop qualities and dispositions that define a truly caring nurse. Thus, one possible way of evaluating whether we fulfill our communal roles well is to examine whether we have any emotional investment in these roles.

Contemporary Western moral philosophers discuss two kinds of roles: institutional roles and social roles. Professional roles such as engineer can be considered as institutional roles. Legal philosopher David Luban (1988) explains how a professional’s individual act is connected to their institution’s or profession’s moral vision. Luban (1988) argues that the connection between a professional’s own moral behavior and their institution can be justified at four stages:

First, an institution, practice, or profession needs to be shown to be morally valuable. Second, the moral agent's role must be necessary to the function of the institution. Third, the specific obligation of the agent must be essential to their role. Fourth, the agent's act needs to be required by their obligation (Wendell 2020, 149). Luban's theory is closely associated with our methodological approach that aims to examine how an engineer's specific actions in the community is connected to and challenged by their institutional and professional roles (e.g., roles in companies and roles in the communities they serve as a professional engineer).

Critics may express concerns about how certain social roles, such as being someone's child or sibling, could potentially influence or undermine the defined professional responsibilities of engineers, which are shaped by institutional roles. While acknowledging this legitimate concern, it is important to clarify that our objective is not to compromise professional integrity by allowing role-based relationships, particularly intimate ones, to undermine it. We argue that social roles and institutional roles are in fact closely interrelated. For instance, when Rosemont (2015) reflects on the question, "Who am I?", he mentions not only his familial roles (e.g., son, husband, father, grandfather, brother) but also more communal, social, and even institutional or professional roles (e.g., teacher, student, colleague, engineer, employee). As he argues, his life as a teacher can only be made significant by his students, and his life as a scholar can only be made significant by other scholars. We argue that the moral sensitivity developed through relationships such as familial relationships, can be extended to professional relationships, such as those between doctors and patients or engineers and the public.

Moral concerns developed in social roles such as familial relationships can be extended toward broader public relationships. In fact, some of these relationships such as the friend-friend relationship can be considered as "mediating" relationships as they have critical value that

bridges more intimate or personal roles to more public, professional roles (Cottine 2020). We as humans often employ these mediating relationships to extend our moral competencies developed in personal contexts to professional contexts. For instance, Confucius discusses the possible moral extension between personal/social and institutional/professional roles, “a young person who is filial and respectful of his elders rarely becomes the kind of person who is inclined to defy his superiors, and there has never been a case of one who is disinclined to defy his superiors stirring up rebellion” (*Analects* 1:2, Slingerland trans.).

Critics of role ethics may argue that some philosophers such as Rosemont and Ames perceive individuals as exhaustively constituted by their social and institutional roles. Such a view can appear to deprive individuals of moral autonomy, thus suggesting that individuals act only because of their roles. A.T. Nuyen (2007) brings agency back into the concept of role ethics and argues that the roles we assume do not simply provide expectations for what we ought to do (or what our obligations are) but also motivate us to discharge our obligations. In other words, good engineers are not only aware of what their obligations are, as based in their roles as engineers, but are also motivated to actively engage in the exercise of these obligations. Nuyen’s account of role ethics has explicitly attached more moral agency to the person who assumes various roles.

A Role Ethics Approach to Engineering Ethics Education

Engineering ethics inspired by role ethics would argue that professional responsibility is often influenced by the specific roles engineers assume in social contexts, and that their responsibilities are often specified, invited, limited, or qualified by different relationships.

Some scholars in engineering ethics have specified the virtues that are called for by the excellent fulfillment of the professional role of engineers. Charles E. Harris (2008) distinguishes

two kinds of virtues in engineering that define the role ethics of engineers: technical excellences (e.g., mastery of the relevant parts of mathematics and physics, engineering science, and design; sensitivity to risk) and non-technical excellences (e.g., techno-social sensitivity; respect for nature; commitment to the public good). More recently, Deborah Johnson (2020) has pointed out that engineers should consider the virtues associated with being a good engineer rather than a particular rule, principle, or decision procedure. For instance, engineers in an ethical dilemma should think about “the ends of engineering and the virtues that constitute a good engineer such as courage” (Johnson 2020, 65).

A few scholars have recently highlighted the value and possibility of introducing role-specific moral relations to engineering ethics practice. For instance, Wade Robison (2017) has recently introduced “role morality” into engineering ethics. According to Robison (2017), role morality includes “a set of role-specific relations connected to the practice of engineering” and “additional moral relations required by other ‘non-engineer’ roles one assumes such as employee, contractor, or manager” (Robison 2017, 15-16). Robison’s approach to the role morality of engineers rightly considers the diverse, multiple roles engineers need to assume in their *actual* practice of engineering. In contrast to the dominant approaches to engineering ethics that oversimplify the roles of engineers and exclusively focus on the “engineer” role, Robison’s work seems to be closer to the reality of engineering practice and has made visible other possible non-engineer roles an engineer may need to assume. Nevertheless, Robison’s work does not address the *relational* nature of these role-specific relations, how these role-specific relations prescribe particular responsibilities that engineers have, and how these role-specific relations provide rich moral experience that inspires engineers to grow moral empathy and sympathy. Nor

does Robison's work discuss how to cultivate engineers' sensitivity toward their role-based responsibilities.

The social responsibility of engineers is neither an abstract nor a predetermined concept. It is a social and relational concept. It is always prescribed by the specific roles engineers assume in particular communal contexts. More specifically, the term "social responsibility" is always about *being responsible to whom and in what context*. It is quite often that engineers may work in different contexts with different people and build different relationships. These different relationships between engineers and others shape the responsibilities of engineers and the ways in which they define and solve problems. An engineer may serve as an employee and work for a mining corporation. They may also work as a humanitarian engineer whose career goal is to develop technologies that can empower people in underserved communities and improve their human capabilities. Apparently, the relationship between an engineer working for a mining company with their clients (can be other corporations) will be quite different than that between a humanitarian engineer and people in underserved communities. Such an engineer's role changes as they travel from one context to another and thus their role-associated responsibilities will also change. Unfortunately, dominant codes of ethics and ethical guidelines in engineering often place an exclusive emphasis on the corporate context and are mostly concerned about "stakeholders" such as "customers, employers, or customary national publics" (Lucena, et al. 2007).

As suggested earlier, the roles lived by engineers are associated with particular social expectations and norms (Bicchieri 2016). These social expectations are not only about how engineers assuming a particular role in a context *are expected by others to behave* in certain ways but also about how *what others believe these engineers should do* in such a context.

Sometimes, the two kinds of social expectations associated with a particular role could lead to some tension. For instance, an engineer working at a mining corporation may be expected by others to work to maximize the interests of their corporation. However, others may also believe that these engineers should in fact hold paramount the safety, welfare, and health of the public and refuse to work on projects that can generate harm for the public. Engineers' specific roles do not only set boundaries for them (what they are expected to do vs. what others believe they should do) but also allow them to have access to certain agency or resources for ethical actions. For instance, if a mining engineer is working as a procumbent engineer in a developing country, then such a role allows this engineer to have certain power to determine whether to buy materials from the local to benefit the community or use materials from Western companies and help these companies extract profits from the community.

Therefore, the idea of social responsibility in engineering is practiced in the engineer's fulfillment of their contextualized roles. Therefore, virtues in engineering practice cannot be solely developed by the engineer themselves. Rather, virtues need to be cultivated in the collaboration between the engineer and the people they serve. For instance, the virtue of caring in nursing is developed through the nurse's experience with their patients including "conversation, body contact, and empathizing with patients" (Wong 2019). Thus, the fulfillment of a nurse's professional role and the related experiences become a *means* for cultivating the virtue of caring. A nurse's professional role encompasses a particular set of norms (or *li* in the Confucian sense) that prescribe appropriate actions for the nurse. Engaging in the practice of these norms, reflecting upon the experiences acquired through such practice, and integrating reflective thinking into future practice constitute the nurse's ongoing and continuous cultivation of the virtue of caring. Readers may observe a notable similarity between the Confucian role

ethics approach to caring and Nel Noddings' work on care ethics. Both traditions emphasize the vital role of caring relationships and recognize the profound impact of these relationships on the cultivation of the virtue of care (Li 2015). Nevertheless, there exist subtle distinctions between these two traditions. For instance, Confucian ethics highlights the value of cultivating a comprehensive set of norms (referred to as "*li*"), often derived from roles, to govern behaviors. In contrast, care ethics resists this approach by placing less emphasis on formalized norms and instead prioritizes the contextual and individualized nature of care (Herr 2003, Li 2015).

Engineering educators may claim that there are certain virtues critical for excellent engineering practice. However, it is worth noting these virtues are not *a priori* or exist before engineers serve others and what engineers do is to ensure their behaviors are aligned with these predetermined virtues. Instead, virtues are always particular and contextualized. Without empathizing with the people they serve, it will be rather challenging for engineers to develop true virtues such as caring. Therefore to become socially responsible engineers, they need to develop moral imagination about what the ideal forms of their roles entail and invite them to do. Cultivating such moral imagination requires engineers to empathize what the people they collaborate with feel and observe what other engineers and actors do in specific situations. Similar to a father whose moral cultivation is made possible through his relationship with his children, an engineer is able to develop their moral character in their daily interactions with the people they serve. The role relationship between the engineer and the served people evokes feelings and expectations that are unique to that relationship.

Implications for Teaching Ethics to Engineering Students

In this section, this paper will briefly discuss what implications can be drawn from role ethics for teaching ethics to engineering students. Engineering ethics education are encountering

daunting challenges such as how to engage students in ethics learning, how to develop practical moral imagination, and how to form moral character and habits. Role ethics can be helpful for thinking about ways to achieve these goals. Role ethics builds upon and extends the existing approaches to engineering ethics education that aim to enhance engineers' ethical decision-making capabilities. In contrast to dominant engineering ethics approaches that focus on teaching engineers to apply abstract moral theories or principles to address ethical dilemmas, role ethics prioritizes the development of moral imagination and creativity. This approach encourages engineers to engage in critical reflections on their multifaceted personal and professional roles, which are shaped by their relationships with others within broader social, cultural, and political contexts.

Role ethics can complement and further improve pedagogies in dominant approaches to engineering ethics education. While teaching case studies, instructors can encourage students to reflect on (1) the diverse roles engineers assume in these cases; (2) the moral obligations prescribed by these roles; (3) whether there are social and institutional resources accessible to these roles; and (4) how these roles are and should be prioritized in specific cases. Reflecting on engineers' roles across cases allows students to develop moral imagination and creativity. In addition, instructors can further extend the traditional approach to teaching cases. For instance, they can ask students to create fictional narratives for the different roles of engineers and imagine how these different roles enact and interact and extend and/or limit their moral agency in their everyday work. The role ethics approach can effectively complement the recent utilization of emerging technologies like gamification and augmented reality in engineering ethics education (Briggle, et al. 2016, York and Conley 2020). Specifically, it can enhance the realism of ethics cases within virtual environments by providing more personalized backgrounds

for the key characters involved. This additional contextual information, including their roles and relationships, can inspire students to develop imaginative and innovative ethical solutions by leveraging the character's background information.

Students could be further invited to employ what Dewey calls “dramatic rehearsal” to imagine various possible lines of action through which engineers’ diverse roles interact or compete with each other (Fesmire 1995). Imagining that an engineer Jessica is working for a global mining company, students can reflect on: (1) what her role as an employee entails; (2) how her employee role interacts with her other roles such as the engineer role (or whether professional code of ethics or corporate code of ethics assumes a more important role); and (3) what Jessica would do if she sees the mismatch between her corporate policy “buying local” and the reality on the ground in the underserved community (e.g., other corporations purchase local materials and resell them to Jessica’s team at a much higher price).

The role ethics approach can also be helpful for students to think creatively and critically about traditional, oversimplified ethics cases such as the data fabrication case. Engineering students are often presented with cases such as this one: An engineer has been asked by their supervisor to fabricate data. If the engineer follows their boss, the engineer will ruin their reputation. Otherwise, the engineer will lose their job. More than simply making an obvious, “black-and-white” choice, it is worth exploring: (1) what roles this engineer assumes in this particular context; (2) what the relationship between the engineer and their supervisor looks like; (3) whether there could be more creative and pragmatic solutions (e.g., asking the supervisor’s motivation to fabricate data, if and what pressures the supervisor is facing, and whether there could be ways to address the supervisor’s interior motive); (4) if there are any other roles the engineer is unaware of but could be potentially useful for solving such a problem.

The role ethics framework can also help students connect their professional roles (e.g., engineer, employee, manager, etc.) with social roles (e.g., family roles) and translate moral inspirations from their social roles to professional roles. For instance, a first-generation, Latinx engineer may reflect on their family roles and associated moral obligations and extend these inspirations to empathetic tendencies in their professional roles as an engineer. The challenges they encountered in the familial context allows them to develop moral sensitivity and sympathy toward people from underserved communities that constitute their unique professional role as an engineer.

Finally, role ethics can be useful in developing self-reflective, lifelong moral learning skills especially in experiential and “clinical” experience programs for engineers such as internships. The role ethics approach can help engineering students better understand the cultures of an organization, relationships between people in the workplace, institutional resources for making good judgment, and the responsibilities and obligations specific to that context. For students working on internships, role ethics can provide a framework for them to conduct more conscious and reflective observations that allow them to develop ethical professional identity in practice. Role ethics allows students to develop ethics as a lifelong skill that invites them to *collaboratively* develop their virtues with the people they serve. It could be used to teach students about the value of context and contextual learning in formulating their professional and ethical identities. Their roles and role-based moral obligations are always context-dependent, and thus if context changes their roles and role-based moralities will be different.

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