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# Teaching engineering ethics: a dissenting voice

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## ABSTRACT

The reference to ‘a dissenting voice’ in the title has a double meaning. On the one hand, this paper itself provides a dissenting voice, in that it challenges a number of common practices and widely held views. (For example, challenging the typical focus on case studies, and the focus on the decision-making of individual engineers.)

In addition though, the paper argues that teachers of engineering ethics should be willing to discuss the state of the profession, and be willing to criticise the profession and the professional institutions (where appropriate), providing a dissenting voice and aiming to inspire the engineers of the future to challenge the status quo and ultimately to strengthen the profession.

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## 1. Introduction

In this paper, I present what many will consider a provocative perspective on the teaching of engineering ethics. In part 2, I challenge the case study approach that is common<sup>1</sup> in the teaching of engineering ethics, highlighting its limitations and stressing in particular its focus on the individual, and its lack of focus on broader ethical issues (particularly at the level of institutions), and its lack of substantial content. Although I do not reject the case study approach completely, I do warn against an over-reliance on the case study approach, arguing that the curriculum should include some content-centric teaching. I also emphasise that, due to its lack of content-centric teaching and its lack of focus on institutions or macro-ethical issues, the case study approach is not well-suited to challenging professional institutions, highlighting flaws in the profession.

In part 3, I focus in more detail on the claim that ethics teaching in engineering should have substance, and I highlight the importance of a strong profession, arguing that educators should be willing to highlight flaws in the profession, with the aim of inspiring the engineers of the future to challenge the status quo and to strengthen the profession.

In part 4, I defend the approach which I call content-centric pluralism, which I suggest as an alternative to an over-reliance on the case study approach.

## 2. The case study approach

In this section, I challenge the case study approach that is common in the teaching of engineering ethics. However, two clarifications are important – one about

the nature of the teaching I am challenging, and one about the nature of my challenge.

### 2.1. What type of case-based teaching? And what type of objection?

In this section, I highlight four key characteristics of the approach I am challenging.

Martin et al state that ‘Case Studies are the prevalent teaching method employed in engineering ethics’<sup>2</sup> (Martin, Conlon, and Bowe 2019, 882), and they specify:

The most common use of case studies is within a microethical frame, focused on describing individual dilemmas set in scenarios of crisis that can be solved through the application of ethical heuristics and by appealing to the precepts of professional codes and ethical theories . . . There is little concern with incorporating macroethical aspects such as public policy and the broader social mission of engineering. (Martin, Conlon, and Bowe 2019, 882)

Also, the case study approach that I have in mind is defined by its format as much as its content. In particular, it is interactive, with the main focus being on the students’ engagement with the case, typically asking the students to discuss the case with each other and the facilitator. As such, it is often contrasted with ‘direct instruction’ (e.g. lectures) and content-centric teaching. And this is often reflected in the claims that are made about the benefits of the case study approach, such as encouraging ‘independent thinking, thus moving away from the lecture and recitation format’. (Martin, Conlon, and Bowe 2019)

In addition, I also want to distinguish between the approach I have in mind and two other possible forms of teaching that could credibly be called case-based teaching. One could base an entire module around a single case, having lectures on one aspect and having students read the academic literature on another aspect of the case etc. Alternatively, one could include ethics teaching within a wider design project, and perhaps one could call this a ‘case’. I mention these options only to emphasise that these are *not* the approaches I have in mind when I talk about the case study approach.

In contrast to the two alternatives just considered, another important feature of the case study approach that I have in mind is that it is typically limited to the in-session teaching (i.e. with little or no additional work required of the students before or after the session). (See (Harris et al. 1996, 95))

To summarise, the case-study approach that is the main target of this paper, is typically:

- (1) Focused on ethical choices (with little or no focus on the technical aspects – in contrast to the sort of design project that I considered above);
- (2) Focused on ethical choices made by *individuals*;
- (3) Interactive (with little or no ‘direct instruction’ or content-centric teaching);
- (4) Focused primarily on peer-to-peer learning, through discussions (albeit directed by a skilled facilitator), and the learning is typically limited to the in-session teaching (i.e. with little or no additional work required of the students before or after the session).

And, to clarify, I am *not* arguing that this form of teaching has no value at all and should never be a part of the engineering curriculum. I am highlighting the limitations of this type of teaching, arguing against an *over-reliance* on this form of teaching. This is necessarily focused on matters of degree. Similarly, there are also matters of degree in the sense that some teaching sessions may fit these descriptions more or less than other sessions. As such, in cases where teaching fits some of these descriptions, but not others, some specific objections may not apply and other objections will apply but the objection may have more or less force. Therefore, many of the arguments presented in this paper will apply to some approaches even if they do not match all four of the criteria above. For example, if you do include a significant focus on the technical aspects alongside the ethical issues, but your ethics curriculum otherwise meets the criteria stated above, the arguments presented in this paper will still apply.

## 2.2 Individual engineers and ethics

In ‘Engineering Ethics Beyond Engineers’ Ethics’, Basart and Serra write:

It seems to be a frequent practice in academic papers<sup>3</sup> to transform any analysis of professional ethics into a study of ethics for the respective professional. Whenever this transformation occurs in engineering the outcome is that engineering ethics becomes engineers’ ethics. Due to the fact that this shift is so subtle and common it quite often goes unnoticed. (Basart and Serra 2013, 180)

The fact that this goes unnoticed is – they argue – a problem because this individualistic approach is not the best approach in ‘our interrelated world’ with various organisations and stakeholders. They suggest that

Engineering ethics should abandon the suffocating scenario of engineers trying to discover in their conscience or wisdom both: (a) the correct answer to a moral dilemma they are confronted with, and (b) the courage to carry it out unhesitatingly. (Basart and Serra 2013, 184)

Arguably, the claim that we should *abandon* this focus on individual choices is too strong. However, even if they overstate their claim, the suggestion that engineering ethics need not (and probably should not) *always* focus on individual dilemmas for individual engineers is an important one. This is also the same limitation that Martin et al highlight when they emphasise the lack of focus on macroethical issues, such as ‘public policy’ and the ‘social mission of engineering’, characterising ‘the most common’ cases as ‘microethical’. (Martin, Conlon, and Bowe 2019, 882) If a method of teaching is not even aiming to highlight the macro-ethical considerations, it is unlikely that this approach to teaching is going to be the most successful at achieving this end. Admittedly, it is possible that one could aim to modify the case-based approach, which is the approach taken by Martin et al, but there are other challenges to the case-based approach (see below). This paper, therefore, defends a more substantial departure from the case study approach.

## 2.3 Content and substance

Typically, defenders of the case study approach explicitly contrast their approach with content-centric teaching. As such, it is clear that the aim of case-based sessions is *not* to present content. This is less likely to be problematic if the case approach is used alongside other forms of teaching, such as lectures. But, if there is an *over-reliance* on the case study approach, there is good reason to suspect that the curriculum will be lacking in substantial content.

## 2.4 Insufficiently challenging

To some extent, this comes out of the two previous concerns: if there is too much focus on the individual, and not enough focus on macro-ethical issues, the case study approach is likely to be insufficiently challenging, in this sense. And if students are not required to do any additional work, before the class (reading academic literature) or after the class (defending their views in an essay, for example), the approach is also likely to be insufficiently challenging in this sense.

In the following (and particularly in part 3), I argue that teachers of engineering ethics ought to be asking themselves, what do engineers need to know that many engineering students seem to be missing? This clearly links to the point above about content. There may be certain content that students ought to be introduced to. This could be anything, but following Martin et al and Basart and Serra, I highlight particular details which relate to macro-ethical considerations, particularly focusing on those which relate to important flaws in the profession, as it functions at the moment (in the UK at least).<sup>4</sup>

Facilitators can steer conversations in that direction, and there may be some scope to design case studies that highlight these same issues, but where there are complex arguments to be presented, or substantial knowledge to present, this necessarily requires a departure from the case study approach because the case study approach is explicitly *contrasted* with approaches which involve teacher directed/content-centric teaching.

As such, once we acknowledge that our goal is to introduce students to an argument or a set of facts that we think they should be familiar with, we have to acknowledge that we have goals that the case study approach was never intended achieve. If these are our goals, case-based teaching needs to be replaced by, or supplemented with, a more content-centric style of teaching.

## 2.5. Uncharitable interpretations of alternatives

If we are considering the strength (or weakness) of the case study approach, it is also important to highlight concerns about the misrepresentation of alternatives, such as content-centric teaching, which is presented as rote learning, stifling independent thinking and critical thinking. As a discipline, philosophy is focused on critical thinking, and is focused on helping to develop the analytic skills necessary to engage with arguments, and to challenge and criticise arguments, but philosophy does not shun teacher directed/content-centric teaching. Lectures can be provocative, presenting arguments that can challenge students' most fundamental assumptions, making them think about a topic

or an idea in an entirely different way. This is clearly not rote learning. One can use lectures to help students develop skills – as philosophers do when teaching critical thinking or formal logic. And lecturing is not the only form of content-centric teaching. Reading is another, and no one argues that reading good, peer-reviewed academic papers prevents students from developing good critical thinking skills.

More generally, Donnelly states that, while there has been significant focus on 'a more collaborative form of learning', there is evidence that teacher directed/content-centric teaching is in fact more effective. (Donnelly 2014) This view is also supported by Kim and Axelrod, who present empirical evidence that suggests that Direct Instruction is more effective than more interactive or collaborative methods (Kim and Axelrod 2005). And, in response to those who dismiss the method as robotic or rigid, they state that there is no evidence that Direct Instruction hinders 'social development, ethical development, critical thinking,' or 'cognitive ability'. (Kim and Axelrod 2005, 117)

Finally, these content-centric methods are used extensively in engineering, so it seems that engineering educators are not sceptical of these teaching methods generally. And indeed, *most* disciplines make some use of content-centric methods of teaching, such as lectures and set readings.

## 2.6. Burden of proof

Following directly from the above, I suggest that the burden of proof is *not* on me, but rather is on my opponents who must either 1) argue that all of these other disciplines are mistaken, or 2) argue that there is something special about engineering ethics, such that the methods that are suitable for so many other disciplines are not suitable for engineering ethics.

## 3. Substance and dissent

### 3.1. Ethics teaching should have substance

To put it bluntly, ethics teaching – like teaching in any other discipline – ought to have substance. In this section, I focus on two claims. First, that engineering ethics may sometimes require something other than a focus on ethics, and second, that those teaching engineering ethics ought to challenge the profession itself, and the professional institutions, where appropriate.

#### 3.1.1. Engineering ethics may require something other than ethics

As odd as it may sound, addressing particular issues that are important to engineering ethics need not involve a focus on ethics. For example, the Royal

Academy of Engineering (RAEng) and the Engineering Council have a shared a Statement of Ethical Principles which states that engineers should ‘maximise the public good and minimise both actual and potential adverse effects for their own and succeeding generations’ (Engineering Council & Royal Academy of Engineering 2017), but there was no explicit reference to climate change specifically. This means that, if engineers reject the claim that climate change is the result of human actions, and therefore reject the claim that carbon emissions harm future generations, they will see no reason to change their engineering practice to reduce carbon emissions, even if they are committed to the aforementioned Ethical Principles. And there is evidence that there is indeed a problem of engineers rejecting the science of climate change. (Lefsrud and Meyer 2012) (Grubert 2018). Perhaps this is changing. Hopefully it is. Perhaps teachers will have to use their own judgment about their own students. But *if* many of the students do seem to be sceptical about the need to mitigate climate change, a focus on ethics may not be what the students need. They might, instead, need to be taught climate science – or at least be made aware of:

- (1) the extent to which there clearly is a consensus amongst climate scientists (Oreskes 2004) (Cook et al. 2013), and
- (2) the extent to which the evidence for climate change goes way beyond the observation that temperature increases correlate with increases in carbon emissions. (For example, lab experiments demonstrating the greenhouse effect (Henson 2006, pp. 23–25) and sophisticated models which are able to ‘reproduce observed continental scale surface temperature patterns and trends over many decades, including the more rapid warming since the mid-20th century and the cooling immediately following large volcanic eruptions (very high confidence).’ (IPCC 2014a)
- (3) the impacts of climate change, which include ‘increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems’ (IPCC 2014b, 8) and ‘greater likelihood of injury, disease, and death due to more intense heat waves and fires (very high confidence); increased likelihood of under-nutrition resulting from diminished food production in poor regions (high confidence); risks from lost work capacity and reduced labour productivity in vulnerable populations; and increased risks from food- and water-borne diseases (very high confidence) and vector-borne diseases (medium confidence).’ (IPCC 2015, pp. 19–20) Also, ‘Climate-change impacts are expected to exacerbate poverty in most

developing countries and create new poverty pockets in countries with increasing inequality, in both developed and developing countries.’ (IPCC 2015, 20)

In addition, given the close relation between engineers and industry, there is also a strong case for educating engineering students about the history of the deliberate promotion of misinformation and the fossil fuel industry’s involvement in this promotion of doubt. (Conway and Oreskes 2012) (Mulvey et al. 2015) Apart from anything else, this might help students to make informed choices when making decisions about their careers, including questions of who they want to work for.

Notice, however, that – whether it is engineers deciding which industries they may or may not want to work within, or the companies they want to work for, or the engineer’s interpretation of the requirement to ‘minimise and justify any adverse effect on society or on the natural environment for their own and succeeding generations’ – this discussion remains focused on the choices of the individual. But the excessive focus on individuals, and micro-ethical issues, was a key part of the objection to the case study approach. Therefore, instead of focusing (only) on the individual engineer, we should (also) focus on the role of the professional institutions themselves.

In addition to ensuring that the students have some knowledge of the evidence for climate change, and an understanding of the deliberate promotion of misinformation, we could also explore the question of whether the engineering profession itself is doing enough (See (Lawlor and Morley 2017) and (Grubert 2018)). And while we want to ensure that individual engineers do not interpret the Statement of Ethical Principles in a way that imposes no restrictions at all, in relation to greenhouse gas emissions, this should not distract us from the simple fact that this interpretation should never have been possible. The statement of ethical principles should have been explicit about climate change, and about the importance of it, making absolutely clear that all engineers need to act responsibly, in relation to greenhouse gas emissions, regardless of their individual views. The statement should have been explicit in stating that any engineer who ignores these considerations in their work<sup>5</sup> is failing to meet the standards expected of a professional engineer. Given that they did not do this, the Engineering Council and the Royal Academy of Engineering missed an important opportunity to do one small thing to show effective leadership on the crucial issue of climate change.<sup>6</sup> These points also lead me to my next claim.



### 3.1.2. *Those teaching engineering ethics ought to challenge the profession itself*

Martin et al emphasise the significance of the macro-ethical issues, criticising the excessive focus on the micro-ethical, and similarly Basart and Serra criticise the focus on individual engineers trying to find ‘(a) the correct answer to a moral dilemma they are confronted with, and (b) the courage to carry it out unhesitatingly.’ (Basart and Serra 2013, 184) In what follows, I emphasise the role of the professional institutions, emphasising the importance of educators challenging the profession, highlighting the weaknesses of the profession, and exploring ways in which the profession could be strengthened.

For example, an individual may fail to do the right thing, not because of a failure to recognise the relevant ethical considerations, but because of the power dynamics. Some might argue that an unwillingness to stand up to authority demonstrates a lack of integrity – or some other moral flaw. I am not persuaded by this (except to the extent that this makes the trivial point that no one is perfect), but, either way, it seems unlikely that the most effective response to this problem is to aim to create superhuman engineers who are able to say no, even under intense pressure, and even without the support of a strong profession behind them. (Also see (Basart and Serra 2013, pp. 181 and 184).)

Davis emphasises the extent to which a code of ethics, supported by a strong profession, can offer significant support to individuals, allowing them to say no. (Davis 1991)<sup>7</sup> Similarly, Chance et al highlight the fact that a change of approach, at the institutional level, has had a significant impact on Health and Safety, and looks promising therefore as a response to other ethical issues as well. (Chance et al, 2021.)

Institutional support is particularly strong in cases where – due to the institution’s support – the individual can, credibly, say, ‘No. I cannot do that. That would be against my profession’s code of ethics, and if I did what you are asking me to do, I would be struck off.’<sup>8</sup> And any other engineer would tell you the same thing.’ (See (Davis 1991; Lawlor and Morley 2016)) As such, rather than focusing on the individual, it is more important to teach students about the state of the engineering profession, the problems that result from a weak profession, and ways in which professions can be strengthened. For example, John Uff’s 2016 report into engineering in the UK estimates that less than 15% of engineers in the UK are registered, and he also highlights the fact that there are very few restrictions on what can be done by non-registered engineers. (Uff 2016)<sup>9</sup> These details are significant when we consider Davis’s argument about the support that engineers can get from a strong profession. If there are few restrictions on what non-engineers can do, and if few engineers are registered, then it will follow that an engineer

cannot, with any credibility, tell an employer ‘any other engineer you hire will be committed to the same code of ethics and will tell you the same thing I am telling you.’ Similarly, if only 15% of engineers are registered, we have no way of monitoring what CPD engineers are doing, if they are doing any.<sup>10</sup>

The significance and implications of these concerns were highlighted by the Grenfell Tower disaster in 2017. In her report into building regulations and fire safety, Dame Judith Hackitt identified ‘a lack of skills, knowledge and experience and a lack of any formal process for assuring the skills of those engaged at every stage of the life cycle of higher risk residential buildings (HRRBs) as a major flaw in the current regulatory system’. (Hackitt 2018) As part of this, she also emphasised the importance of CPD, particularly in relation to fire safety and, when I interviewed Hackitt in 2018, she agreed that the very low percentage of engineers who are registered is part of the problem.<sup>11</sup>

Hackitt’s report also highlighted the fact that ‘In other parts of the world, those engaged to work on more complex buildings require a higher degree of competence and expertise – for example through certification and accreditation – than that required for work on small scale or simple buildings.’ (Hackitt 2018) But this was not the case in the UK.

Hackitt highlighted these flaws, in her report, *after* the Grenfell Tower fire. But John Uff had highlighted many of these flaws (in relation to engineering as a whole) in 2016, the year before the fire.

Given that today’s engineering students will (in many cases<sup>12</sup>) be tomorrow’s engineers, and some of them will have the potential to shape the profession (either by having significant roles in various professional institutions, or by challenging the professional institutions from the outside), it makes sense to explore these issues in the curriculum, and to explore ways in which the profession can be strengthened. (For example, see (Lawlor and Morley 2017))

As part of this, there would also be a case for studying the history of the medical profession. (See (Brown 2007), (Brown 2011), (Brown 2014) and (Burney 2007).) For example, studying the role that Thomas Wakley played in the formation of the medical profession could inspire young engineers to be similarly proactive in reforming, and ultimately strengthening, the professional engineering institutions. (Wakley started *The Lancet* and challenged conservatism, nepotism and complacency in the medical colleges in London in the 1800s (Brown 2014).)

Similarly, given that the evidence suggests that, in the UK, it is the professional institutions themselves who resisted changes which would have strengthened the profession (see (Uff 2016) and (Jordan and Richardson 1984)) there is good reason to think there could be value in teaching students about the

history of the engineering profession.<sup>13</sup> (Also see (Lawlor 2018)) And Eric Katz's discussion of engineers and the engineering profession in Nazi Germany highlights a number of interesting questions about the nature of a profession and the role of dissent within a profession (Katz 2010).

### 3.1.3. The purpose of a profession

The discussion above also highlights further questions, which I suggest would be great questions to raise with engineering students: what is the purpose of a profession? Why does society need a profession of registered engineers? Who should the profession serve and to what extent should the profession be aligned with the industries that the engineers work within, and to what extent should the profession align itself with the public, potentially aiming to protect the public from these industries, therefore (potentially) putting themselves in direct conflict with industries that many engineers are working within? How should professional institutions deal with the potential conflicts of interest that may emerge?

The purpose of this paper is not to answer these questions. However, it is the purpose of this paper to argue that these are appropriate, and important, questions to address in the engineering curriculum. And given that these are questions that do not focus on the individual decisions of an engineer in a particular set of circumstances, and given that these are questions which require substantial content, I suggest that the case-study approach is unlikely to be the most appropriate option, and (whether the case study approach is used or not) there should be at least be *some* content-centric teaching involved.

## 4. An alternative model for teaching engineering ethics

Part 2 of this paper challenged a number of commonly held views about the teaching of engineering ethics, particularly highlighting the limitations of the case study approach. This naturally prompts the question, what do I propose instead? To a large extent, my answer can be deduced from the arguments presented above. In this section, however, I fill in the gaps and add some more detail.

### 4.1. Four main elements

Abaté suggests that students need to be 'exposed to the techniques of philosophical analysis and the need for clarity of conceptual evaluation'. He continues, 'It is these tools, I contend, with which we need to arm our engineering students in the hopes of enabling them to "think ethically".' (Abaté 2011, 588) Abaté, among others, argues that the case study approach is the

best approach to achieve these aims. However, I have rejected those arguments. So where does that leave us?

I assume that most would agree<sup>14</sup> that Philosophy is one discipline that clearly specialises in teaching the techniques and skills that Abaté highlights in the quotes above. It is also a discipline that specialises in teaching ethics. As such, as a starting point, it would be worth considering what methods of teaching are used by philosophy departments. That is not to say that we should simply borrow directly from the ethics syllabus of the local philosophy department. For example, elsewhere, I have argued *against* the teaching of moral theories when teaching professional ethics. (Lawlor 2007, 2008) And, I have also suggested that we may want to draw from other disciplines, such as history and climate science. Nevertheless, it is worth emphasising that philosophy departments do not typically rely heavily on a case study format. Many classes will include case studies, but no one *equates* the discipline of philosophy with the case study format. On the contrary, almost all philosophy teaching has four core elements:

- (1) Reading – which introduces students *directly* to high quality philosophical argument and counter-argument.
- (2) Lectures – which can serve a number of purposes, but notably helping students with the interpretation of readings that they might struggle with (if they had to read the texts without help), and presenting additional arguments and perspectives to the students, presenting a range of ideas and arguments that go beyond the ideas and arguments in the set readings. Also, lectures offer, to some extent, an alternative to 1) for those students who – for whatever reason – fail to do the set reading.
- (3) Discussion – which also serves a number of purposes. Again, these discussions allow the lecturer (or tutor) to help students with their interpretations of the texts (correcting the students if they make a mistake or adding nuances if the student seems to be missing them). In addition, these discussions allow students to develop their own skills at reasoning and constructing arguments. And the discussions expose students to other people's attitudes, such that they realise that not everyone reached the same conclusion they did, and that maybe the answer is not obvious. This discussion could take place within sessions adopting the case-study approach, but equally they need not, and there will often be reasons why the case-study approach would not be the most obvious choice (when discussing a broad question, such as the purpose of a profession, for example).

- (4) Assessment – usually an essay or presentation – which again serves several purposes. The most obvious is to assess the student’s work, and ultimately to reward a degree of a certain class/grade. But in addition, as in the discussion, it also allows the lecturer to identify errors, misinterpretations or other flaws, and to offer advice about how to improve. Also – again, like the discussion – essays and presentations allow students to develop their own skills in analysing, and criticising, other people’s arguments as well as giving them an opportunity to develop their own arguments. But, compared to the discussion, there is more focus on the requirement to present a coherent line of argument, avoiding inconsistencies. Finally, the inclusion of assessment also motivates the students to engage with 1, 2 and 3.

A few points are worth highlighting here. First, while discussion is an important element in this approach, it is only one element. In addition, these elements should not be considered in isolation. They work together and support each other. In particular, a higher level of discussion is possible if students have attended the lectures and have read high quality academic literature on the topic. Furthermore, although discussions will sometimes focus on case studies, they will not always. Most importantly, though, notice how much of this approach involves content-centric teaching. Discussion, for example, will typically focus on arguments found in the readings, and this will typically be the case even when discussions focus on case studies.

#### 4.2. Content-centric pluralism

I call the approach I have described Content-centric Pluralism: ‘content-centric’ because of the focus on substantial content, in the form of lectures and reading (and/or other alternatives); and ‘pluralism’ because it does not focus on just one form of teaching, but includes content-centric instruction and assessment in *addition* to interactive methods. It is also pluralist in that the content taught need not be limited to one discipline (e.g. philosophical ethics), but could also draw on sociology, history, science or economics etc.

There may be some vagueness about what counts as Content-centric Pluralism, but I advocate a relatively broad interpretation. As such, I am not committed to the view that Content-centric Pluralism must be committed to having all of the four elements highlighted in the previous section. In particular, I appreciate that compromise may be required. With limited room for ethics in the curriculum, one may struggle to include all four elements. In addition, for various reasons, departments may not want the ethics teaching to be

assessed. And, if the teaching is not assessed, students may not be motivated to do the reading. However, even if one must compromise, one can nevertheless be guided by the ideal, ensuring that the ethics teaching does include *some* substantial taught content along with the discussions.

#### 5. Conclusion: teach a man to fish ...

Abaté appeals to the saying that ‘if we give a man a fish we feed him for a day, but if we teach him to fish, we feed him for a lifetime,’ (Abaté 2011, 594) arguing that we should not aim to cover all of the ethical issues that an engineer may need to consider, but should rather aim to equip the students with the relevant *skills*. Based on the arguments I have presented above, there is good reason to think that Content-centric Pluralism will do this more effectively than a reliance on the case-study format. Content-centric Pluralism is likely to involve better peer-to-peer discussions because the curriculum is designed in such a way that the discussion will be with peers who are already, to some extent, well-informed on the topic.

In addition, Content-centric Pluralism teaches the students the importance of research. The teaching method sets an example and sets expectations: if you want to understand an ethical issue, you may need to do some research, reading relevant papers in good quality academic journals and books. If your aim is to ‘teach a man to fish’, this lesson is an essential one.

Finally, the arguments presented in this paper also suggest that there is a strong case for providing *optional* ethics modules for engineers. While I agree that all engineers should take their professional/ethical responsibilities seriously, not all engineers need to be enthusiastic ethics champions, and there is reason to think that the profession would benefit from having some engineers who really focus on ethics in engineering, with the possibility that some of these engineers may shape the profession, either by taking up roles within professional institutions, or by challenging the institutions from the outside, in the way that Thomas Wakley and others revolutionised the medical profession in the 1800s. (Brown 2014) (Brown 2011)

#### Notes

1. Note that I say ‘common’, and not ‘ubiquitous’. Without a detailed survey of engineering ethics teaching around the world, it is hard to say how common the case study approach is, and I certainly do not claim that it is the only approach. But I can say that some authors endorse the approach – e.g. (Harris et al. 1996) and (Abaté 2011) – while others agree that the approach is common even if their aim is not necessarily to endorse the approach (Martin,



Conlon, and Bowe 2019) and (Thistlethwaite et al. 2012).

2. It is worth noting, however, that the quote continues, 'but despite their popularity, there is little or no empirical evidence supporting their effectiveness compared to other teaching methods'. (Martin, Conlon, and Bowe 2019, 882) Similarly, Thistlethwaite et al state 'Although many claims are made for CBL as an effective learning and teaching method, very little evidence is quoted or generated to support these claims'. (Thistlethwaite et al. 2012, 421).
3. And I suspect in teaching as well.
4. This paper has a UK focus, but I assume that other countries will have issues of their own, which are likely to be similar even if not the same.
5. Assuming the considerations would be relevant to their work.
6. One referee challenged this suggestion, arguing that it indicated a 'misunderstanding of science' and suggesting that it would be inappropriate for a statement of ethical principles to refer to 'a scientific framework that is likely to become out of date'. For anyone who shares this concern, I would urge you to read (Oreskes 2015) and (Conway and Oreskes 2012).
7. Also see (Lawlor 2016) and (Lawlor and Morley 2016).
8. Or 'de-registered' etc.
9. Also see (Hackitt 2018).
10. John Uff made this point at the Engineering Ethics Conference in 2018 at the University of Leeds.
11. Hackitt, Judith. Personal Interview. 8 October 2018.
12. Even if many engineering students do not, in fact, go on to become engineers, the fact remains that accredited engineering degrees are designed to prepare engineers for a career in engineering and this fact is, and ought to be, reflected in the curriculum.
13. Obviously, this discussion focuses on the profession in the UK. But, unless there is no scope for improvement in other countries, a similar focus on the professional institutions – rather than the individual – is likely to be worth considering elsewhere as well. (For example, see (Grubert 2018; Lefsrud and Meyer 2012).)
14. And the quote above – and his paper as a whole – suggest Abaté would agree.

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