

Teaching phronesis in a research integrity course

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Abstract

More and more research institutions are implementing courses in research integrity (RI). Recent studies indicate that teachers of RI courses are increasingly adopting a “phronetic” approach to their teaching, where the focus is on nurturing values and practical wisdom—what Aristotle called *phronesis*. When adopting a phronetic approach, it is important to understand what phronesis in relation to RI entails and how and to what extent an RI course can contribute to the development of research phronesis. This paper contains a practice-based discussion of the realistic aims of RI courses and a first step towards a specification of the skill set necessary for developing research phronesis drawing on experiences from the PhD courses on Responsible Conduct of Research at the University of Copenhagen. We discuss the limited extent to which research phronesis can be taught in short courses and examine the broader implications of this for the role of RI courses in the training of good researchers.

Key words: research integrity, phronesis, responsible conduct of research, virtue ethics, PhD courses

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1. Introduction

Research institutions are encouraged to foster and maintain research environments characterized by a high degree of research integrity (RI) and to ensure that the researchers they employ and train also have a high level of RI. *The Singapore Statement on Research Integrity* (Resnik and Shamoo 2011, § 13), for instance, calls on research institutions to “create and sustain environments that encourage integrity through education, clear policies, and reasonable standards for advancement, while fostering work environments that support research integrity”. A similar call is made in *The European Code of Conduct for Research Integrity* (ALLEA 2017). Researchers with high levels of RI have adopted the core values of their field and perform their professional tasks in accordance with these values. Similarly, a research institution can be said to have a high degree of RI only if it is organized and managed in accordance with the core values of science and employs researchers who, predominantly, have high levels of personal RI.¹

Personal and institutional RI can be promoted through a variety of measures. One of these measures is RI training, typically at the PhD level. Such training can take various forms. Courses focusing

¹We focus here on RI, but researchers and research institutions are embedded in a broader social and cultural context where related kinds of integrity—including teaching integrity (Macfarlane 2004)—are required to develop a high degree of personal and institutional integrity. Equally, it is hard to imagine a person with high RI but no personal integrity.

exclusively on RI-related issues (henceforth, RI courses) are one option, but training can also be more informal and delivered through supervision and daily practice. RI issues may also be discussed when they become relevant in courses where RI is not the primary focus. Plagiarism might, for instance, be discussed when preparing students to write papers and theses. Of course, the different forms of RI training are not mutually exclusive. In fact, the overall aim of developing personal and institutional RI is most likely to be achieved when all three types of RI training are combined and coordinated continuously from bachelor level and onwards (cf. Section 4).

Our primary focus in this paper, however, is RI courses and the development of teaching for such courses (henceforth RI teaching) at the PhD level. A recent review (Mejlgaard et al. 2019) indicated that teachers of RI courses are increasingly adopting a “phronetic approach” to RI teaching, where the main focus is on nurturing values and practical wisdom (what Aristotle called “phronesis”). This strategy is in contrast to what Pennock and O’Rourke (2017) described as the traditional “legalistic” approach, where the focus is on introducing students to relevant rules and codes of conduct and the potentially severe consequences that violations can have for the individual researcher, the institution, and science as a whole.

When adopting a phronetic approach to RI teaching, it is helpful to develop an understanding of what phronesis in relation to RI entails and how and to what extent an RI course can contribute to the development of research phronesis and thus to the aim of developing personal and institutional RI. To address these issues, we first discuss the realistic aims of an RI course (Section 2). We then consider how to understand the concept of research phronesis in some detail linking it to some central concepts from the virtue ethics tradition (Section 3), before presenting a case study of an RI course to illustrate some of the challenges and opportunities of the phronetic approach when faced with the realities of combining it with the typical short time available for RI teaching (Section 4). We argue that although an RI course can lay a good foundation for the development of research phronesis, it cannot stand alone, as the notion of practical wisdom entails a continued development towards an ideal and not a “ready-to-use” tool. To achieve research phronesis and RI, RI training must continue in an informal but coordinated way throughout the PhD program and the ensuing academic career, which implies, among other things, that supervisors and other senior staff must be capable and willing to participate in the training.

2. The aims of RI courses

There is great variety in the stated aims of RI courses (Kalichman and Plemmons 2007; Chen 2016; Abdi et al. 2021), so for the present discussion, we distinguish three different ideals:²

- 1) **Ensuring compliance:** A minimal aim of RI courses is that participants should achieve sufficient knowledge, skills, and motivation to comply with relevant codes and regulations.
- 2) **Developing RI:** Participants should achieve sufficient knowledge, skills, values, and motivation to fulfil the responsibilities defined in the relevant codes of conduct.
- 3) **Supporting RI:** To begin to develop participants’ skills, values, and motivation needed to fulfil the responsibilities defined in the relevant codes of conduct, and to give those participants a well-defined subset of the knowledge they need to fulfil the said responsibilities.

²For a similar distinction, see Horback and Halfman (2017). Our first two ideals are similar to those described by Horback and Halfman (2017); our third normative ideal is not included in their descriptive analysis. Please note that we do not claim to provide a complete list of the possible aims of RI courses, but we use the taxonomy provided in this paper to highlight certain basic questions pertaining to the overall goals of such courses.



Fig. 1. The spectrum between perfect fulfilment of all relevant codes and regulations and misconduct.

Research institutions may introduce RI courses to prevent serious violations of good scientific practice—including research misconduct. For institutions motivated in this way, it will be an important aim of the RI course to ensure that the participants are informed about relevant codes and regulations and given sufficient training to develop the skills they need to determine whether a given behaviour, in a specific context, would be compliant with these codes and regulations. In addition, the RI course should aim to motivate the participants to comply with the relevant codes and regulations, even when, for example, the possibility of major personal gain is tempting them not to comply. In short: a minimal aim of RI courses is that participants achieve sufficient knowledge, skills, and motivation to comply with relevant codes and regulations.

Adopting such a minimal aim, easily suggests also adopting a legalistic approach to RI teaching, although this might not actually be the best approach to reach the stated goal. [Pennock and O'Rourke \(2017\)](#), for instance, noted that introducing RI as a set of rules that are imposed on the researcher from the outside is unlikely to motivate compliance (see also [Bebeau \(2014\)](#) and [Stephens and Wangaard \(2016\)](#)).

Beyond compliance, research institutions committed to fostering and maintaining RI may also see RI courses as the primary means to develop RI in researchers. The goal thus becomes that researchers learn to understand and adopt the core values of their field and learn to perform their professional tasks in accordance with those values. In doing so, they not only comply with codes and regulations—in the sense that they cannot be formally reprimanded for their conduct—but they also seek to embed the values underlying the responsibilities described in the said codes of conduct because they find them important in themselves and believe that they will lead to a desired development of science. This results in what can be labelled “a flourishing research life”, meaning researchers will be able to contribute to the body of scientific knowledge and do this in an inclusive, competitive, and fair work environment. Thus, such researchers seek to embed the values of the scientific community aiming at RI in their work, not out of fear of punishment or because of outside pressure, but because they have integrated the values into their own value system and thus seek to live by them because they want to, not because they have to.

The difference between aiming for compliance and aiming for fulfilment may be substantial in some areas. Within a given topic, such as communication of research results, a full spectrum exists between the most laudable behaviour showing perfect fulfilment of the researcher's responsibilities and the most egregious misconduct (see [Fig. 1](#)). In the case of communication of research results, intentional plagiarism of other researchers' significant intellectual contributions will, in severe cases, be considered research misconduct and sanctioned accordingly ([ALLEA 2017](#)). At the other end of the spectrum, we find perfectly transparent communication of results that, among other things, enables the competent reader to replicate the study and makes all relevant conflicts of interest explicit.

Somewhere between these extremes, we find the (blurred) line that separates compliant from noncompliant practice. However, as illustrated in [Fig. 1](#), there is often a significant light grey area between minimal compliance and perfect fulfilment and, adjacently, a dark grey area between minor noncompliance and genuine misconduct. Referring to communication of research results, for instance, we find intentional self-plagiarism, including multiple publications of the same results without appropriate cross-referencing, in the dark grey area between misconduct and compliant behaviour. Although self-plagiarism is not necessarily considered misconduct, research institutions may still see it as noncompliant behaviour, and it may even be sanctionable depending on the institution and (or) national legislation. In the light grey area, for example, we find publications in which the methods section is too vague and general to make the study easily replicable, even for a very competent reader. Although this kind of research communication is suboptimal, it is hardly something that would justify a formal complaint. Still, it may be argued that suboptimal behaviour is harmful to the overall aims of science, and that RI courses should not merely focus on making sure that participants occupy the compliant end of [Fig. 1](#), but also motivate and enable them to work towards real fulfilment of the responsibilities laid out in the relevant codes of conduct.

In addition to the minimal aims described above, we therefore suggest a more ambitious aim of RI courses—participants should achieve sufficient knowledge, skills, values, and motivation to fulfil the responsibilities defined in the relevant codes of conduct. The knowledge, skills, and motivation a researcher needs to meet this ideal may differ somewhat from those needed to achieve compliance. More knowledge and skills will probably be needed, just as a different kind of motivation will be necessary (see Section 3). Whereas the minimal aim of an RI course may not be ambitious enough given a commitment to RI, the second formulation is very ambitious. In reality, an RI course is likely to be fairly short ([Committee on Assessing Integrity in Research Environments 2002](#); [Abdi et al. 2021](#)), so it is unrealistic to expect it to provide researchers with all the knowledge and skills they need to fulfil their professional responsibilities, just as the embedding of a motivation that goes beyond mere selfish reasons needs more time to develop in those where it is not already present.

This leads us to a third formulation of the overall aim of RI courses—to begin to develop participants' skills, values, and motivation they need to fulfil the responsibilities defined in the relevant codes of conduct and to give those participants a well-defined subset of the knowledge they need to fulfil those responsibilities.

We next expand on the ideals of phronetic RI teaching and in more detail describe what the third formulation of the overall aim of an RI course entails. As discussed further in Section 4, it will depend on the course setting how far the development of skills and motivation can go and how much knowledge can be provided: How much time is available? How many participants are there? How is the course integrated with other elements of the training as a PhD? How important is the course perceived to be by supervisors, etc.? All of these factors will influence how far an RI course can realistically take the participants.

3. Phronetic RI teaching

We believe that the overall aim of phronetic RI teaching ought to be aligned with the third formulation of the overall aim of RI teaching described above, with the addition that the values, skills, and knowledge in focus include those that constitute research phronesis. Phronesis (practical wisdom) as a technical term originates from virtue ethics (for a general introduction see [Hursthouse and Pettigrove 2018](#)). To grasp the notion of research phronesis, it helps to consider that in virtue ethics the focus is primarily on the good person and only secondarily on good deeds. The good person has internalised a set of virtues (“arête”) to an extent where they have become second nature as described with RI in the previous section. Examples of general moral virtues are honesty, courage,

justice, and kindness. Other virtues relevant for scientific practice may be derived from the values emphasised in relevant codes of conduct or upon reflection on the aims of scientific practice in general and the specific practice in particular (e.g., following the lines of reasoning outlined by Pennock and O'Rourke (2017)). Following the *European Code of Conduct for Research Integrity* one could thus suggest that the central virtues to bring into attention in a RI setting would be reliability, honesty, respectfulness, and accountability (ALLEA 2017).

However, in addition to internalizing relevant virtues, the virtuous person needs the intellectual virtue of practical wisdom (phronesis) that enables the virtuous person to weigh and express the different virtues in the multitude of specific situations and contexts that a human life is made up of. For example, to be virtuous is not “just” to be honest, but to be honest in “the right way, towards the right objects, for the right reasons, to the right degree, on the right occasions, in the right manner, and to act accordingly . . .” (Hursthouse 2007, p. 161) and at the same time combine this with other virtues relevant in the situation, e.g., kindness.

As can be readily observed from this description, virtues are not skills that can be easily transferred from one person to another as if they were a sort of simple tool to operate (e.g., a garlic press). Rather, they are character traits that develop over time, if practiced, and need to be combined with practical wisdom (phronesis) to be expressed rightly. In that sense, they are like a craft more than a simple skill. As Aristotle remarked in his *Nicomachean Ethics*:

“The virtues, by contrast, we acquire by first engaging in the activities, as is also true in the case of the various crafts. For the things we cannot produce without learning to do so are the very ones we learn to produce by producing them—for example, we become builders by building houses and lyre players by playing the lyre. Similarly, then, we become just people by doing just actions, temperate people by doing temperate actions, and courageous people by doing courageous ones.” (Aristotle 2014, p. 21)

In relation to RI, virtues then need to be developed over time and research phronesis is the intellectual virtue that allows a person to act with RI (on the basis of the right virtues) in specific situations.³ Mejlgård et al. (2019) reviewed a diverse set of RI teaching activities across Europe and found that many use some kind of phronetic approach. While many have been arguing for the benefits of phronetic approaches as opposed to more legalistic teaching (Chen 2015; Meriste et al. 2016; embassy.science/wiki/Theme:520b3bc7-a6ab-4617-95f2-89c9dee31c53), a detailed account of what knowledge and skills constitute research phronesis is missing (Kristjánson 2015). Having such an account would be beneficial for at least three reasons. First, it might be easier to assess whether participants have made progress towards research phronesis. Second, it would be easier to assess which aspects of research phronesis are most suitably pursued in RI courses and which should be left for other kinds of RI training. Finally, it would enable institutions to coordinate the aims of RI courses with other forms of RI training. Next, we therefore synthesize and expand some of the existing understandings of research phronesis into a more detailed account.

3.1. Components to research phronesis

Our aim in this section is to further develop existing sketches of components of research phronesis in a way that is fruitful for the development of RI teaching. Such an account will build on classic accounts of phronesis, including Aristotle's, but we do not wish to claim that our account is true to

³If one wants to maintain a distinction between research ethics and (the subject) research integrity, one might add here that the situations should involve the responsibilities defined in the relevant codes of conduct (cf Section 2). While this may limit the application of research phronesis, it does not change its nature as a virtue nor the way in which it is achieved.

these. Rather, we rely on the general framework of virtue ethics more than we present a detailed account of how this approach fits into the different understandings of virtue ethics.

Phronesis is traditionally linked to finding appropriate solutions to concrete ethical problems. Some take phronesis to also include the ability to identify such problems and character traits that lead the person to do what they think is right. From an RI teaching perspective, we find this more inclusive view fruitful. We therefore follow [Darnell and colleagues \(2019, p. 118\)](#) who defined phronesis functionally as that which enables an agent “to perceive what the salient features of a given situation are from an ethical perspective, and to see what is required in a given situation as reason(s) for responding in certain ways”.

In addition to this constitutive function, [Darnell et al. \(2019\)](#) argued that phronesis has an integrative function: it helps you identify the appropriate action in a given situation by enabling you to identify actions that not only express individual virtues, but actions that also, to the extent possible, integrate all relevant virtues in the right balance. Given this functional characterization of phronesis, [Darnell et al. \(2019\)](#) listed two central components.

First, phronesis includes a conception of the good life (known as “eudaimonia” within the tradition of virtue ethics), a sort of blueprint of the kind of life to strive towards where the researcher’s full potential is expressed. [Darnell et al. \(2019, p. 119\)](#) emphasised that having a blueprint does not mean having a “sophisticated comprehension of the ‘grand end’ of human life”. However, they did adopt [Kristjánson’s \(2015, p. 165\)](#) definition of a blueprint as “a consciously accessible, comprehensive, and systematic—if also flexible and open-textured—conception of what makes human life go well”, which does seem to be rather demanding. For research phronesis, something less might do: a consciously accessible and comprehensive conception of the aim(s) of scientific practice and what it means to do well as a researcher, including (as mentioned in Section 2) the experience of contributing to science within a good work environment. We will argue that having such a blueprint is very valuable in every step of the RI decision process.

Secondly, [Darnell et al. \(2019\)](#) argued that phronesis includes “emotional regulation”, meaning that the agent’s emotions are in line with their ethical judgements. Ethical actions feel right, immoral actions feel wrong. The agent feels joy and satisfaction from incarnating the relevant virtues and remorse when not. This reflects our earlier statement that the researcher acts from a place of understanding and acceptance of the values behind RI, and not from fear or pressure. [Darnell et al. \(2019\)](#) argued that this component is important to ensure that there is motivation to do the right thing (see also process 4 below).

[Mejlgaard and colleagues \(2019\)](#) further showed that the skills of being able to critically reflect on one’s own research practice and in engaging in discussions on the aims, governance, and practice of science as aspects of research phronesis that are often emphasised in phronetic RI teaching. They further argued that this emphasis is well grounded in theoretical considerations, partly because it helps develop the abovementioned blueprint of the good research life.

In addition to these components, we can derive further components by considering the function of research phronesis in each of the four processes, identified by [Stephens and Wangaard \(2016\)](#) (see also [Rest \(1983\)](#)), which must be completed to act ethically in relation to an RI issue. These processes are:

1. Realizing that the issue has an ethical aspect—in addition to legal and methodological aspects for example.
2. Realizing that it is (at least partly) your responsibility to act.

3. Finding out what the ethically right action is.
4. Possessing the will (and perhaps the courage) to act ethically.

We consider each process in turn.

3.1.1. Identifying RI issues

While it is usually obvious that misconduct and detrimental practices at the darker end of [Fig. 1](#) are ethically problematic, it may be less clear in other cases, especially if a researcher lacks the guidance of the blueprint mentioned above. Gift authorship and salami publication are examples of areas where, in our experience, young researchers are sometimes surprised to discover that there are important ethical questions to consider in addition to custom and law. A certain amount of knowledge and reflection is often necessary to see that a practice has a negative impact on public trust in science, the quality of scientific research, or the fairness of competition among researchers, for example, partly because those impacts are often the sum of many small individual contributions which in themselves seem relatively harmless. To aid such reflection, it is often helpful to introduce relevant concepts and distinctions, e.g., to simply point out that authorship comes with both credit and responsibility. Case studies may also be relevant, especially if they are authentic and rich ([Committee on Assessing Integrity in Research Environments 2002](#), Chapter 5).

3.1.2. Responsibility

Even when researchers are able to describe an RI issue in relation to a practice they are involved in, they will not necessarily feel that it concerns them in the sense that it is their responsibility to do something about it. They might believe, for instance, that responsibility for dealing with the issue lies elsewhere, perhaps at the institutional level. In some cases, this will be true. In others, it will be only partly true. Even when they recognize their own responsibility, individual researchers can feel powerless. Research phronesis therefore requires one to understand the distribution of responsibility among individual researchers and research institutions, and to see how personal responsibility and possibilities of action may depend on such things as seniority. It also requires one to grasp that one has a personal responsibility to contribute to the aims of research through one's daily practices—even if these are embedded in countervailing institutional practices. In addition, the researcher must be aware of both the formal and the informal routes through which to challenge detrimental practices.

3.1.3. Finding an appropriate solution

The core of RI as understood here within a general virtue ethics framework is the ability to understand the situation and express the relevant central virtues properly. This is why research phronesis is essential in the process: partly because of the lack of clear action guidance discussed in the relevant codes on conduct ([Schmidt 2014](#)) and partly because the right course of action is often highly context dependent. Gaining research phronesis therefore implies gaining skills and experience in analyzing complex situations from an RI perspective with the aim of determining what the good researcher would do in those situations. [Meriste et al. \(2016\)](#) emphasized that research phronesis includes sensitivity to details. Cases that from a legalistic perspective are very similar, e.g., two cases of gift authorship can be very different from a virtue ethics perspective because of differences in power relations among the people involved.

As can be readily understood from the above, research phronesis contains an important knowledge component. When deciding what to do, for instance whether to report a peer or to confront them personally, an adequate understanding of the post-reporting process (the legal ramifications, possible sanctions, etc.) is valuable. Furthermore, even as codes of conduct can only rarely (if ever) be used to determine the appropriate action in a specific situation, they may still in some cases constrain

and guide the choice and in this sense make it easier. Knowledge of rules and guidelines is thus a part of research phronesis, just as it is a part of the knowledge that should be provided in legalistic RI teaching, although the emphasis may be different in the two types of teaching (see Section 4 and Resnik (2012) and Meriste et al. (2016)).

In addition to rules and guidelines, role models also play an important part as exemplars when young researchers develop research phronesis, and it is an important function of an RI course to make the participants aware of this so that they choose their role models more consciously. Furthermore, RI courses can provide valuable concepts and perspectives that can be used in the ethical analysis of complex situations through contemplating context-rich cases. Two examples of perspectives that we have found valuable to emphasise in case discussions are: (i) challenging participants to think in terms of the fulfilment of their professional responsibilities rather than compliance with relevant codes and regulations (which is how many participants initially approach the cases) and (ii) challenging the participants to consider what kind of researcher they would like to be in addition to considering what they would do in the concrete case, making them aware that the choice they have to make is not only about what they want to do but also about how they want to shape their personal character.

3.1.4. Will and courage

Finally, researchers need the will and (or) courage to act while at the same time not being reckless. We know from previous studies that young researchers are generally reluctant to report misconduct and detrimental practices to relevant authorities (Horbach et al. 2020). However, more are willing to react in other ways, for instance by confronting the perpetrator (Goddiksen et al. 2021). Reluctance to act often stems from either a lack of perceived responsibility (discussed in Section 3.1.2) or from a fear of negative consequences, which could either be in the form of ruining a relationship with a colleague or supervisor or fear that reacting will be damaging to his/her career (Horbach et al. 2020).

Other things being equal, researchers who have internalised the core values of their field as virtues are more likely to be willing to act rightly, but they may still not do so out of fear of jeopardizing a fruitful collaboration or perhaps even their careers—even though this will not happen to the fully virtuous person, it seems fair to assume that most of us are only on the way towards that ideal. Thus, the fear for negative personal consequences from reporting a senior colleague, for example, may cause researchers to falsely conclude that what would otherwise be considered the right action in this context is reckless and not courageous, even though it may lead them to focus more on avoiding similar situations in the future. In other cases, mitigating measures such as whistle-blower procedures may be in place at an institutional level to protect the individual from the potential repercussions of standing up for RI. However, these may be unknown to the researcher or simply not in place or not trusted by young researchers. By informing participants about such measures, RI courses may therefore put the participants in a position where they need less courage than they would have otherwise required to take appropriate action—in addition to setting the internalization of virtues in motion and thus promoting the will to act. Research phronesis thus entails an important knowledge component in such cases, and again the importance of having a clear conception of the aims of research and the nature of a good research life as well as skills in thinking in terms of how to promote these are valuable.

However, as many RI courses are relatively short (cf. Section 2) the phronetic approach is challenged, as it is a method that basically requires continuous nourishment and development throughout a scientific career. In the following section we will describe how this apparent dilemma can be approached.

4. A case study

As an example of how the phronetic approach can inspire and guide a short RI course, we will describe RI training for PhD students at the University of Copenhagen (UCPH) at the Faculties of

Health and Science and discuss some practical challenges to phronetic teaching that we believe to be shared to a significant extent across institutional and cultural contexts.

4.1. RI courses at UCPH

Partly due to the misconduct scandal involving Milena Penkowa (Jensen et al. 2020, p. 33), RI courses have been mandatory in all PhD programmes at the Faculties of Health and Science UCPH since 2011. Since 2015, PhD supervisors at the faculties have also been required to attend a similar course, as have post-docs and assistant professors, unless they have gone through similar training elsewhere. The authors of this paper have been heavily involved in developing and delivering these courses over the years, especially the courses for PhD students.

At the faculties of Health and Science, the mandatory PhD courses in RI are 7.5 hours (usually taught in one day or split into two days) covering 5 themes: (i) introduction to RI, (ii) authorship, (iii) research data management, (iv) conflicts of interest, and (v) communication with the public.

They are run approximately eight times a year at each faculty, with 25–50 participants per course. The number of participants in each course is deliberately limited to allow interactive teaching and round table discussions. The teaching is an interactive mix of lectures and discussions based on real cases presenting grey area issues and constructed realistic scenarios.

A textbook has been developed specifically for the courses (Jensen et al. 2020) that covers the relevant codes and regulations, the enforcement of these in a Danish context, and presents a number of national and international misconduct cases. The textbook also contains a short history of RI. In addition, various online elements are either integrated into the teaching or provided as preparation for the classes.

4.1.1. Course aims

The RI courses discussed here exemplify how the official aims of an RI course may be rather minimal even though the actual teaching strives to achieve more ambitious aims. Officially, the course aims to “inform about current norms of responsible conduct of research and enable reflection on how to apply these norms” (UCPH 2018). After the course and related to the five course topics, the PhD student should be able to:

- “describe and discuss various forms of Research Misconduct: Fabrication, Falsification, and Plagiarism,
- describe how to draw the line between Research Misconduct and Questionable Research Practice,
- describe how allegations of Research Misconduct are raised and the principles for handling suspicions of Research Misconduct, and
- describe national and international institutions handling Scientific Misconduct or dealing with Questionable Research Practices” (UCPH 2018).

The official aims of the courses are thus rather minimal, as discussed in Section 2, and they focus heavily on the darker end of Fig. 1. Three aims are also relatively easy to achieve, given that a tailor-made textbook is available, as they simply require that the student is able to correctly describe some basic definitions and institutions that are carefully described in the textbook.

The teaching sessions tend to be mostly devoted to discussion of “current norms” and grey areas surrounding fabrication, falsification, and plagiarism in relation to the various topics. In these discussions, the teachers have considerable freedom to choose how to focus the sessions, and over the years

increasing attention has been given to the ideal of integrity, as opposed to the ideal of compliance,⁴ and there is a strong focus on the four steps described in Section 3: identification of relevant issues, understanding of distribution of responsibility, development of research phronesis, and development of will and courage to pursue the right action. Although various major misconduct cases are mentioned in the sessions to illustrate how such behaviour is counterproductive to a flourishing research environment and the possibility to contribute to the body of scientific knowledge, the focus is mainly on grey area issues that lie between noncompliant behaviour and perfect fulfilment of the researcher's responsibilities, such as data sharing, plagiarism, authorship issues, and transparency regarding conflicts of interests. In addition, time is spent in the introductory module discussing the aims of research and what characterizes a flourishing research environment that supports the fulfilment of these aims by allowing researchers to achieve their potential.

4.1.2. Exam

The course ends with an exam, in the form of a reflective assignment, where the participants relate the course contents to their own research project and discuss the best way to handle a (potential or actual) grey area issue that has arisen or might arise during their project. Participants are free to choose which theme from the curriculum they want to focus on in their assignment; However, they must address a grey area issue. A participant who describes an authorship issue where it is clear that authorship has been awarded unethically will thus not be allowed to pass even if he or she has demonstrated an ability to correctly apply the definition of when authorship is deserved presented in the Vancouver Recommendations (ICMJE 2017). So, the exam is a test, not so much of the participants' understanding of any particular concept in the curriculum, but rather of their ethical sensitivity and their ability to reflect on and discuss grey area issues in relation to their own research.

4.2. Challenges to phronetic teaching

When attempting to conduct phronetic teaching in an RI course, like the one described above, with significant time constraints and a significant emphasis from the institution on ensuring compliance, one needs to consider a number of challenges and objections to the choice of teaching strategy.

First, it should be considered that when the focus of the teaching shifts from ensuring that everyone complies with codes and regulations to fostering RI, it also shifts away from getting everyone to understand relatively simple but fundamental distinctions (like the one between misconduct and questionable research practices) and towards getting most participants to reflect on more complicated distinctions and grey area issues. Thus, it needs to be communicated clearly to the students that the textbook serves as the background for the teaching and the teaching will not simply be a lecture reiterating the main points of the book. Instead, within the limited time available, complex cases and grey area issues are prioritized. While the exam results show that most participants are indeed able to gain a sufficient understanding of the fundamental distinctions from the textbook—some, if not many, will find it a waste of time to be required to sit through a lecture going through these distinctions once more. There are of course, some participants, including some who never open the textbook, who do not succeed. Some of these participants probably would have succeeded if the emphasis in the teaching had been put on the more basic issues. In practice, therefore, the choice of a phronetic approach may also be a decision to lift the general level of RI rather than creating a shared minimal level. Such decisions should preferably be made at the institutional level.

⁴At the time of writing, discussions about whether to change the official course aim are ongoing—inspired by the development of teaching methods and goals since the initiation of the course. It should be noted that as of 2021, there are two mandatory courses in RCR for PhD students at the Faculties of Health and Science at UCPH. One to be taken within the first 12 months of the PhD with the content described here and one to be taken at the end of the PhD studies focusing on publication requirements, plagiarism, etc.

At many universities, the PhD population is a highly international and culturally diverse group. Some may be used to very hierarchical environments in which the professor is never questioned and the highest grades are awarded to those who can reproduce the curriculum most accurately. Others may have been brought up in very different academic environments emphasizing independence and critical thought, perhaps even at the cost of correctness. Such cultural differences can lead to challenges in RI training, as the cultural differences can lead to, for example, differences in the participants' detailed understanding of basic concepts like plagiarism or deserved co-authorships. Hence, it could be argued that it is essential to spend a significant amount of time ensuring that everyone has a shared understanding of core concepts like fabrication, falsification, plagiarism, and major breaches of questionable conduct of research, and that this, indeed, should have priority over any discussion of what constitutes a flourishing research environment. Against this, however, we argue that it is in precisely these cases that it is very important to discuss why issues such as plagiarism or undeserved authorships are a problem, and how transparent communication of research can promote the flourishing research environment. By not doing so, we increase the risk that participants will simply memorize the right things to say for the exam without securing any significant change in their values and future actions.

Further, by continuingly stressing that the flourishing research environment is an ideal that should direct researchers not only to create the highest quality science, but also because "it enables the individual researcher to live a unified and unalienated life and gives a strong sense of identity and self-respect" (Meriste et. al. 2016, p. 11); the intent is to provide a virtue-based motivation for attempting to fulfil relevant recommendations. The motivation is thus not only grounded in professional reasons, but also recognizes that there is a connection between the professional virtues and the personal experience of quality of life.

A final worry may be that without suitable institutional backing and formal and informal continuation of the training, phronetic teaching will largely be in vain, as there is no guarantee that the RI training initiated in a course will be continued as it needs to be. Thus, it may be suggested that any shift towards phronetic teaching should only be made once the relevant institution has established a suitable framework for continuous RI training throughout the PhD programme. While it would certainly be desirable to have full institutional backing before embarking on phronetic teaching, we would argue that a shift in teaching focus may be beneficial even when full institutional support is lacking. Although it may not be possible to realize the full potential of phronetic teaching in this situation, the classes may still be as effective as legalistic classes presuming the students either voluntarily or through the design of the exam become familiar with the content of the textbook. Additionally, the proposed approach may initiate a change, from the bottom up, in institutional emphasis if the teachers of the RI course can provide inspiring and effective phronetic teaching that provides the necessary knowledge and at least as a first step creates a curiosity towards the presented ideals and thus serve as a valuable platform for further RI training.

The lessons learned from the RI courses at the University of Copenhagen described here can be summarized like this:

1. Textbook material describing rules, regulations, codexes, etc., and relevant concepts should be read before the course to allow time for discussing grey areas instead of lecturing on what is written in the material used.
2. Focusing on grey area issues and the potential conflicts based on real-life cases and using student interaction and discussions as a didactical tool brings forth the complexity of RI and thus makes clear to students the need for research phronesis.

3. The exam should be centered around making the student describe how he/she would approach a case that happened or could happen to him/her and the possible inbuilt conflicts and dilemmas.
4. Ideally there should be institutional for continuous formal and informal teaching in RI throughout the careers of scientists, but even if this is not the case the phronetic approach can inspire students to continue their RI development.

5. Conclusions

RI courses for PhD students like the one described in Section 4.1 are important in developing research phronesis and eventually RI. But they cannot stand alone (Pizzolato and Dierickx 2021). A short course can develop in participants a valuable awareness of ethical aspects of research practice, a vocabulary in which to talk about these aspects, and familiarity with navigating grey areas through a first training set of cases, preferably from the entire spectrum presented in Fig. 1. Importantly, such a course can also provide motivation to seek to create a flourishing research environment and inspire hope that change is possible.

From our perspective, the goal of phronetic teaching in RI courses is to plant in the participant a seed of integrity, that given the right conditions can germinate. However, short courses will not ensure that the seed survives and grows. For this to happen, the seed must be nourished and cared for after the course is over, and for this, several things must be in place. First, the student must have the will and skills necessary to begin to develop his or her RI. The courses have an important role to play here, especially if there is an emphasis on the importance of understanding why it is important to promote RI, and the teaching inspires hope that it is possible to make a difference. Second, the environment around the student must be fit for the promotion of RI. Among other things, the senior staff must also have the will and the skills needed to act as positive role models and to provide the more informal RI training necessary to help students develop their RI. Institutions must therefore ensure that their senior staff have received sufficient training to be able and willing to take up and discuss RI-related issues, and take action when it is needed, to foster and maintain both institutional and personal RI.

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Author contributions

MPG and MG conceived and designed the study, performed analyses, and wrote the manuscript.

Competing interests

The authors have declared that no competing interests exist.

Data availability statement

All relevant data are within the paper.

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