

Choices in research ethics

Ph.D. students in the Centre for DNA Fingerprinting and Diagnostics, take a course in Research and Publication Ethics in their first year. For this year's course, I was one of the two instructors. For my classes, I either wholly contrived a few hypothetical scenarios, or drew upon my experience as a principal investigator to create them. Each was followed by three to four questions which the students answered 'yes' or 'no' with a show of hands. Most students had no difficulty selecting the correct answer to most questions. However, a few questions were incorrectly answered by a majority of students. I present here the ones that elicited incorrect answers. The exercise told me beginning Ph.D. students are unclear about conflict of interest, informed consent and full disclosure. Although the scenarios and questions were biology-centric, I tried to provide some background to make them more widely appealing. The students permitted me to use their responses for an article such as this.

Scenario 1: The RIP mutational process alters all DNA sequences present in more than one copy in the haploid genome of the fungus *Neurospora* by inducing tens to thousands of G : C to A : T point mutations in all the copies. Of hundreds of *Neurospora* strains examined, only one contained a multi-copy DNA sequence. This suggested that the strain was a suppressor of RIP. A student (*X*) performed a blind experiment to test this hypothesis.

X grew 15 *Neurospora* strains on 19 petri dishes. The putative suppressor was grown on 5, and 14 other strains were grown on the remaining 14 dishes. *X* handed the dishes to *Y*, who picked three dishes with the putative suppressor and seven others, relabelled them 1, 2, 3, ..., 10, and gave them to *Z*, who re-labelled them A, B, C, ..., J, and returned them to *X*. Thus there were two keys: one with *Y*, indicating which strains were coded 1, 2, 3, ..., and the other with *Z*, indicating which of 1, 2, 3, ... were relabelled A, B, C, Note that unless both keys are opened, no one can know which dishes have the putative suppressor. Low RIP efficiency was found for strains B, C and E, correctly identifying them as the suppressor. *Question*: Should *Y* and *Z* be co-authors of the paper reporting these findings? [12 voted yes, 6 no.]

The correct answer is 'no'. The blind experiment rests on the premise that *Y* and *Z* are disinterested in the outcome of the experiment. Co-authorship undermines this premise.

Students voting 'yes' did so to recompense *Y* and *Z* for their contribution. However, it was adequate and proper to note this in the 'Acknowledgements'.

Scenario 2: The Sentinelese of Andaman & Nicobar Islands are a 'Particularly Vulnerable Tribal Group'. The Government of India prohibits outsiders from within 3 miles of the island. Two research proposals to obtain their DNA for genome analysis are received for approval. One proposes that a police party will approach the island in a boat outside the 3-mile limit. The islanders will attempt to repulse the police with arrows. The police will retrieve the arrows from the sea, and the scientists will obtain human DNA from them. In the other, a drone will land on the island bearing mosquitoes in a net cage. Curious islanders are expected to examine the drone and a few will be bitten. After they leave, the drone will fly back and human DNA will be isolated from the mosquitoes. *Question*: Should either proposal be accepted? [9 yes, 9 no.]

The correct answer is 'no', because neither proposal states how informed consent would be obtained from the islanders. We had also just finished discussing the possibility that both proposals carried risks; one of inadvertent injury, and the other of mosquito-borne infection. That nine voted 'no' is an example of getting the right answer for the wrong reason.

Scenario 3: You are writing a research manuscript that describes four experiments which use the same 'controls'. *Question*: Which of the following options are acceptable? (i) To re-do a control for each experiment, and report results of the control performed alongside its experiment. [16 yes, 2 no.] (ii) Use the one good image from one control for all four experiments, and declare you have done so. [1 yes, 17 no.] (iii) Do only one control, and declare that its results apply to all four experiments. [10 yes, 8 no.] (iv) All of the above. [0 yes, 18 no.]

The correct answer is 'yes' to all the above options. Full disclosure safeguards you against allegations of misconduct. That many voted 'no' for (ii) and (iv) shows this safeguard is not widely appreciated. It is another matter that some referees might consider (ii) or/and (iii) as unacceptable shortcuts. But this fact was declared.

Proof of the pudding, the examination: More scenarios and questions were created for the course exam. Here is a sample.

Scenario 4: Continuing from scenario 1, another student (*W*) performed experiments to test if the ability of the *Neurospora* strain to suppress RIP depended on a gene for an error-prone DNA polymerase. For this, RIP efficiency was compared between suppressor strain derivatives from which the gene was deleted and those with the intact gene. The results suggested that the gene was indeed required for RIP suppression. *W* published these results, completed his Ph.D. and left the laboratory. Later, the PI asked a few new students to repeat the experiment but in a blind format. Now the students did not know which strains contained the deletion and which ones the intact gene. The earlier results were not reproduced. *Question*: Do you agree with the following statements? (i) *W* did his experiment as an experienced researcher, and his honesty and integrity were unquestionable. The blind experiment was performed by new and inexperienced students. Therefore results of the blind experiment should be disregarded. (ii) The results of the blind experiment cast doubt on *W*'s honesty and integrity. (iii) If an erratum is issued based on the blind experiment, then *W* should be invited to be a co-author.

Scenario 5: A mutant of a single-celled eukaryote shows increased sensitivity to an antibiotic compared to the wild type. You found a plasmid clone that complemented the mutant, whereas the control transformation with the empty vector did not. Images documenting these findings showed many colonies on drug-supplemented medium in the experiment versus very few in the control. You are preparing a poster to present these findings at a scientific conference. Unfortunately the image files are lost, and there was no time to repeat the experiment and obtain new images. *Question*: Do you agree with the following statement? (i) Since you vividly recall the images, you can report that you found a plasmid that complemented the mutant and symbolically represent the findings using +++ and + to designate the experiment and control results.

Scenario 6: You are refereeing a manuscript for a journal. You notice that some years ago its authors reported a screen for mutations affecting a particular physiological process. Each year they publish a paper on one or another mutant gene discovered in the original screen. The manuscript you are reviewing is another in this series. The authors have not yet reported the full list of genes uncovered on the screen. There are two points of view. One, the results of studies done with public funds should be speedily published to enable other research groups to also get involved and accelerate the research. This benefits society. The other is that authors should be free to decide how to report their discoveries. The PI might want to give individual mutants

to her/his students for follow-up research. If they report the list, others might compete with their students. You support the first point of view. *Question*: Which of the following statements are acceptable? (i) You demand in your comments that the authors include the full gene list in the revised manuscript. (ii) Imagine you are the journal editor. Referees are experts in the area therefore, if a referee demands the list, you should over-ride it.

It is an exam, so I will not reveal the correct answers.

The 'yes/no' format enabled us to cover many different topics in research ethics despite the limited number of classes. They included gender, caste, class and disability inclusivity, fairness in evaluating the research of others, whistle-blowing, pubpeer.com, impunity and dubious allegations misused to harass other researchers. The course certainly helped raise awareness. But is it realistic to expect it to reduce misconduct? I do not think so.

Misconduct occurs not as much out of ignorance as out of a perceived unlikelihood of getting caught and prosecuted. On the one hand, we measure academic success in ways that incentivize a relentless drive to obtain as many publications in high-impact celebrity journals as possible. On the other hand, most misconduct allegations are haphazardly and non-transparently addressed, and this does not disincentivize recklessness and inadequate oversight. The students grasped this dichotomy as is evident in their response to scenario 7.

Scenario 7: Stellar careers of academics at leading American Universities nose-dived following reports of alleged research and publication misconduct. Impressively, the allegations made at Stanford University were first reported in the student newspaper. Few academic leaders of comparable standing have suffered this fate in India. *Question*: Do you agree with the following explanations for why it is so? (i) Indian academic leaders are carefully vetted for honesty and integrity. [1 yes, 17 no.] (ii) An excessively competitive research culture in the West fosters misconduct. [0 yes, 18 no.] (iii) We do not probe misconduct allegations in a timely and fair manner, and it is harder to question authority in India; consequently the outcomes of misconduct investigations remain obscure. [18 yes, 0 no.] (iv) Media fails to follow up on allegations and investigations; hence it is easier to brush them under the carpet. [18 yes, 0 no.] Need I say more?

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