AUSTRALIAN INSTITUTE OF PHYSICS
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Australian Council of Deans of Science

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Dear Susan,

Thank you for sharing the draft of your revised Science Threshold Learning Outcomes for consultation, and for the work that went into the revision of these TLOs.

We have discussed the draft within the National Executive of the Australian Institute of Physics. While we are generally in agreement with most parts of the document, we believe there is one key aspect that requires an essential correction:

Statement that Science is an evidence-based inquiry seeking objective truths

The principal characteristic of science is that it is an evidence-based endeavour that seeks to establish objective and verifiable truths that are independent of belief or opinion. Scientific methods are designed so as to enable this goal.

The current draft version – and also the current published version – of the Threshold Learning Outcomes do not express this fundamental principle.

In our view, this fundamental principle needs to be upfront and central to the definition of the nature of science. We strongly recommend to include a statement such as the following as the first item in section "1 Understanding Science":

> *"recognising the nature of science as a form of evidence-based inquiry that seeks to establish objective [and verifiable] truths [facts] independent of belief or opinion, and articulating the methods and principles that enable it"*

The principles articulated as items 1.1, 1.2 and 1.3 (contestability; testability; social context; subjection to bias) in the draft revised TLOs are, of course, highly important, and are well articulated. However, they need to be a qualification of, and therefore secondary to, the overarching principle articulated above.

The above issue represents our sole serious concern with the revised TLOs and requires, in our view, a correction.

We also wish to comment on several other aspects below, none of which represent substantial concerns.

Critical evaluation of science's role in problems facing humanity (sect. 4.2)

We agree with the learning outcome expressed in 4.2 that science students should learn to explain (and to 'critically evaluate') the role of science in the context of problems facing communities or humanity.

We question, however, whether there is an actual benefit in providing a list of specific problems. There is a risk that including some problems in the list but not others creates a perceived ranking of 'problems' and a risk that the list 'ages'.

Should this section on science's role for society include, in addition to the context of "problems", also include a mention of the potential for economic or technological development? An obvious item left out from the list is "artificial intelligence", with all of the problems, risks and potential it creates.

Finally, should science's impact through societal and/or ethical challenges that we face as a result of scientific discovery be referred to? (such as, in a military context, the Manhattan project/atomic bombs or AI controlled automated arms or, in a medical context, the ethical challenges related to ability to predict likely fatal or detrimental disease)

Re-introduction of reference to regulatory framework

It is our view that the sentence "Demonstrating knowledge of the regulatory frameworks relevant to their disciplinary area and personally practising ethical conduct." (item 5.3 of the *current* version of the TLOs) should be reinserted in section 5. Its content is, in our view, of greater importance and greater clarity than the statements in item 5.3 (of the revised TLOs), particularly the reference to the fashionable but poorly defined term "global citizen".

If section 5 requires an amendment compared to its original version, an express mention of the scientist's responsibility to "ensure and uphold scientific integrity" and to an "unequivocal commitment to evidence-based and truthful practice" is, in our view, timely and important.

Ability to discern scientific results from less well-founded claims and from misinformation

In an age when it becomes difficult for a lay person to discern scientific results from other (less well founded) claims or reports, should the TLO's include an ability to discern science from less well founded claims or from deliberate misinformation?

Perhaps, section 3.1 could be changed to read "gathering and synthesising and critically evaluating information from a range of sources, and evaluating their scientific merit and reliability".

We wish to thank you and the ACDS again for your work on this initiative.

Kind regards,
Prof Gerd Schröder-Turk, AIP Special Project Officer for Policy
Professor Nicole Bell, AIP President

– on behalf of the Australian Institute of Physics National Executive –

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