



# How will COVID-19 change how we teach physics, post pandemic?

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Published online: 20 July 2020  
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On 4 May 2020, the National Executive of the Australian Institute of Physics (AIP) and the chair of the AIP accreditation committee released a position statement entitled “Temporary replacement of face-to-face classes by online delivery in physics courses impacted by the COVID-19 pandemic”. This statement, which incorporates feedback by AIP members, is intended to inform a constructive open debate on the longer-term impacts—positive and negative—of the COVID-19 pandemic on physics education. As it looks certain that the COVID-19 pandemic will have profound and financial impacts on Australia’s tertiary sector, it appears timely for the physics community to articulate clearly what it values in its degree programs while also critically assessing the potential for positive change.

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This article is a reprint of the article with the same title published in *Australian Physics*, the magazine of the Australian Institute of Physics (Volume 57, Number 2, Apr-May 2020, p 8-10), reproduced with permission by the authors and the editors of *Australian Physics*.

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The statement is a joint statement developed by the AIP National Executive and the Chair of the AIP Accreditation Committee. It should be attributed to these committees rather than individual authors.

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There can be little doubt that the COVID-19 pandemic and its secondary effects (such as on university finances) will have both immediate and also long-term implications for physics education. The sudden change to online delivery—expertly implemented by physics academics and teachers around the country—has sustained learning and student progression through the crisis. Yet it throws up questions, opportunities, and risks that will affect our educational practices long-term and thus warrants reflection.

The National Executive of the Australian Institute of Physics (AIP) and the chair of the AIP Accreditation committee believe that these questions are of significance and urgency for our physics community, and have formulated a position statement, released in final form on 4 May 2020 [1]. The executive summary and the full statement are reproduced below.

This article provides a brief description of the member consultation process and a call for members to continue to engage in this immensely important discussion about the future of physics education in Australia.

## Consultation process and feedback

On 9 April, the National Executive released a preliminary position statement and circulated this to all AIP members for consultation and feedback [2].

In response, we received 77 emails with feedback. The vast majority of respondents offered unqualified endorsement or agreement or strong support (61) or were supportive (6). Three respondents were expressly opposed to the statement, and a further 7 made comments but did not indicate agreement or disagreement. The position statement presented here incorporates the response to the feedback received, while maintaining the key themes that received such resounding endorsement from a very clear majority of the members who responded.

We summarise the most common suggestions for improvements: All up about a dozen respondents commented

that the draft statement appeared somewhat dismissive of the positive changes that may come out of the COVID-19 pandemic or of innovative teaching methods more generally; or that the expectation to return to best practice implied a too rigid adherence to the pre-pandemic status quo; or that the statement lacked an expression of recognition for the academics' and teachers' efforts in transitioning online at short notice. The final statement has been revised in response to these suggestions.

The AIP Executive expresses its gratitude to all members who submitted detailed and carefully presented feedback. All members are invited to contribute further and in detail to this debate, through letters to the editors of the *Australian Physics*, see below.

### Continuing the conversation

The key purpose of releasing this statement is for it to act as a catalyst for a broad and open debate on this important topic.

The physics community, and hence the AIP, needs to be central to this discussion. It is a safe assumption that the majority of our members are graduates, alumni or current students of a physics degree, from Australia or overseas. That is, on an individual basis, we have first-hand experience about what worked (or works) for us in our physics degrees and what did (or does) not. Because of this experience, we should assert our voice—or rather our multiple voices—in this debate, loud and clear.

The prepared statement reflects the view of the AIP National Executive and the Chair of the Accreditation Committee that physics degrees and education are, as they stand, generally of high quality and fit-for-purpose. Our degrees succeed in educating graduates that meet the demand for highly capable, analytical and independent thinkers with solid technical and computational skills. Of course, we need to constantly review the teaching and learning of Physics in Australia with respect to educational innovation and opportunities. But we also need to identify and articulate clearly the positive elements of our current (pre-COVID) practices—those pillars that ensure its ongoing success—and ensure that these are preserved in times of change and times of tight budgets.

One theme that has been given a stronger voice during the discussion of the “COVID-19” position statement for physics education was with us already as a quiet murmur. It is how do we continue to establish and re-establish the value and benefit of a degree like a physics degree, for students, education funders, and employers; in a nation such

as ours; in an education system where the majority of students cannot devote their time and attention to their studies in the way that would best serve their higher education. We can continue to look to nations like the UK, with envy, for the value that physics and related degrees hold there, or, is it time for a “bang” or at least a “meaningful whimper” on such issues here in Australia, from our community. Is the pandemic an opportunity to reassess, renew, rebadge, and redeploy our physics values.

Over to you! We would like to see some good solid debate on the statement and related physics education issues. Whether you are a student, an industry professional, an academic, a teacher, a professional scientist, an employer, an emeritus, a *hidden physicist*, a physics aficionado or otherwise, we would like to hear your opinions and arguments, both for and against the statement. We would also like to hear your suggestions as to what further steps the AIP could take to protect or enhance the high quality of Australia's physics degrees throughout and beyond the COVID-19 pandemic and how to promote the appreciation of this beyond our community.

Feedback for publication is encouraged in the form of letters to the editors of *Australian Physics* ([aip\\_editor@aip.org.au](mailto:aip_editor@aip.org.au)). Alternatively, feedback can be submitted by email to [feedback@aip.org.au](mailto:feedback@aip.org.au).

### Summary of statement

The Australian Institute of Physics (AIP) recognises the challenges posed by the COVID19 pandemic for tertiary and secondary education. The AIP applauds the academics and teachers, and their universities and schools, for their success in maintaining teaching and learning through online delivery during this crisis. However, the AIP's position is that the adoption of a fully online delivery mode should be a short-term emergency response, and should not become a ‘new normal’. The AIP contends that the high quality and high standing of physics education in Australia stems from large face-to-face and hands-on curriculum components, from high levels of student–student and student–teacher interactions, and from invigilated examinations. The AIP encourages a public discourse on the nature of physics education post-COVID19. This discourse should consider opportunities for positive change and the long-term adoption of innovative technologies and teaching methods; yet, it should occur with an appreciation of the success that face-to-face and hands-on physics education has had in producing high quality science graduates.

## Temporary replacement of face-to-face classes by online delivery in physics courses impacted by the COVID-19 pandemic

### Full statement

The AIP joins other institutions in recognising that the COVID-19 pandemic has created significant challenges in many areas of education. As universities and schools are responding to this crisis, some well-founded practices and standards are temporarily compromised.

In the contexts of university undergraduate and senior-level high-school teaching in physics, the crisis responses include foremost the replacement of the face-to-face learning activities of our current curricula with a range of online activities. The AIP endorses these replacements as short-term crisis management measures and applauds the academics and teachers, and their universities and schools, for their success in maintaining teaching and learning through online delivery. It recognises the creative and swift development of high-quality online learning material, and the long-term value of these resources for physics education.

However, the AIP's position is that the adoption of what is a predominantly online delivery mode should be viewed as a short-term emergency response, to be implemented for the duration of the present crisis. It should not become a 'new normal'.

The AIP contends that the high quality of Australian physics degrees stems from large components of the curriculum being taught hands-on and face-to-face, by way of laboratory-based classes, small-group interactive tutorials, engaging and interactive lectures, individual or collaborative projects, supervised thesis projects, industry placements, and including invigilated examinations. Beyond the individual curriculum components, the social structure of the degree programs with extensive student–student and teacher–student interactions—and the community of learning that these create—are integral to high quality physics programs.

The AIP's position is that this structure and format has provided, and continues to provide, Australia with physics degrees of high quality and international standing.

The above assertion of the value and quality of our degrees should not be confused with an opposition to change. The AIP recognises that, like physics itself, physics education is continually evolving alongside developments in technology and society and that there

are instances where the COVID-19 pandemic can act as a trigger for positive change. The AIP encourages the development of novel technologies and methods that enhance learning and teaching or that achieve other merits, such as broader or more equitable access to physics education or a reduction of our institutions' ecological footprint.

Through the accreditation process the AIP fulfils an important function in providing independent quality assurance of physics degrees in the Australian higher education sector. In addition to setting standards for physics graduates, it seeks to represent employer groups of those graduates. The AIP's links with professional associations and governing bodies for physics throughout the world ensure that Australian physics qualifications are of a known standard compared to qualifications in other countries. The nation benefits from maintaining international standards and competitiveness at all times, but never more so than in unprecedented times.

In its quality assurance role and through publicising this statement, the AIP will add its voice to the public discourse about the opportunities and risks arising from the long-term effects of the COVID-19 crisis on the quality and international competitiveness of science education in Australia. This is a particularly pressing topic due to the inevitable, but as yet uncertain effects of the COVID-19 crisis on university budgets in the post-crisis era.

Beyond COVID-19, in all likelihood, Australia and the world will face many and varied challenges, most prominently the manifold impacts and implications of climate change. The availability of high quality scientists including physicists will be essential in understanding, mitigating and overcoming these challenges. With a view to ensuring that the next generation be afforded the best possible educational opportunities, the AIP is committed to contributing towards ensuring the maintenance and ongoing improvements of Australia's educational system, throughout and beyond the turbulence of the COVID-19 pandemic.

### References

- The final statement released on 4 May 2020 can be accessed here: <https://aip.org.au/covid-19-teaching-position-statement>  
 The preliminary statement released on 9 April can be accessed here: <https://aip.org.au/covid-19-teaching-preliminary-statement/>

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