AN ONLINE PHYSICS DEGREE FOR SCIENCE TEACHERS

Elizabeth Angstmann

Presenting Author: Elizabeth Angstmann (e.angstmann@unsw.edu.au)
School of Physics, University of New South Wales, Sydney NSW, 2052, Australia

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There is a shortage of physics trained high school teachers in Australia, like in many countries. The fraction of high school students choosing to study physics in their final years of schooling has been dropping. In 2021, only 12.8% of final year students chose to study physics in New South Wales (NSW). The proportion of students choosing to study physics is even worse for female students, with only 17.9% of the students studying physics identifying as female, the average over the past five years has been 22.3% (Board of Studies NSW, 2022). The gender ratios among teachers closely matches the gender ratios of students, while over 55% of secondary teachers are female, in physics, under 30% of teachers are female (Weldon, 2015). The fraction of students choosing physics in rural high schools is even lower, and the shortage of physics teachers even more dire. In Australia, we also have a problem with teacher attrition, with many sources reporting that around 30% of teachers are leaving the profession in the first five years (Weldon, 2018). To increase the number of students choosing to study physics and improve diversity among this cohort, we need well trained physics teachers who can enthuse students in junior high school.

To address these problems, in 2018, I introduced an online Graduate Certificate in Physics for Science Teachers. Since its introduction, 33 students have completed the degree, 26 women and 7 men, with numbers trending upwards (there was a dip in 2021 because of COVID workloads on school teachers). Around half the teachers enrolled in the degree work in rural schools. By training established teachers in physics, rather than training physicists how to teach, there is a lower attrition rate among the Graduate Certificate graduates than among graduates from teaching programs. Feedback from the Graduate Certificate graduates has been very positive: many have commented that it has improved their teaching of junior science. Inspiring students in junior high school, before they make their decision about what to study for their final two years, is key to shifting the fraction of students choosing physics related careers.

An online degree aimed at established teachers that covers both physics content and pedagogy is a useful tool to address the shortage of physics trained teachers and influence the teaching of physics in junior high school. Teachers who are confident in physics can link related concepts, helping students with their conceptual understanding, and contextualise what they are teaching to make it relevant to the students in their class. This has been shown to improve one's "Physics Identity", which in turn is linked to students persisting in physics (Hazari et al., 2010). A degree such as this one has the potential to address similar problems in other countries.

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