

AUSTRALIAN NUCLEAR FORUM

Nuclear Education in Australia

Policy

- a. The secondary education system should provide all students with at least an elementary knowledge of radiation and its effects (esp. background radiation), nuclear medicine and nuclear energy.**
- b. Secondary school and university level studies in specific sciences and technologies should include nuclear content consistent with the field and associated fields being studied.**
- c. University level courses of study should be offered as necessary to develop the nuclear expertise required within the country.**
- d. Government agencies involved with nuclear matters should do their part in improving public understanding of the technology.**

(Adopted 3/3/06)

Summary and Conclusions

ANF members collectively have long and varied experiences with the public misunderstandings of nuclear science and technology. They attribute this to the secondary and tertiary education systems' failure to impart to most students a basic factual knowledge of present applications and future developments. This lack of basic understanding leaves the public receptive to those who seek to instill a distorted picture of the technology for their own purposes - a situation generally not consistent with a democratic society.

Australia does very little to educate its citizens about nuclear science and technology. In fact most Australians do not have any formal education in such subjects. Considering the widespread applications of nuclear science and technology existing in the world, these subject areas should be understood at least in basic terms by all citizens. Consequently the ANF believes that an elementary understanding of nuclear science and technology should be provided to all secondary students, and that secondary and university level students specialising in various scientific and technical fields should be provided with the nuclear content pertinent to their studies.

Universities should also offer education in nuclear science and technology subjects consistent with applications within the country regardless of political pressures. In addition government agencies involved in nuclear matters should accept their obligation to provide objective information to the public.

Considerations

1. Public Knowledge of Nuclear Science and Technology

ANF members, being experienced in the field, are fully aware of the lack of knowledge of nuclear science and technology amongst the public. This lack of knowledge is so acute that members of the public generally cannot provide an informed opinion about any nuclear issue. This ignorance is used by the purveyors of nuclear misinformation for their own political purposes, and taken advantage of by politicians who, paradoxically, are often well informed on the subjects. This has led to a situation where government policies on nuclear matters are primarily based on party politics - a prime example being the three-uranium-mines policy of the ALP government introduced in the 1970s.

2. Nuclear Education at the Secondary Level

Nuclear science has been taught in the secondary schools but in ways that vary in time and by state, subject, age, and the knowledge and biases of the teachers. Nuclear matters arise in many subject areas from social studies to physics and may or may not be specified in the corresponding curricula or even taught as intended, depending on the schools and teachers involved. For example a book commonly used in literature studies is "Z for Zachariah" which is basically anti-nuclear. On the other hand, most science teachers are reasonably objective but they may also have their own biases and misunderstandings that can provide distorted views to their students.

NSW has recently introduced a general science curriculum that does include some nuclear content and is applicable to all students by the time they finish year 10 (thus catering for those leaving then). As with most such curricula it has been devised primarily by the educational community with little reference to outside sources. Unfortunately, in the view of the ANF as laudable as it is, this curriculum and comparable ones in other states still miss imparting the essential understandings of: radiation and its effects (i.e., sources, uses and natural background radiation), nuclear medicine (which most will encounter) and nuclear energy (a major source of the world's electricity). Students going on to years 11 and 12 generally start to specialise and those that aim for a career in science, particularly physics, may obtain instruction in nuclear matters – depending on the factors mentioned above. However, a question from the 2001 NSW HSC 2 unit physics exam is indicative of the problems in having nuclear subjects taught objectively, "Discuss the significance of this project [the Manhattan Project] for society"!

Australian resource materials specific for teaching nuclear subjects at the secondary level are also often deficient or distorted through ignorance or intent. Good information is available on the net however, and that provided on the web site of the Uranium Information Centre is very reliable but a majority of available web sites are sponsored by anti-nuclear groups promoting their standard lines.

3. Nuclear Education at the University Level

Most tertiary students do not go on to graduate studies so if they have missed out at the secondary level and do not receive nuclear science education as an undergraduate, they miss out all together. One would think that most undergraduate science and engineering students would be required to study first year physics (including introductory nuclear physics) but this is not always so depending on the university. Moreover, even when nuclear physics is taught it is usually toward the end of the course when, as a former head of the School of Physics at the UNSW related, it is then that course schedule slippages accumulate such that nuclear is often skipped over. Indicative confirmation of this was obtained by surveys of third year undergraduate engineering students carried out by ANF members at two NSW universities showing about half had any nuclear related education at all. Further, this situation will probably worsen under the current trend of de-emphasizing science in Australian universities.

From about 1961 the UNSW operated a School of Nuclear Engineering and a Department of Nuclear and Radiation Chemistry, but in 1986 both had disappeared respectively through disestablishment and reorganisation. (That this was done reportedly under pressure from the then federal government illustrates the vulnerability of the universities to political agendas.) However, the current situation for studies at the graduate level retains most of the capabilities necessary for education in specialist applications of nuclear technology. Among the more than 39 universities in Australia, courses and/or research studies are offered in nuclear related subjects, such as radiation chemistry, radiation biology, plasma physics, nuclear physics, and other areas employing nuclear techniques, but regrettably, there are no tertiary level nuclear engineering courses currently available.

4. Other Nuclear Education

There exists little education in nuclear subjects outside of the usual education system. The AAEC did operate an Australian School of Nuclear Technology (1964-1988) for the education of staff and external students. The ASNT also provided remedial training in nuclear science to about 300 science teachers from throughout Australia. In addition, the AAEC conducted a

vigorous public information program consistent with its role as a publicly funded organisation, but with the reformation into ANSTO these efforts diminished considerably. At present ANSTO has a popular tour program for site visitors and still carries out training of its own staff, but external training particularly in radiation safety is carried out by outside agencies. It does, however, financially support graduate studies in the universities via the Australian Institute of Nuclear Science and Engineering particularly for studies involving the use of ANSTO facilities, the support of nuclear related research and the organisation of conferences in relevant fields.

None of the other federal bodies involved with nuclear technology has a significant public information program including the Australian Radiation Protection and Nuclear Safety Agency, the National Health and Medical Research Council, Australian Safeguards and Non-Proliferation Office, and the departments: DEST, DEH, DHA and DITR in spite of all being publicly funded presumably to provide services in the public interest.

5. References and Further Reading.

1. "Nuclear Australia" 8/85, 2/86, 6/86.
2. "Training at the Australian School of Nuclear Technology", D. Culley, J. Fredsall, B. Toner 24/4/87.
3. "Education and Training in Nuclear Engineering and Science at the University of New South Wales (UNSW) – A Review," G.C. Lowenthal, 9th Pacific Basin Nuclear Conference 1-6 May 1994
4. "Nuclear Technology Questions in NSW HSC Exams 1995-2001," J.R. Fredsall, ANF Discussion Paper No. 5, 8/6/02.
5. "Who Cares About Nuclear Science? -Teaching Nuclear Science in Secondary Schools", J. Mackenzie, ANF Discussion Paper No.13, 5/2/04.
6. "Comments on Nuclear Science Content of 'Z for Zachariah'", ANF Information Paper No 5, 21/5/03.
7. UIC website, www.uic.com.au