

Using Live Animals in Biology Teaching and Research – a Comparison between Australia and Japan

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Whilst their use in biology teaching has reduced in recent decades, live animals are still used extensively in university research and less frequently in teaching in both universities and schools. Both Australia and Japan have followed worldwide trends in ensuring that animal welfare is strongly considered in both teaching and research, and each jurisdiction has similar laws preventing animal cruelty and ensuring integrity in biology education. In universities, appropriate committees exist in both countries to scrutinise animal use. This includes the appropriateness of experimentation, the skills of researchers and teachers, and the quality of animal housing and care. However, while in Japan universities themselves regulate the care and use of animals through relevant Animal Experimentation (and Use) Committees, Australian institutions, and their Animal Ethics Committees (AECs) are audited by State government agencies to ensure adherence to the prescriptions of the National Code. The membership of the committees also differs markedly between the two countries. In both countries, the 3Rs (Replacement, Reduction and Refinement) are guiding principles. In Australian schools, teachers wishing to use live animals for science practicals must seek approval from the relevant State-based AEC although animals used for pets and rearing require no such approval. In Japanese primary schools there is strong interest in animal-assisted education as well as in animal-rearing – the latter emphasising children’s education through assisting animals rather than being a focus on animals assisting education. Teachers are required to consult with veterinarians about proper care and rearing of subject animals. In Japanese senior secondary schools, Biology experiments with animals must only comply with the relevant animal welfare legislation.

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INTRODUCTION

Use of living materials in biology teaching has long been recognised to be important in educating students about important aspects of life as well as in carrying out biological research that produces significant outcomes for human welfare and the wider environment. As noted in the *Notice No. 71 of 2006* (The Ministry of Education, Culture, Sports, Science and Technology, Japan, MEXT, 2006, p. 1) “A scientific understanding of the bio-

logical activities of living organisms on the planet is essential for the solution of many issues, including human welfare, and conservation and restoration of the environment. Animal experiments and related activities are necessary and unavoidable for gaining scientific insights into the biological activities of living organisms...”

However, there have been recent and community-driven moves to consider the welfare of animals used in teaching and research and to en-

sure that subject animals are only used when absolutely necessary. The Council for International Organizations of Medical Sciences (CIOMS) and the International Council for Laboratory Animal Science (ICLAS) noted in their revised guidelines (ICLAS, 2015, see Website list): “The use of animals in research, education and testing is an essential component of the advancement of our understanding about human and animal function. This knowledge is important for advancing human and animal health and welfare through disease prevention and cures, new treatments, and drug and device development. The scientific community, understanding that using animals is a privilege entrusted by society, remains committed to ensuring the health and welfare of animals as an integral consideration when animals are used for these purposes.”

This has certainly developed with the acknowledgement of higher animals as sentient beings. As well, religions such as Buddhism view the sanctity of life and treat animals based on the philosophy of *Karma* (Kagiyama and Nomura, 2003) and the reincarnation of beings; such a philosophy can have an important effect on how teachers and scientists treat animals in their use and care. Accordingly, live animals are being used less frequently in the classroom and student learning.

In this paper we will examine the protocols and regulations for using live animals in both teaching and research. We will compare the animal ethics requirements in two countries that have been long-standing members of the Asian Association for Biology Education, Australia and Japan, noting significant similarities but also differences in approaches.

WHAT ANIMALS ARE CONSIDERED?

To a biologist, the term ‘animal’ refers to life that has features that belong to members of the

Kingdom Animalia. Thus, animals are heterotrophic, multicellular organisms that lack cell walls and chloroplasts and, at least at some stage of their life, are motile (Audesirk *et al*, 2020). Their DNA is typically in a membrane-bound nucleus.

However, in Australia and Japan when animal ethics are considered, the term “animal” refers only to certain taxa of higher forms of life. In Australia, regulations only apply to teaching and research that uses live vertebrates as well as members of the class Cephalopoda (octopus, squid, cuttlefish, nautilus) in the Phylum Mollusca (NHMRC, 2013). This latter group is included presumably because of their well-developed nervous systems. Some Animal Ethics Committees (AECs) include other taxa, such as decapod crustaceans (Phylum Arthropoda) and apply this extra group in their institution’s deliberations on animal ethics in the classroom and laboratory.

In Japan, the range of animals that must be considered by Institutional Animal Experiment Committees (IAECs) is even narrower – only mammals, birds and reptiles.

In both countries, all use of live animals must comply with relevant legislation of prevention of cruelty to animals. In Australia, the States and Territories have responsibility of these laws such as the *Prevention of Cruelty to Animals 1986 Act 1986* (Victoria) and *Animal Care and Protection Act 2001* (Queensland). In Japan, there is a national Law, the *Act on Welfare and Management of Animals 1973* (The Ministry of the Environment, 1973, 2007, see Website list). However, even these Acts use a limited definition of “animal”. For example, the relevant Act in Victoria defines an animal as any vertebrate and decapod crustacean, whereas the Queensland Act includes these groups and cephalopod molluscs. In contrast, the South Australian and Western Australian Acts do not include fish (Sharman, 2004, see Website list). The

Act in Japan only covers mammals and birds, including farm and companion animals but excludes wild animals because these are covered by laws and guidelines for wildlife protection and conservation.

RESEARCH USING LIVE ANIMALS

Australia

All use of live animals for research is governed by a national set of regulations outlined in the *Australian Code for the Care and Use of Animals for Scientific Purposes* (referred to as the *Code*) (National Health and Medical Research Council, NHMRC, 2013). This set of rules has been agreed on by relevant parties such as Commonwealth agencies that fund research (NHMRC and the Australian Research Council), all universities, the major Commonwealth research body the Commonwealth Scientific and Industrial Research Organisation (CSIRO) as well as State and Commonwealth government departments. The *Code* is effectively the method implementing the requirements of the Animal Research Act 1985.

All institutions that undertake research using live animals must have a properly constituted AEC in which categories of memberships are defined. Each AEC hence must contain at least one veterinarian who has familiarity with the kinds of research being carried out on animals, a scientist, an animal welfare representative and a community/lay person with no association with animal experimentation or with the institution. If an AEC meeting lacks any one of these members, then its decisions are non-binding until a subsequent meeting can be arranged with the appropriate quorum. For this reason, many AECs (such as at Federation University Australia) have several members in each category. Because of their membership requirements, there are usually more members of an AEC who are external to the university than inter-

nal staff members. Membership of an AEC must be approved by the relevant State government agency – in my case, Animal Welfare Victoria. This body also regularly audits institutions' AECs, their operations, and licenced facilities.

Decisions of an AEC must be unanimous. So, what happens if one member votes against approving a proposal while the remainder approve it? The Chair should try to negotiate a compromise and bring the issue to the next meeting; only then can a vote be taken on the application. Small organisations can access State-run AECs especially established for clubs and other groups, while schools wishing to undertake biology research with live animals must seek approval from their relevant State education department AECs.

Furthermore, animals can only be held at licenced establishments. Many universities would have either an animal house or a facility for holding animals. The university's AEC would have to inspect the facility and approve its use. Similarly, AECs are meant to visit field sites for which they have approved animal work, for example, vertebrate surveys.

Japan

Japanese research institutions including universities are responsible for self-regulation in terms of animal experimentation. Most voluntarily set up an Institutional Animal Experiment Committee (IAEC) that is sometimes called an Institutional Animal Care and Use Committee (IAEUC). Here we use IAEC to cover both types of committees. Typically, IAECs comprise scientists who actively use animals in their work as well as researchers from other fields of study. Most of the members are thus internal appointments.

Whilst there is no regulation of the committees (or equivalent if committees as such are not set up), the National Government and other agencies have strong advisory roles. There are *Stan-*

Standards Relating to the Care and Management of Laboratory Animals 1980 (The Prime Minister's Office, 1980, see Website list), which was amended to *Standards Relating to the Care and Keeping and Reducing Pain of Laboratory Animals* in 2006 and revised in 2013 (The Ministry of the Environment, Japan 2006, see Website list), and *Standards Relating to the Methods of Destruction of Animals* (The Prime Minister's Office, 1995, see Website list). Based on them, *Fundamental Guidelines for Proper Conduct of Animal Experiment and Related Activities in Academic Research Institutions* (MEXT, 2006) and *Guidelines for Proper Conduct of Animal Experiments* (The Science Council of Japan, 2006, see Website list) were produced. As well, the Government has published explanatory documents on the *Standards Relating to the Care and Keeping and Reducing Pain of Laboratory Animals* (The Ministry of the Environment, Japan 2006, 2017, see Website list).

The Japanese Association for Laboratory Animal Science (JALAS), a nongovernment organization of researchers, published the *Guidelines for Animal Experimentation* (JALAS, 1987) and released their opinion very early (JALAS, 1992, see Website list).

The terms of reference for university IAECs are generally similar. For example, the *Regulations on Animal Experimentation at Kyoto University* stipulate that the Committee should be made up of:

- (i) One of the professors and one of the associate professors of each Department that conducts an Animal Experiment.
- (ii) Several professors and associate professors of Departments other than the Department prescribed in the preceding item.
- (iii) Some other persons if deemed necessary by the President.

The Committee described in paragraph 1 shall include at least one member who has excellent

judgement regarding Animal Experiments, at least one member who has excellent judgement regarding Experimental Animals, and at least one member who has other academic knowledge. (Kyoto University, 2020, see Website list).

Ogden *et al*, (2016) provide a useful section on animal laws, regulations, guidelines and standards in Japan and also those in China and Korea.

COMPARING THE TWO SYSTEMS

In both countries, experiments using live animals must abide by the 3Rs, Replacement, Reduction and Refinement (Russell and Burch, 1959). Researchers must also comply with laws relating to animal welfare and prevention of cruelty. Research institutions also have established committees that approve use of live animals in research (Baumans, 2004).

Differences exist, however, in the regulation and oversight of the committees' operations and the institutions' use of animals. In Australia, the presence of AECs is compulsory, and governments inspect licenced research and animal holding facilities as well as audit the AECs. In Japan, organisations self-regulate and there is no compulsory registration or inspections. This is very similar to the situation in the USA and Canada (Kagiyama and Nomura, 2003). As well, Australian AECs must have members who are veterinarians, scientists, animal welfare representatives and members of the general community. There are strict rules on quorums for meetings (each category of membership must be present), voting and consensus protocols and even minimum proportions of each category of members present at each meeting.

Nomura (1995) made an interesting observation: Japanese scientists working with European and Australian colleagues are sometimes frustrated by the more stringent regulatory environments of Western institutions whose members view the

Japanese system as lenient and ambiguous. Kagi-yama and Nomura (2003) also made a point that Japanese more generally have a less exploitative view of animals that is related to their Buddhist philosophy in which all life is considered equally precious.

What are the strengths of each country's systems? In Australia, it could be argued that the regulation assures the community that animal welfare concerns are being addressed and that having such a broad AEC membership ensures that community expectations and standards are being met. On the other hand, it does suggest a level of distrust of scientists. This view is probably unjustified since there have been very few breaches in research of animal welfare laws and standards. There have been cases of hard-line views of certain non-scientist appointees on AECs who believe animals should not be used at all in research. This must be frustrating for researchers as well as the others on that AEC. The Japanese system is thus likely to be more efficient but provide less assurance to the animal welfare lobby that community standards and expectations are being met.

Finally, a lot of the emphasis in the Japanese system is geared to laboratory animals such as rats and mice. The Australian *Code* covers all forms of research, including field-based studies of wild fauna, as well as laboratory animals.

TEACHING USING LIVE ANIMALS

There is debate on the effectiveness of student learning using living versus dead animals. Sherwood *et al.* (1989) found there was no difference in cognitive learning of fourth graders who used live animals compared with dead specimens, but that only using live animals positively increased their affective learning (attitudes and feelings about animals). Nevertheless, use of live animals

in the classroom has been steadily declining in both Australia and Japan.

What then are the regulations for using live animals in the classroom?

Australia

Teachers in universities and schools that use live animals as part of their student learning activities also must abide by laws relating to animal protection and welfare. For universities, the requirements are the same as for research. Thus, the teaching staff (professor/ lecturer) would apply to the university's AEC describing the planned work and must not commence it until approval has been given. Examples at Federation University Australia of teaching projects that have been approved by its AEC include wildlife surveys (how to live trap and release animals as part of teaching about field survey techniques), animal behavioural studies, and handling, shearing, taking care and monitoring of sheep.

For schools, the situation is similar. If experimental (*i.e.* scientific) work is planned, for example in senior Biology classes, then approval from the State-based schools animal ethics committee is also required. As with research, it is the different Australian States and Territories that have responsibility for administering the use of live animals in student learning activities. I will describe the situation in my home State of Victoria as an example, but other states are very similar.

The first step is to ensure the school is covered by a Scientific Procedures Premises Licence. All government schools are covered by the one licence, but private schools would need their individual licence. Teachers would then need to ascertain whether approval was required from the Victorian School Animal Ethics Committee (one committee serves all schools). Some animal rearing activities are pre-approved, but the Committee would still need to be notified of the intended work.

Application for study that disrupts an animal's normal condition or behaviour is also required. Any activity that invasively subjects an animal to pain or survival is banned (Education Victoria, see Website list).

There are several activities that are typically carried out in primary schools that do not require animal ethics approval. These include rearing young animals, introducing companion animals or having pets in the classroom. Chick hatching programs, however, do require ethics approval. Animal Welfare Victoria (see Website list) provides advice to schools on ensuring the welfare of pets in the classroom.

Japan

Using live animals in Japanese elementary school classrooms has been practiced for many years and the MEXT has produced guidelines for housing and using animals for each grade and covering several fields of study (Nakajima, 2017). The Ministry also requires schools to consult with veterinarians on the proper care of animals (Hakui, 2010). "Animals" in this sense only refers to mammals, birds and reptiles.

The MEXT notes that one of the purposes of science teaching is the nurturing of attitudes of love for nature and respect for the life of living things by students. This is clearly stated in the guidelines of the current Course of Study. On the other hand, the Ministry indicates that conducting animal dissections in science learning is important as they help students develop an understanding of the structure and function of animals. Thus the Ministry asks each school to decide whether such practical activities should be conducted, while simultaneously considering respect for the life of living things (According to the Japan Anti-vivisection Association, see Website list).

While the biology curricula in secondary schools contain student research activities (Nakamichi and Katayama, 2018), it is unlikely these

would involve the kinds of animal experimentation that would necessitate approval of a school equivalent of an IAEC.

TEACHING USING PRESERVED ANIMAL SPECIMENS

Unless the animals that are to be used for activities such as dissections are killed on site before or during the class at the institution, no ethics approvals are required for using dead specimens.

Dissecting preserved or freshly killed vertebrates was once common in school and university biology classes but has declined recently as substitute learning resources like videos, YouTube clips, interactive computer games and simulations and models become more widely available (Balcombe, 2000; Iwama *et al.*, 2010; Oakley, 2012). There is now active debate around the ethics of dissection and scholars urge teachers to include discussions about these and the welfare of animals if dissections are to continue (Madrazo, 2002).

CONCLUSIONS

In both Australia and Japan, use of live animals in biology teaching and research is underpinned by the '3Rs'. Animals should be **replaced** using other methods wherever possible. If animals are to be used, then the number of animals used should be **reduced** to the maximum number needed. Techniques used on animals should be **refined** to cause minimal distress.

Researchers in both countries must seek approval for their work from their organisations' relevant authorising committees. In Australia, it is mandatory for organisations such as universities to have an AEC with a designated constituency of mainly members who are external to the institution, whereas in Japan IAECs are only recommended and are usually made up of internal (staff) appointments.

The use of live animals in teaching in both schools and universities in Australia must be approved by an AEC. There is no such requirement in Japanese primary and secondary schools, although it seems experiments using live animals in both countries are uncommon nowadays. In both countries, no approvals are required for animal care and companion and pet animals in classrooms.

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REFERENCES

- Audesirk, T., Audesirk, G. and Byers, B. (2020) *Biology, Life on Earth with Physiology*, 12th Ed., Pearson, New York.
- Balcombe, J. (2000) *The Use of Animals in Higher Education. Problems, Alternatives and Recommendations*. The Humane Society Press, Washington DC.
- Baumans, V. (2004) Use of animals in experimental research: an ethical dilemma? *Gene Therapy* **11**: 64-66.
- Hakui, Y. (2010) How the new course guidelines address raising school animals. *Journal of the Japan Veterinary Medical Association* **63**: 150-151. (in Japanese)
- Iwama, J., Hatogai, T., Matsubara, S., Yamagishi, R. and Shimojo, T. (2010) Educational significance of “fish dissection” in elementary school science for realizing preciousness of life. *Asian Journal of Biology Education* **4**: 19-27.
- Japanese Association for Laboratory Animal Science (1987) Guideline for Animal Experimentation. *Experimental Animals* **36**(3): 285-288. (in Japanese)
- https://www.jalas.jp/fukushi-kyouiku/law/edu_law_04.html
- Kagiyama, N and Nomura, T. (2003) Japanese regulations on animal experiments: current status and perspectives. In: Klein, H. J. et al. (eds.) *The Development of Science-based Guidelines for Laboratory Animal Care: Proceedings of the November 2003 International Workshop*. pp. 50-56. Institute for Laboratory Animal Research, National Research Council (U.S.) The National Academic Press, Washington DC.
- Madrazo, G. (2002) The debate over dissection; dissecting a classroom dilemma. *Science Educator* **11**: 41-45.
- Nakajima, Y. (2017) Comparing the effect of animal-rearing education in Japan with conventional animal-assisted education. *Frontiers in Veterinary Science* **4** Article 85: 1-15.
doi:10.3389/fvets.2017.00085
- Nakamichi, T. and Katayama, N. (2018) Biology education in upper secondary schools at present in Japan. *Asian Journal of Biology Education* **10**: 7-16.
- NHMRC, National Health and Medical Research Council (2013) *Australian Code for the Care and Use of Animals for Scientific Purposes*. NHMRC, Canberra.
- Nomura T. (1995) Laboratory animal care policies and regulations in Japan. *ILAR Journal* **37**:60-61.
- Oakley, J. (2012) Science teachers and the dissection debate: perspectives on animal dissection and alternatives. *International Journal of Environmental and Science Education* **7**: 253-267.
- Ogden, B., Pang, Wanyong, Agui, T. and Lee, Byeong Han (2016). Laboratory animal laws, regulations, guidelines and standards in China

- Mainland, Japan and Korea. *ILAR Journal* **57**: 301-311.
- Russell, W. M. S. and Burch, R. L. (1959) *The Principles of Humane Experimental Technique*. Methuen & Co., London
- Sherwood, K. P., Rallis, S. F. and Stone, J. (1989). Effects of live animals vs preserved specimens on student learning. *Zoo Biology* **8**: 99-104.

WEBSITES

- Animal Welfare Victoria (undated) *Classroom pets*.
<https://agriculture.vic.gov.au/livestock-and-animals/animal-welfare-victoria/community-and-education/animals-in-schools/classroom-pets>
- Education Victoria (undated) *Teaching with Animals*.
<https://www2.education.vic.gov.au/pal/teaching-with-animals/guidance/vsaec-application-and-approval-process#when-is-vsaec-approval-required>
- International Council for Laboratory Animal Science (2015) *International Guiding Principles for Biomedical Research Involving Animal*.
<https://iclas.org/cioms-iclas-international-guiding-principles-for-biomedical-research-involving-animals/>
- Japan Anti-vivisection Association (undated) “No vivisection in school science!” campaign.
<https://www.java-animal.org/campaign-kaibou/> (in Japanese)
- Japanese Association for Laboratory Animal Science (1992) *Opinion Concerning on Animal Experimentation*.
https://www.jalas.jp/fukushi-kyouiku/law/edu_law_06.html
- Kyoto University (2020) *Regulations on Animal Experimentation at Kyoto University*.
<https://www.kyoto-u.ac.jp/sites/default/files/inline-files/1-3.pdf>
- Ministry of Education, Culture, Sports, Science and Technology, Japan (2006) *Fundamental Guidelines for Proper Conduct of Animal Experiment and Related Activities in Academic Research Institutions*. MEXT Notice No. 71 of 2006.
https://www.mext.go.jp/b_menu/hakusho/nc/06060904.htm (in Japanese)
- Ministry of the Environment, Japan (1973) *Act on Welfare and Management of Animals*. Act No. 105 of 1973.
https://www.env.go.jp/nature/dobutsu/aigo/1_law/files/aigo_kanri_1973_105_en.pdf
 Latest revision: Act No. 39 of June 19, 2019, has not been translated in English.
https://www.env.go.jp/nature/dobutsu/aigo/1_law/index.html (in Japanese)
- Ministry of the Environment, Japan (2006) *Standards Relating to the Care and Keeping and Reducing Pain of Laboratory Animals*. Notice of the Ministry of the Environment No. 88 of 2006.
 Latest revision: Notice of the Ministry of the Environment No. 84 of 2013
https://www.env.go.jp/nature/dobutsu/aigo/2_data/laws/nt_h25_84.pdf
- Ministry of the Environment, Japan (2006) *Explanatory Document on the Standards Relating to the Care and Keeping and Reducing Pain of Laboratory Animals*.
http://www.env.go.jp/nature/dobutsu/aigo/2_data/nt_h180428_88.html (in Japanese)

- Latest revision: Notice of the Ministry of the Environment No. 84 of 2013
- Ministry of the Environment, Japan (2007) *An Outline of the Act on Welfare and Management of Animals*
https://www.env.go.jp/nature/dobutsu/aigo/2_data/pamph/1912en.html
- Ministry of the Environment, Japan (2017) *Explanatory Document on the Standards Relating to the Care and Keeping and Reducing Pain of Laboratory Animals*.
https://www.env.go.jp/nature/dobutsu/aigo/2_data/pamph/h2911/0-full.pdf (in Japanese)
- Sharman, K. (2004) *Animal law in Australia*. <https://www.animallaw.info/article/animal-law-australia>
- Science Council of Japan (2006) *Guidelines for Proper Conduct of Animal Experiments*.
<https://www.scj.go.jp/ja/info/kohyo/pdf/kohyo-20-k16-2e.pdf>
- The Prime Minister's Office (1980) *Standards Relating to the Care and Management of Experimental Animals*. Notice of the Prime Minister's Office No. 6 of 1980.
<http://nrichd.ncchd.go.jp/anim/law7.htm> (in Japanese)
- The Prime Minister's Office (1995) *Standards Relating to the Methods of Destruction of Animals*. Notice of the Prime Minister's Office No. 40 of 1995.
- Revisions: Notice of the Ministry of the Environment No. 59 of 2000. Latest revision: Notice of the Ministry of the Environment No. 105 of 2007.
https://www.env.go.jp/nature/dobutsu/aigo/2_data/laws/shobun_en.pdf