**Secondary Schools:
Competency through Challenge – 3 projects from the Babraham Institute Animal Care Facility**

Approximate timing: 25 minutes for basic lesson. 3 challenge projects for lessons, homework or longer term challenge projects for individuals or teams

Required resources: PowerPoint presentation, fact sheet

This lesson will introduce students to the use of animals in research, what must be considered in the care of research animals and how to address design challenges relating to animal care. The challenge projects can be run as classroom discussions, set as homework or used as longer-term team/individual challenge projects.

**The lesson supports:**

Key stage 3

*Science - Applications and implications of science*

Examining the ethical and moral implications of using and applying science.The way scientific developments are achieved can raise ethical and moral issues, for example experiments on animals to produce drugs that may prolong human life.

*Citizenship - Rights and responsibilities*

a) Exploring different kinds of rights and obligations and how these affect both individuals and communities.

b) Understanding that individuals, organisations and governments have responsibilities to ensure that rights are balanced, supported and protected.

c) Investigating ways in which rights can compete and conflict, and understanding that hard decisions have to be made to try to balance these.

There are different kinds of rights, obligations and responsibilities - political, legal, human, social, civic and moral. Pupils should explore contested areas surrounding rights.

*Religious Education - Values and commitments*

Evaluating their own and others' values in order to make informed, rational and imaginative choices.

*PSHE: Personal wellbeing - Critical reflection*

Pupils should be able to reflect critically on their own and others' value

*English - Critical understanding*

a) Engaging with ideas and texts, understanding and responding to the main issues.

b) Assessing the validity and significance of information and ideas from different sources.

c) Exploring others' ideas and developing their own.

d) Analysing and evaluating spoken and written language to appreciate how meaning is shaped

Key stage 4

*How Science Works: Applications and implications of science*

Pupils should be taught to consider how and why decisions about science and technology are made, including those that raise ethical issues, and about the social, economic and environmental effects of such decisions

All pupils should develop their ability to relate their understanding of science to their own and others' decisions about lifestyles, and to scientific and technological developments in society.

*Citizenship*

Critical thinking and enquiry

Students should be able to:

1. question and reflect on different ideas, opinions, assumptions, beliefs and values when exploring topical and controversial issues and problems
2. research, plan and undertake enquiries into issues and problems, using a range of information, sources and methods
3. interpret and analyse critically sources used, identifying different values, ideas and viewpoints and recognising bias
4. evaluate different viewpoints, exploring connections and relationships between viewpoints and actions in different contexts (from local to global).

*Religious Education*

Values and commitments

Evaluating their own and others' values in order to make informed, rational and imaginative choices.

*PSHE: Personal wellbeing*

Critical reflection

Pupils should be able to reflect critically on their own and others' values

*English*

Critical understanding

a) Engaging with the details of ideas and texts.

b) Connecting ideas, themes and issues, drawing on a range of texts.

c) Forming independent views and challenging what is heard or read on the grounds of logic, evidence or argument.

d) Analysing and evaluating spoken and written language to explore their impact on the audience

Links to Babraham Institute research:

<https://www.babraham.ac.uk/our-research/healthy-ageing>

Links to Babraham Institute Biological Support Unit

<https://www.babraham.ac.uk/science-services/biological-support-unit>

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| **Learning outcomes** |
| All students will: | Develop solutions for challenges related to the care of research animals |
| Most students will: | Describe what needs to be considered for welfare of research animals |
| Some students will: | Explain how to balance openness with high standards of animal care |
| Key word/s | Openness, freedom, concordat |

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| **Teaching notes** | **Student learning activities**  |
| **Starter activity** (15 minutes)Introduce the Babraham Institute and its research programmesIdentify students’ existing knowledge:Ask students to work in groups to identify the five freedoms relating to animals in research and give an example of how they can be fulfilled.Show answers on slide and discuss.Ask students which of the Five Freedoms would apply to animal care staff and give an example of how they can be fulfilled. | Slides 1 - 3Slides 4 & 5Freedom from: hunger or thirstFreedom from discomfortFreedom from pain, injury or diseaseFreedom to express (most) normal behaviourFreedom from fear and distress |
| **Development** (10 minutes) Describe the animal care facilities at the Babraham Institute – including function, housing and health status of each bio-science unitDescribe function of central servicesBiosafety level two would cover work with agents associated with human disease, in other words, pathogenic or infectious organisms posing a moderate hazard.<https://www.labmanager.com/lab-health-and-safety/2010/12/biosafety-levels-1-2-3-4#.XBuKuzD7RhE> | Slides 6 - 11Ask students to suggest why mice in the Specified Opportunist Pathogen Free unit are housed in positive pressure isolatorsAsk students to suggest why mice in the Import unit are housed in negative-pressure isolatorsAsk students to suggest why mice in the Transgenic unit are housed in individually ventilated cagesAsk students to consider the implications of different animal health status levels for animal care staff |
| **The following challenge projects can be run as classroom discussions, set as homework or used as longer-term team/individual challenge projects** |  |
| **Project 1**Adapt our animal unit or design a new building to allow the public to visit in order to learn about our research and the high standards of care and welfare provided while ensuring health of the animals and safety of visitors and staff | Slides 12 & 13Explain the principles of the Concordat on Openness on Animal Research and present the challenge. Suggested classroom activity: discuss challenges (e.g. hygiene, security, cost, privacy) and debate what the priorities are.Longer term: design and construct a model of an animal unit which would allow more openness. |
| **Project 2** Design a solution to allow the food and animal health in the top and bottom rows of cages in a rack to be efficiently checked with the minimum of risk to the technician. An alternative solution to avoid using footstools and ladders should be considered. | Slides 14 & 15Explain that mice are housed in racked cages and checked twice daily. It can be difficult to check the top and bottom rows due to the dimensions of the racks (see photographs) and it is inefficient not to use all rows possible.Suggested classroom activity: discuss requirements and compare cost with benefit.Longer term: design and construct a model of a solution which would meet all requirements. |
| **Project 3**Build a working LEGO model of a cage washing robot and create a set of instructions (contruction and programming) for use in other schools, science festivals and careers events. Explain that our robotic cage-washing system is an efficient method for cleaning large numbers of mouse cages efficiently and hygienically.Clean cages have sawdust and bedding added automatically before the cages are sterilised and transferred back into the different units.  | Slides 16 & 17The model must be capable of picking up a series of ‘cages’, inverting them to tip out any contents and then putting them down in another location.Instructions must be written to allow other schools, institutions or animal care facilities to make their own version for use in lessons, science festivals or careers events.Pictures/video, programming and construction instructions should be shared with the Babraham Institute via pe@babraham.ac.uk |
| **Plenary (5 mins)**Ask students what the key learning points have been from the lesson  | Slide 18Ask students to recap the Five Freedoms and how they relate to both research animals and animal care technicians |