# *When is a Mammal not a Mammal?*

| **Primary: (ages 7 – 11)** | **Science** |
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**Students will use their scientific knowledge and creative and critical thinking skills to reimagine the way we classify the world and communicate alternative ways of seeing and thinking. Students will be required to disrupt the way they order the animal kingdom, to ask novel questions and reposition data, and to justify and communicate their new ways of thinking. As a possible extension, students can also be asked to consider different ways to order their school.**

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| **Time allocation** | Between 2 and 4 lesson periods |
| **Subject content** | Classification of animal species<br>History of science |
| **Creativity and critical thinking** | This unit has a **creativity** and **critical thinking** focus:<br>• Generate and play with unusual and radical ideas<br>• Challenge assumptions and make connections<br>• Propose own opinion justified on logical, ethical or aesthetic criteria |
| **Other skills** | Collaboration; Communication |
| **Key words** | taxonomy; classification; animals; mythical creatures; biology; kingdom; zoology; mammals; Linnaeus |

**Products and processes to access**

Students produce, present, and discuss different ways of classifying animals, as well as creating mythical creatures that combine different features of existing animals. At the highest level of achievement, their classification systems are imaginative and novel. Students demonstrate a willingness to explore, challenge, and play with conventional systems of classification as well as the ability to make connections between classification in different domains (e.g. for animals and in schools). There is a good awareness of the advantages and disadvantages of different systems, and of classification as a whole.

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## Teaching and Learning plan

This plan suggests potential steps for implementing the activity. Teachers can introduce as many modifications as they see fit to adapt the activity to their teaching context.

| Step | Duration | Teacher and student roles | Subject context | Creativity and critical thinking |
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| **1** | Lesson period 1 | Teacher shows students photos of lots of different types of animals (print or web).<br>Ask students to consider how they could classify or order these animals into groups.<br>Ask students to develop 4 new test questions that could separate them, e.g. their size, where they live, what they eat, whether they give birth to live young lay eggs, whether they can fly or go underwater, etc.<br><br>As a whole class create and complete a chart (see example below) that uses the new 4 test questions on 5 animals (different from those shown at the beginning of the lesson).<br><br>Have a conversation about *why* we classify or group animals and the advantages and disadvantages of doing so. The class might be interested to learn about Carolus Linnaeus (1707-1778), a Swedish scientist who was the first person to classify the biological world in families and species, partly based on the animals and plans he discovered during his expeditions.<br><br>Ask them how many ways they know in which we classify animals, e.g. mammals, invertebrate, etc. Write these up on the board. Ideally show them an infographic with details of how we group animals, birds, insects, etc. | Developing knowledge of classification of animal categories (e.g. taxonomy based on biological or zoological criteria)<br><br>Developing knowledge of history of science (e.g. of how discoveries, travel and instrumentation/measurement can shape scientific knowledge)<br><br>Developing technical skill in creating charts to present raw data; information displaying and conveying skills | Generating ideas and making connections (e.g. range of new questions proposed)<br><br>Finding several perspectives on the problem (e.g. reflecting on how knowledge in one field can influence another) |
| **2** | Lesson period 2 | Ask the class to work in small groups to consider other ways to classify animals. What are things you would like to know about animals that the standard ("textbook") way of classifying them does not tell us?<br><br>Invite the groups to think of 4 new test questions, different from the original ones, e.g. furry face, edible, scary. Students can be challenged to think of really unusual or creative ways to classify animals as appropriate. Ask them to make a new chart with their own test questions applied to the same animals (that is, new questions with same animals).<br><br>When the small groups have developed their charts ask them to share with the class and discuss *why* they think they would be a useful way of grouping animals and what are the things that this grouping makes visible that were not obvious before. | Building knowledge of classification of animal categories (e.g. taxonomy based on biological or zoological criteria)<br><br>Developing technical skill in creating charts to present raw data; information displaying and conveying skills | Challenging assumptions (e.g. in what ways does the standard classification fall short of explaining things we are interested in?)<br><br>Playing with unusual and radical ideas, generating ideas and making connections (e.g. richness and quality of new test questions)<br><br>Proposing own opinion justified on logical, ethical or aesthetic criteria |
| **3** | Lesson period 3 | Ask students to work in the small groups from the previous lesson and pick 5 new animals. The groups should complete the chart(s) from lesson 1 with the 5 new animals | Building knowledge of classification of animal categories (e.g. taxonomy | Generating ideas and making connections (e.g. for mythical |

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| | | (that is, same questions with new animals).<br><br>A potential path for the activity is to present to students some mythological animals combining attributes of two existing animals or creatures (e.g. phoenix, griffin, unicorn, chimera, siren, centaur, etc.), as a way of inviting them to imagine and propose new animals playing with as many as possible of the criteria used for the two charts in the preceding lessons (either biological only if the focus is on science exclusively, or including other criteria for a more interdisciplinary approach). Students could present to the class the animals they came up with combining these classificatory criteria, either through an oral presentation, the creation of some visual art, or through a performance.<br><br>Ask groups to comment on each other's suggestions for new criteria for classifying animals, or on the new animals. What are new things we would know? Ask them to reflect on how humans' relationship to animals could change (e.g. pets, domestication of animals, eating habits, etc.) | based on biological or zoological criteria)<br><br>Developing technical skill in chosen method of presenting data/conclusions | creatures that combine attributes of existing animals)<br><br>Producing, performing or envisioning something personal<br><br>Proposing own opinion justified on logical, ethical or aesthetic criteria<br><br>Appreciating the novelty of solution and/or possible consequences (e.g. ability to critically comment on other people's ideas) |
| **4*** | Lesson period 4 (*Optional extension) | Reflect on previous lessons. Ask the class what else in the world is classified into different groups, i.e. shops, clothes, humans, etc.<br><br>Ask them to consider how their school is organised. Encourage them to consider the importance of age within school, i.e. why do we have classes according to the year they were born.<br><br>In small groups ask them to come up with new test questions (other than age) that would group students in the school differently, i.e. where they live, number of siblings, things they like to do in their free time, etc.<br><br>The small groups should then present to the rest of the class and/or create some visual art and/or a performance to why their way of classifying the school would improve everyone's experience and what this new arrangement would look like. The class can also be encouraged to consider any differences between the different classifications. What is new or different about each system and what are its advantages? Finally, the class can be invited to consider again why we classify and the advantages and disadvantages of doing so as appropriate. | Developing technical skill in chosen method of presenting data/conclusions<br><br>Communicating about classification and developing presentation skills during final presentation | Generating ideas and making connections (e.g. connections to other aspects of their lives)<br><br>Challenging assumptions and finding several perspectives on the same problem (e.g. awareness of the world around them)<br><br>Proposing own opinion justified on logical, ethical or aesthetic criteria<br><br>Appreciating the novelty of solution and/or possible consequences (e.g. ability to critically comment on other people's ideas) |

## Resources and examples for inspiration

**Web and print**

- Collection of photos of animals
- Not essential but a graphic which might help explain the classification of animals, such as: https://www.sheppardsoftware.com/content/animals/kidscorner/classification/kc_class_again.htm
- On imaginary beings/animals, two possible references are Jorge Luis Borges' "Book of Imaginary Beings", which has been illustrated by many artists including Peter Sis, Natascha Schwarz or Silvio Baldessari (Many of these illustrations can be found on the web) and Laurence King's "Myth Match: A Fantastical Flipbook of Extraordinary beasts"

**Other**

- Paper and pens for recording data from school
- Art materials for the presenting of the data

**Creativity and critical thinking rubric for science**

- Mapping of the different steps of the lesson plan against the OECD rubric to identify the creative and/or critical thinking skills the different parts of the lesson aim to develop

| | CREATIVITY<br><br>Coming up with new ideas and solutions | Steps | CRITICAL THINKING<br><br>Questioning and evaluating ideas and solutions | Steps |
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| **INQUIRING** | Make connections to other scientific concepts or conceptual ideas in other disciplines | 2-4 | Identify and question assumptions and generally accepted ideas of a scientific explanation or approach to a problem | 1,2,4 |
| **IMAGINING** | Generate and play with unusual and radical ideas when approaching or solving a scientific problem | 1-4 | Consider several perspectives on a scientific problem | 1-4 |
| **DOING** | Pose and propose how to solve a scientific problem in a personally novel way | 2-4 | Explain both strengths and limitations of a scientific solution based on logical and possibly other criteria (practical, ethical, etc.) | 1-4 |
| **REFLECTING** | Reflect on steps taken to pose and solve a scientific problem | | Reflect on the chosen scientific approach or solution relative to possible alternatives | 1-4 |

## Appendix

| Animal | Lives where? (Land/sea/air) | Type of skin? | Size? (Bigger/smaller than a person) | Kind of babies? (Living or eggs) |
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| **cow** | land | hide with short fur | bigger | live babies |
| **bear** | | | | |
| **fish** | | | | |
| **bird** | | | | |
| **whale** | | | | |
| **horse** | | | | |