

ANIMAL EXPERIMENTATION IN SCIENTIFIC LITERACY

3RS LEARNING SCENARIO

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Summary

This learning scenario aims to help students understand and differentiate good science from bad science (fake news, pseudoscience, etc.), while pupils acquire knowledge on animal experiments and animal welfare. By using critical thinking skills, pupils learn how to do literature search about animal experimentation and then have a group discussion in the classroom. They comprehend how science works by carrying out a survey about the use of animals in scientific experiments in their own school and analysis the results as a final activity.

Key elements

Key elements	Suggestions
Subject	Biology, Environmental Science, Ethics, Ecology, Science Literacy, Pseudoscience
Topic	Critical thinking - Science literacy
Age of students	13-18 years
Preparation time	90'
Teaching time	6x40'
Online teaching material	Prezi https://prezi.com/ Tuvalab https://tuvalabs.com/ Google Forms https://www.google.com/forms/about/
Offline teaching material	Laptops, mobile phones and tablets with internet connection, projectors, paper, pen
Resources used	<ul style="list-style-type: none"> ○ Battling Bad Science https://www.ted.com/talks/ben_goldacre_battling_bad_science?fbclid=IwAR0V8MkAinCJh3XTuxK8xBHkZk7MjohD-rJDORzFBWUezdYGZB2x-89VXSg ○ 360° Laboratory Animal Tours ○ Can we do science without animal testing? https://www.youtube.com/watch?v=2hxUMpYFo_Y ○ E-learning resources in Animals in Research https://www.nc3rs.org.uk/e-learning-resources ○ Films and slide shows of laboratory animals

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Key elements	Suggestions
	<p>https://norecopa.no/education-training/films-and-slide-shows</p> <ul style="list-style-type: none"> ○ Ethics and the use of laboratory animals https://norecopa.no/more-resources/ethics ○ The 3Rs: What are Medical Scientists Doing about Animal Testing? https://kids.frontiersin.org/article/10.3389/frym.2018.00044 ○ Research animals (Video) https://www.youtube.com/watch?v=WEuvqJMinqY ○ Why do researchers work with mice? https://www.jax.org/why-the-mouse ○ Background briefings, pictures and videos of animals in research https://speakingofresearch.com/links/media-downloads/ ○ Medical Advances and Animal Research http://www.pro-test.org.uk/MAAR.pdf ○ How animals help scientists in research – and how research helps animals in return http://kids4research.org/ ○ Animal testing http://www.pro-test.org.uk/index.php ○ IFLA Infographic https://www.ifla.org/publications/node/11174 ○ How to spot fake news? https://www.factcheck.org/2016/11/how-to-spot-fake-news/ ○ Evaluating Information: The Cornerstone of Civic Online Reasoning, Executive Summary, Stanford History Education Group, Produced with the Support of the Robert R. McCormick Foundation https://stacks.stanford.edu/file/druid:fv751yt5934/SHEG%20Evaluating%20Information%20Online.pdf ○ Bad Science (compilation of activities) https://www.stem.org.uk/resources/collection/3116/bad-science ○ Alternatives to Animal Testing https://www.peta.org/issues/animals-used-for-experimentation/alternatives-animal-testing/ ○ Student Feedback Survey (retrieved from Edutopia) https://www.edutopia.org/sites/default/files/resources/edutopia-student-feedback-survey.pdf

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Aim of the lesson

- Students can illustrate the relation between science and society on an ethical and philosophical base.
- Students can illustrate the importance of scientific research in a healthy lifestyle.
- Students can formulate answers on sustainability problems concerning animal welfare.
- Students can think critically about emotions vs facts in animals used in science.
- Students can formulate well-build arguments in a critical debate.

Trends

- Collaborative learning
- Student centered learning
- Peer learning
- Project-based learning
- Mobile learning
- Open source learning
- Social media learning

21st century skills

- Critical thinking
- Communication and collaboration
- Media literacy
- Information, Media and Technology Skills

Lesson Plan

Name of activity	Procedure	Time
Good science/bad science	The teacher starts the lesson with a warm-up activity for 10'. After pupils get motivated, cases about good science/bad science, fake news and pseudoscience are presented by the teacher on Power Point slides for 10 minutes.	40'

Name of activity	Procedure	Time
	<p>Afterwards, the teacher focuses on the question “<i>How to spot fake news?</i>” using the infographic and article is available on the link below in varied languages for 10 minutes.</p> <ul style="list-style-type: none"> ○ https://www.ifla.org/publications/node/11174 (infographic by the International Federation of Library Associations) ○ https://www.factcheck.org/2016/11/how-to-spot-fake-news/ (article by FactCheck.org) <p>In addition, the below videos and resources can facilitate teachers in providing some information about fake news, how they work and spread, the truth about fake news and how we can protect ourselves against the phenomenon and be able to spot ‘bad science’ practices.</p> <ul style="list-style-type: none"> ○ Bad Science https://www.stem.org.uk/resources/collection/3116/bad-science ○ How to Spot Fake News https://nycdoe.libguides.com/newsliteracy ○ A Rough Guide to Spotting Bad Science https://www.compoundchem.com/2014/04/02/a-rough-guide-to-spotting-bad-science/ ○ Fake News, Bad Science, and Predatory Journals: Information Evaluation for the Academic: Bad Science https://libguides.southernct.edu/ta2017fakenews/badscience ○ 5 Bad Scientific Studies That Fooled Millions https://www.mic.com/articles/28940/5-bad-scientific-studies-that-fooled-millions <p>The teacher asks students to collect fake news and good vs. bad science clippings from newspapers, Internet resources or magazines during the week. Pupils can distinguish fake news, and good vs. bad science components among the collected items they gathered before each lesson starts.</p>	
<p>Literature review about animal experiments in groups</p>	<p>Introducing the topic of Animal Experimentation and Animal Welfare and Creating Group Tasks (10’)</p> <p>The topic of animal experimentation and animal welfare is presented to pupils as the subject of the lesson. The teacher briefly presents the group work principles before creating groups (max.4 pupils). The way of generating groups could be based on a kind of activity related to animals to keep pupils’ motivation on the topic.</p> <p>In this starting activity, each pupil has a different animal card. The</p>	<p>40’</p>

Name of activity	Procedure	Time
	<p>teacher arranges how many different species of animals will be used and how many cards there will be in total. Depending on the number of pupils in the classroom, pupils that took the same animal card will be in the same group. Teachers can adapt according to their own classroom.</p> <p>Each group will research one of the questions below:</p> <ul style="list-style-type: none"> -Do scientists need animals in science? -How are animals affected by experiments in laboratories? -What are pros and cons of animal experimentation in science? -What could be the alternatives instead of animals in experimentation? -What are ethics in animal experimentation? <p>Pupils will have an idea about how to search literature from the link below for 10 minutes.</p> <p>https://blog.efpsa.org/2011/12/10/how-to-search-for-literature/ http://libguides.dundee.ac.uk/literaturesearching/home</p> <p>Group Work (20')</p> <p>Groups reach a conclusion based on the research they do on reliable Internet resources or the Internet resources that the teacher offers are below for each group separately.</p> <p>The group that has the question “<i>Do scientists need animals in science?</i>”</p> <p>https://www.youtube.com/watch?v=WEuvqJMinqY https://norecopa.no/education-training/films-and-slide-shows https://kids.frontiersin.org/article/10.3389/frym.2018.00044 https://www.jax.org/why-the-mouse https://speakingofresearch.com/links/media-downloads/ http://www.pro-test.org.uk/MAAR.pdf http://kids4research.org/ http://www.pro-test.org.uk/index.php</p> <p>The group that has the question “<i>How animals are affected by experiments in laboratories?</i>”</p> <p>https://www.youtube.com/watch?v=WEuvqJMinqY https://www.nc3rs.org.uk/e-learning-resources https://norecopa.no/education-training/films-and-slide-shows https://norecopa.no/more-resources/ethics https://www.jax.org/why-the-mouse https://speakingofresearch.com/links/media-downloads/ http://kids4research.org/ http://www.pro-test.org.uk/index.php</p> <p>The group that has the question “<i>What are pros and cons of animal experimentation in science?</i>”</p> <p>https://www.youtube.com/watch?v=WEuvqJMinqY https://norecopa.no/education-training/films-and-slide-shows https://norecopa.no/more-resources/ethics</p>	

Name of activity	Procedure	Time
	<p> https://kids.frontiersin.org/article/10.3389/frym.2018.00044 https://www.jax.org/why-the-mouse https://speakingofresearch.com/links/media-downloads/ http://www.pro-test.org.uk/MAAR.pdf http://kids4research.org/ http://www.pro-test.org.uk/index.php </p> <p> The group that has the question “<i>What could be the alternatives instead of animals in experimentation?</i>” https://www.youtube.com/watch?v=WEuvqJMinqY https://kids.frontiersin.org/article/10.3389/frym.2018.00044 https://www.jax.org/why-the-mouse https://speakingofresearch.com/links/media-downloads/ http://www.pro-test.org.uk/MAAR.pdf http://kids4research.org/ http://www.pro-test.org.uk/index.php https://www.peta.org/issues/animals-used-for-experimentation/alternatives-animal-testing/ </p> <p> The group that has the question “<i>What are ethics in animal experimentation?</i>” https://www.youtube.com/watch?v=WEuvqJMinqY https://www.nc3rs.org.uk/e-learning-resources https://norecopa.no/more-resources/ethics https://kids.frontiersin.org/article/10.3389/frym.2018.00044 http://kids4research.org/ </p>	
<p>Preparation for next lesson/Preparation of consent form and deal with participants</p>	<p> Preparation of consent form (15’) Before the next lesson, the teacher introduces the aims of next lesson and pupils’ tasks. Related with creating a survey, the teacher explains the concept of ethics about research and why it is required to have the signed consent form from the parents of participants before they conduct the survey at school. The teacher asks the pupils to prepare a consent form to give to their participants and their parents. University of Melbourne has published instructions on “<i>How to create a consent form?</i>” This link may be helpful for pupils: https://staff.unimelb.edu.au/research/ethics-integrity/human-ethics/faq/how-do-i-write-a-consent-form </p> <p> Distribution of forms (15’) After pupils prepare the consent form, they distribute the forms to the participants and collect them before using the survey in the next lesson. The teacher will need to present this project to the school administration to get permission for the implementation of the survey at school. </p>	<p>30’</p>

Name of activity	Procedure	Time
Groups data collection and interpretation in classroom	<p>The groups collect and combine the data retrieved from reliable resources which are given above in 10 minutes. Each group prepares a presentation on Prezi for 10 minutes and present it for 5 minutes. After all presentations are completed, each group takes questions from other groups and discuss them for 5 minutes.</p>	30'
Peer Group Evaluation	<p>Each group fills out the peer group evaluation forms and exchange between each other (please see Annex 1).</p>	10'
Survey in school	<p>At this stage, pupils set up a research question about the 3Rs and animal experimentation in society. (e.g. <i>“Are the pupils in our school aware of the pros and cons of animal experimentation?”</i> <i>“Are pet owners in our school more aware of the pros and cons of animal experimentation/animal welfare?”</i> <i>“To what extent are the pupils in our school aware of animal welfare practices in science (considering) their class level?”</i> <i>“Are the pupils in our school aware of the fact that animal experiments should be based on ethics according to their gender?”</i> <i>“Are the pupils in your school aware of the fact that there could be alternative methods instead of animal use in scientific experiments according to their age?”</i>)</p> <p>Create and apply a survey (40') Pupils are split into groups (max 4 pupils in each group). We encourage pupils to generate their own survey according to their research question on Google Forms. For this, they are going to use some resources in order to learn how to create the survey. The resources could be these ones: https://www.surveymonkey.com/mp/how-to-create-surveys/</p> <p>Examples of questions that can be used for the survey can be found in Annex 3. They distribute the survey they prepared at the school.</p> <p>Collect data and Analyze (25') Pupils collect data from the survey and upload them on Tuvalabs. They will generate one bar/pie chart each. They interpret data and make a conclusion. The instructions on how to interpret results of research can be found there. These instructions will be given after pupils have already interpreted the data. This way, they can compare how they can reach a conclusion based on the results and what could be done in any other way. After each group finalizes their research, they prepare a poster and present it with the other groups.</p>	80'

Name of activity	Procedure	Time
	<p>Discussion (15') When all presentations are completed, pupils evaluate their own study related to good and bad science. The evaluation addresses the following criteria:</p> <ul style="list-style-type: none"> - Is our sample size large enough? - Is our sample biased? Is there a specific gender or age group that is represented more in the sample? - Are our questions neutral enough or do they make people biased causing them to answer differently? <p>All these steps contribute in students gaining an experience on how good science works and how to avoid bad science and fake news.</p>	

Assessment

In order to assess pupils' critical thinking and help them understand how they should proceed in order to evaluate information, an assessment will take place. For this reason, we will use the [Executive Summary Evaluating Information: The Cornerstone of Civic Online Reasoning](#) (hyperlink) by Stanford University. In this guide, valuable information on how students should process critically the information overload they are faced with daily is provided. There are infographics and assessment rubrics teachers can use, as well as examples of responses previously given by other students during the creation of this document, which teachers may take into consideration.

Students' and teachers' feedback after the implementation of the Learning Scenario during the Pilot phase of the project

Student feedback

- Students enjoyed working in groups, reviewing the materials and collaborating.
- Depending on the level of students, the topic was perceived as difficult.

Teacher's remarks

- Some teachers opted to shorten the duration of the lesson plan and were proactive in adapting various aspects of the lesson such as implementing it as an extra-curricular activity or modified the content of certain activities as they saw fit.
- The authors of the learning scenario received a lot of praise for the way they created it and the activities they chose.
- The time allocated for each activity was an issue for most teachers, who found all the activities interesting and wanted to implement them all.
- The preparation time teachers needed in order to go through the materials was perceived as very long and teachers recommended that more ready-to-use resources would have been very helpful, in order to avoid reading the lengthy documents that the resources include.

About 3Rs project

This Learning Scenario has been created in the framework of the 3Rs project. The 3Rs project is building learning activities for secondary schools to introduce the principles of the 3Rs - the Replacement, Reduction and Refinement of animal use in science. Students will develop their critical thinking and science literacy skills by exploring topics such as ethics in science, how the European Union is protecting the welfare of laboratory animals, and what high-tech non-animal tools are available as alternatives. The learning activities are available for teachers in a Massive Open Online Course (MOOC), organized by the European Schoolnet Academy.

The 3Rs project has been funded by the European Commission's Joint Research Centre under a European Parliament Pilot Project. This document has been prepared by European Schoolnet (a network of 34 European Ministries of Education which aims to bring innovation in teaching and learning), in collaboration with ECORYS (international company providing research, consultancy and management services) and SYRCLE (Systematic Review Center for Laboratory Animal Experimentation).

ANNEXES

Annex 1

Group Work Peer Evaluation Form

Your Name _____

Partners Name _____

Criteria: 4-consistently 3- most of the time 2-occasionally 1-seldom

Circle the appropriate grade using the grading criteria above:

4 3 2 1 Worked collaboratively on all parts of the project.

4 3 2 1 Used group time wisely and remained focused.

4 3 2 1 Remained respectful and polite to all group members.

4 3 2 1 Addressed any conflict in the group constructive.

Additional comments:

Annex 2

Student feedback survey

1. How satisfied are you with your current learning in my class?

Circle one number: 0 = completely dissatisfied; 10 = completely satisfied

1 2 3 4 5 6 7 8 9 10

2. Thinking about my classroom teaching, fill in the blank: It would be helpful for me if my teacher spent:

More time:

Less time:

3. With respect to homework and other assignments for completion outside class time, circle one:

- a) I complete every assignment on time
- b) I complete most assignments on time
- c) I complete very few assignments on time
- d) I complete almost no assignments on time

4. Give a detailed reason for your answer to #3:

5. What things about my teaching, our procedures, our classroom, our assignments, etc. are satisfactory and what needs improvement? Please be as specific as you can!

Teaching:

Procedures:

Classroom:

Assignments:

Assessments:

6. What can I do to help YOU reach your goals for my class? Here is your opportunity to reflect on your particular needs so that I can improve!

SOURCE: [EDUTOPIA](#)

Annex 3

Animal Experimentation in Science and Society

1. Have you pet or have you ever had?

Yes

No

2. Do you think animal experiment in laboratories is good for humanity?

Agree

Disagree

Occasionally

3. Do you think animal experimentation in laboratory has bad effect on animals?

Agree

Disagree

Occasionally

4. Do you think animal experiments in laboratories has good effects on animals?

Agree

Disagree

Occasionally

5. Do you think animal experimentation should be based on ethics?

Agree

Disagree

Occasionally

6. Do you think animals in laboratories are crucially needed?

Agree

Disagree

Occasionally