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Are biology students at Lund University given equal opportunities in their education regardless of their animal welfare beliefs?

Abstract

While active learning through practical exercises is recognized as an efficient method to increase students' learning, there are also risks of achieving the opposite results if students are forced to perform an activity that goes against their beliefs. A persons beliefs is in Sweden protected as a ground for discrimination, which is also incorporated in the Lund University equal opportnities plan. We wanted to evaluate whether students at the Department of Biology at Lund University perceived that their beliefs were in conflict with practical exercises involving animals. We sent out a questionnaire to students and interviewed a former student, the director of studies and one teacher. We received 82 responses by current and former students to our questionnaire. Of these, twelve responded that because of their animal welfare beliefs they felt their education was being compromised, and four students felt discriminated against. Our findings suggest that there is a need to review how animals are used in education at the Department of Biology. Among other things, we suggest that non-invasive alternatives should be offered to students whenever it is not in conflict with the intended learning outcomes. Also, teachers should incorporate discussions of ethics in their teaching, especially in connection to practical exercises involving animals.

Introduction

Biology is a topic of research that branches out to a broad array of research fields. In some of them, using animals in a controlled way, has historically been and may remain essential to achieve major scientific breakthroughs (Barré-Sinoussi and Montagutelli, 2015). However, the care and use of animals in research and education are very controversial topics in our societies and most of the time it raises concerns whether animal welfare is ignored in order to benefit human purposes. In education, one argument in favor of the use of animals is that concrete experiences, such as field or lab activities, engage students in active learning which benefits their learning process. Put into context to Kolb’s theory on experiential learning, these activities can be considered important to complete the full cycle of the students' learning process.

However, there is growing evidence that the use of animals in education may also have adverse effects on some students such as discomfort, anxiety and insecurity (Capaldo, 2004; Phillips and McCulloch, 2005; De Villiers, 2011, Rochelle et al. 2016). When students are forced to use animals in their learning activities in ways that they find ethically unacceptable, it can lead to impaired cognitive abilities (Capaldo, 2004). Students might feel frustrated or experience trauma which affects their motivation and results in impaired learning. Based on our own experiences as teachers and as former students, we have noticed that this is true for some students, for which practical exercises with animals during field and lab sessions are in conflict with their animal welfare beliefs. We think that this could potentially exclude some students, and may ultimately negatively affect their learning process throughout their biology education.

The Discrimination Act of Sweden (2008:567) aims to “promote equal rights and opportunities regardless of seven grounds for discrimination” and is further incorporated in the equal opportunities plan at Lund University (STYR 2021/2323). The fourth ground for discrimination concerns “religion or other belief”. However, this particular ground is the only one lacking an extensive definition. The Discrimination Act further distinguishes “direct” and “indirect” discrimination. Direct discrimination

covers anyone being “disadvantaged by being treated less favourably than someone else is treated, has been treated or would have been treated in a comparable situation”. Indirect discrimination covers anyone being “disadvantaged by the application of a provision, a criterion or a procedure that appears neutral but that may put people at a particular disadvantage (based on the seven grounds), unless the provision, criterion or procedure has a legitimate purpose and the means that are used are appropriate”. These distinctions might be both relevant in the field of education, if the methods used for teaching and learning excludes some students. In the field of biology, any student should not feel discriminated against for their animals’ welfare beliefs considering the great variety of alternative methods that currently exist. In fact, alternative methods could provide similar learning outcomes, and be equally or even more efficient in reaching the ILOs as compared to traditional teaching methods involving animals (Finkelstein, et al. 2005; Fančovičova and Prokop 2014).

The aims of this study are to (i) evaluate if students animal welfare beliefs are in conflict with the intended learning outcomes (ILOs; Appendix 1) of the educational programmes in biology at Lund University, (ii) evaluate if these students perceived that their education is being compromised or that they are being discriminated against, (iii) evaluate if these students are offered satisfactorily alternative learning methods to reach the ILOs, as well as personal learning goals, (iv) reflect over whether students’ animal welfare beliefs is covered under the Discrimination act of Sweden, and (v) evaluate whether there is a need to review how animals are used in the education at the Department of Biology. The end goal is to bring forward any concerns among the students and report them to the director of studies and the teachers. We also want to suggest possible improvements and alternative learning methods in order to promote motivation and learning, as well as inclusiveness in the students’ learning process.

Methods

In order to assess the students' perspective of their own learning situation, we designed a questionnaire (Appendix 2) using Google forms. A link to the questionnaire was sent out by the study counselor via email to all current and former students at the Department of Biology at Lund University, and was open for answers for about 72 h (start date: 2022-02-14, end date: 2022-02-17). The questionnaire consisted of 14 mandatory questions that aimed to collect information on students such as: age, current education, diet preferences, previous experiences and personal discomfort of using animals in learning activities during their education. We also included questions in order to assess if students felt that, because of their animal welfare beliefs, their education was compromised or that they were being discriminated against at Lund University, especially at the Department of Biology. All questions were close ended with a multiple answer design (choice between two to four answers) which were designed in an ordinal format. At the end of the questionnaire, the students were allowed to provide extra information about themselves as comments in an open text format (optional). No other personal inquiries were made about the students and all the answers collected were anonymous. This design was chosen in favor of a format for faster and simpler interpretation.

To collect a qualitative student's perspective, we approached a former student (hereby referred to as Student1). Student1 conducted both her bachelor and master studies at the Department of Biology at Lund University and is currently pursuing her PhD at the same department. We sent to Student1 an email with three questions and room for comments (Appendix 3). We asked whether Student1 felt uncomfortable with using animals for learning during her education, if she was offered any alternatives, and if she believed they were sufficient alternatives. To collect additional perspectives, we approached coordinators who use animals in their teaching activities as well as the director of studies at the Department of Biology at Lund University. We sent to them an email with three

questions and room for comments (Appendix 4). The director of studies provided us with the names of six course coordinators for courses using animals-based samples for learning. All interviewees have agreed to have their responses cited by their name, but we have chosen to use ambiguous names to not allow online search engines to associate their names with this report.

Results

Students questionnaire responses

We obtained a total of 82 responses from the biology students and we will summarize the results for some of the questions (see Appendix 5 for raw data for all questions). Among the respondents, 20 students (24.4%) were pursuing their bachelor's degree, 50 students (61%) were pursuing their master's degree, and twelve students (14.6%) had completed their masters degree. Concerning food preferences, 40 of the students (48.8%) answered that they made adjustments to exclude at least some meats from their diet, of which 23 students excluded meat completely, and nine students also excluded other animal products from their diet.

Four questions were designed to evaluate students' animal welfare beliefs. We found that 31 (37.8%) of the students responded that the formal course in ethics training should be extended to include Invertebrates. When asked whether they would be comfortable with euthanizing an animal for an exercise, 49 students (59.8%) were comfortable with euthanizing an insect themselves but only 28 (34.1%) were comfortable with euthanizing a mouse (Figure 1). Nine students (11%) would prefer to be excused from the exercise with a dead insect and 20 students (24.4%) would prefer to be excused from the exercise involving a dead mouse (Figure 1). When it came to justification for working with animals in biological research, a heavy majority of the respondents (71 i.e. 86.6%) believed that it could be justified only if the animals do not suffer and if it will benefit conservation efforts or similar. However, one of these students commented that education should not be one of these reasons.

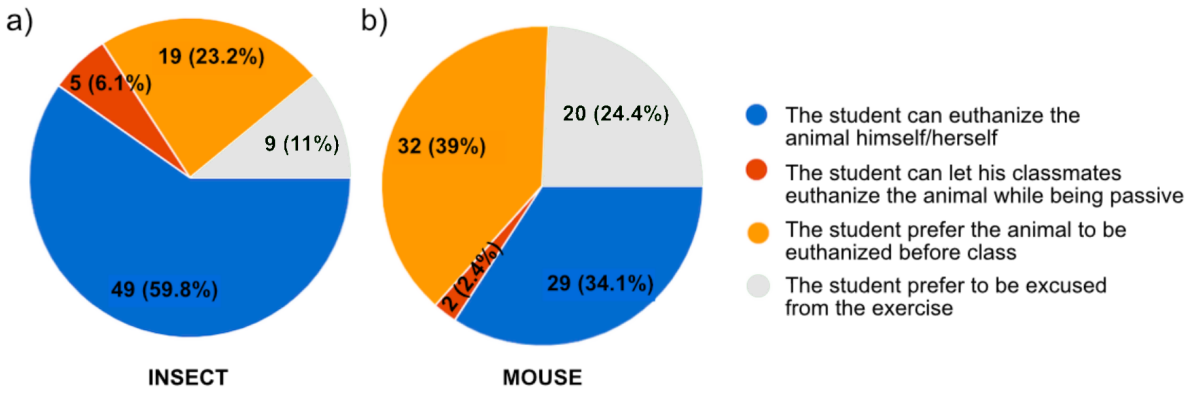

Figure 1. The level of involvement students were comfortable with when asked to work with a) an insect, and b) a mouse.

We further wanted to evaluate whether the students perceived that their education was being affected. Thirty-three students (40.2%) believed that the learning goals of practical exercises with animals could be achieved with less invasive and/or alternative methods. Twenty-five students (30.5%) believed that there could be some changes in the way animals are used in their education and seven students (8.5%) believed that there should be major changes. When the students were asked whether they perceived that their education was being compromised because of their animal welfare beliefs,

twelve students (14.6%) answered positively (Figure 2a). When asked if they felt discriminated against, four students (4.9%) believed so (Figure 2b).

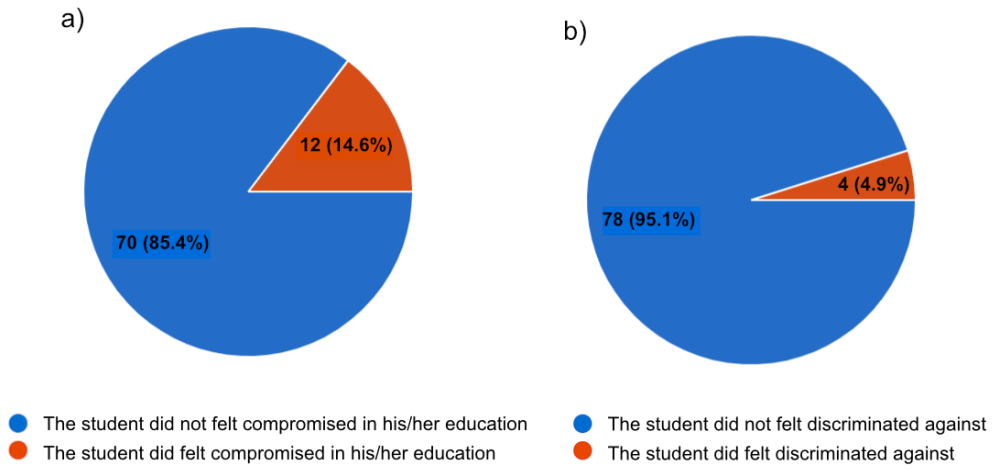

Figure 2. Proportion of students who felt that, because of their animal welfare beliefs, a) their education was being compromised, and b) they were being discriminated against.

We decided to delve further into the beliefs of this minority of students, twelve students in total (Figure 2a). All but one of these students were either pursuing or had graduated from their master's degree. Four (33.3%) of them answered that they ate meat, while the rest excluded meat from their diet partly or even entirely. Ten out of the twelve students (83.3%) thought that the formal course in ethics training should be extended to include invertebrates. When asked whether they would be comfortable with euthanizing and working with an animal, four (33.3%) were comfortable with euthanizing the insect themselves and three (25%) were comfortable with euthanizing the mouse. Two (16.6%) students would prefer to be excused from an exercise involving a dead insect, while seven (58.3%) would prefer to be excused from an exercise involving a dead mouse. Three (25%) of these students believed that working with animals for research is never justified, two (16.6%) of them thought it is always justified, while the other seven (58.3%) students believed that it could be justified only if the animals do not suffer and it will benefit conservation efforts or similar. Eight (66.6%) of the students further believed that the learning goals of these exercises could be achieved with less invasive and/or alternative methods, while the other four (33.3%) believed that it was a necessary skill or experience for them to have. Five (41.6%) of the students also believed that there could be some changes in the way animals are used for learning in their education in biology at Lund University, while four (33.3%) students believed that there need to be major changes.

In general, one student answered that he/she did not feel that his/her education was being compromised, but that he/she was being discriminated against. He/she commented that there should always be non-invasive options available and on this subject it is not up for the teachers to decide what's best for the student's education. Further, students should have the option to incorporate practical experience with animals into their education towards the end of their education, but not in their first year. Several of the students also commented that even though they thought the use of animals for research was acceptable, the important question is to determine if it is always necessary or if it can be avoided in some cases. Two students commented that they and their course mates felt very uncomfortable with killing spiders during a one day excursion in the evolutionary animal ecology course, a course which is otherwise purely theoretical.

Student1 interview response

In 2016, Student1 and her fellow students made complaints during a course in Animal physiology, which is mandatory for first year students. The course involves animal dissections among other things. The student's reasons were purely ethical as they do not eat or wear animals-based products. They specifically asked for alternatives to these labs, such as digital and advanced programs that they knew were offered by other Swedish universities (such as the Linnaeus University and the Swedish University of Agricultural Sciences). As a response the teacher offered comments which Student1 experienced as demeaning, such as "you should think about why you are here and if Biology is really your thing" and "so, what do you do to avoid hitting flies when you drive a car?". Further, Student1 didn't perceive that the teachers were interested in helping the students in their search for digital alternatives, and they left the students to find these on their own. At the end, after many efforts to fight for their beliefs, they were offered an alternative for the dissections. One of the teachers personally sat down with the students to describe each lab with the help of photographs, which Student1 believed was an alternative that was as good as the regular dissection exercise. Even though Student1 appreciated the knowledge gained from the course in Animal physiology, she does not think that the dissections would have provided any knowledge that she had used for in her current research nor in her future research. She also thinks that dissection exercises are not that important during the first year in the students' education and that they should be offered later in the education when students who need the skills are closer to a time when they might apply it in their own work. Student1 commented further that it was exhausting to be questioned for her beliefs and to have to fight for what she believes is important. Student1 believes that students' feelings should be taken into consideration, and even though Student1 uses animals, to some extent, in his/her current research she thinks that "we should not always continue as we've always done, just because we can."

Teachers interview responses

Of the teachers we reached out to with interviews, we got responses back from the director of studies and one of the six teachers (course coordinator of the course in Field Faunistics, hereby referred to as Teacher1), before the deadline of our report submission. Both the director of studies and Teacher1 responded that they have experienced complaints from students. The director of studies responded that they had made some dissection labs non-compulsory or offered the student to attend the lab but remain passive. Even though he thinks students can still reach the ILOs with alternative methods, he worries that they risk missing out on basic knowledge, experiences and skills that all biologists should have. Teacher1 has still managed to incorporate alternatives in his teaching, even though Teacher1 is teaching a course in which one of the ILO mentions to have the students learn how to collect and identify entomological material. Except for one grade based assignment on how to collect, preserve and label entomological material, students are always given the choice whether they want to keep or release the animals they catch and identify, and for their final project in the course are able choose non-invasive methods, such as catch, identify, release. In his teaching, Teacher1 also incorporates a lecture and daily discussions on the ethics of collecting entomological material for research, which he believes has mitigated any negative experiences amongst the students. However, when it comes to working with invertebrates in particular, Teacher1 observes that the students that learn through the more active methods also learn faster and better. In general, Teacher1 argues that for any project, having hands-on experience is important for students to stay motivated and get a sense of "ownership" of their project, as well as getting a feeling for being a researcher. Teacher1 also thinks that regularly talking about ethics and not "sugar coating" animal experiments will benefit all students. The students should know from the start what to expect.

Discussion

In this study, we aimed to evaluate whether students' animal welfare beliefs is a factor affecting their learning process throughout their biology education at Lund University, and to assess whether this belief could be a cause for discrimination. In at least 16 different courses at Lund University, of which five are mandatory in the bachelor's programme (Appendix 6), the use of animals is incorporated into learning activities. Many arguments are in favor of using animal-based samples because such activities might be considered as "necessary" in order to have the students partake actively in their learning process.

A previous report (Active learning in biology) from former students at the Teaching and Learning in Higher Education course, found that active modules involving a high degree of active learning, such as seminars, excursions and labs, were positively influencing students' grades and led to more grades with "pass with distinction" at the Department of Biology. Although not all identified courses involving animals (Appendix 6) were included in their analysis, these results strongly support arguments for the use of active learning activities in biology education. Interestingly, the same report suggested that the students' overall satisfaction with the courses also increased with the amount of active learning. However, the type of exercises, and whether animals were involved in these learning activities were not further investigated in their analysis. In this study, we focused on practical exercises such as field and lab exercises with animals. In fact, previous studies suggest that using animals in education may in some cases have adverse effects on students and negatively impact their learning process (Capaldo, 2004; Rochelle et al. 2016).

In our study, we found that the animal organism group (insect or mouse) used in an exercise greatly influenced the level of discomfort experienced by the student. Although about 40% of the students were not comfortable euthanizing an insect, this number increased to 66% when they were asked to euthanize a mouse. In addition, 11% of the students prefer to be excused from the course when working with insects and increased to 24% when working with a mouse. These observations further indicate that animal welfare concerns are more exacerbated towards "close-species relatives" than more distant species, which is a phenomena in agreement with what was previously described by Miralles et al. (2019). Further, animal welfare beliefs can be expressed through food preferences such as vegetarianism and veganism. While neither animal welfare, nor veganism is specifically defined under the Discrimination Act of Sweden, ethical veganism (philosophy that entails plant-based diet and refuse the use of animals for any purpose) is a protected belief in United Kingdom under the Equalities Act 2010 and is given the same protection as age, disability, race, religion, sex, and sexual orientation. We argue that animal welfare beliefs should be considered as ground for discrimination, and, therefore, learning institutions must take this into consideration throughout systematic and continuous work to prevent discrimination.

We asked teachers if there have been previous complaints formulated by students, which alternative methods were offered in their courses and what they do to prevent adverse effects on students' learning. The director of studies mentioned that lab exercises involving dissections are no longer mandatory and the students are given the choice to attend and remain passive by only observing. In the course held by Teacher1, alternatives are incorporated in his teaching and Teacher1 offers the choice whether the students want to keep or release the animals they catch and identify.

Whether incorporating alternatives in all courses using animal-based samples may affect the ILOs expected from students, we wanted to include both teachers and students' perspectives. For bachelor programmes, one ILO included in Competence & skills do mention to "demonstrate the skills required

to work autonomously in the main field of study" (Appendix 1). For master programmes, similar ILOs are included such as "demonstrate specialized methodological knowledge in the main field of study" (Knowledge and understanding) and "demonstrate the skills required for participation in research and development work or autonomous employment in some other qualified capacity" (Competence & skills). Whether, not using animal-based samples may affect such ILOs in particular remains difficult to assess with the current data and would need further investigations. The director of studies does not think that students using alternative methods are less likely to reach the ILOs but they might "risk missing out on basic knowledge, experiences and skills that all Biologists should have". We do believe that in the end this depends on the specific career path the individual student chooses in the very broad field of biology.

Course specific ILOs might therefore be a different matter. In the course held by Teacher1, he says that one learning objective is "for students to learn how to properly collect, preserve and label entomological material". In this course, Teacher1 observes that "students that chose to actively work with animals also learn faster and better". Additionally, Teacher1 incorporates a whole lecture dedicated to the ethics of collecting entomological material for research, as well as incorporating it in daily discussions. He believes that this has mitigated any negative experiences amongst the students. Thus, this example is particularly interesting because alternatives can still "align" with the ILOs but alternatives should be designed to be equivalent "active" learning activities as using animal-based samples. Through discussions, the students are explained the "WHY?" of the learning activities when they use animals and it will benefit the teacher to take into consideration the students' animal welfare beliefs. This may help them to understand and actively think about the ethics and justifications for working with animals in biological research. We think that the students being able to justify the use of animals in research is especially important for their learning, as 86.6% of the students that have responded think that the use of animals is justified as long as the animals do not suffer and will benefit conservation efforts. This may apply to education in our case as well.

Twelve students felt that their education was compromised because of their animal welfare beliefs, and even more concerningly, four students felt discriminated against in their education at Lund University. None of the students mentioned in the comments how they were treated differently during the learning activities of the courses they have attended. According to the Discrimination Act of Sweden, indirect discrimination can be identified as when "someone is disadavantaged by the application of a procedure that apperas neutral but may put people of a certain belief at a particular disadvantage, unless the procedure has a legitimate purpose and the means that are used are appropriate and necessary to achieve that purpose". Presently, we cannot clearly state that direct or indirect discrimination happened, as we did not design our questionnaire to assess that in particular, and might further need to interview these students that felt discriminated against. Also we would need to assess, neutrally, whether the situation they have experienced had legitimate purposes and appropriate means.

While not offering satisfactory alternative learning methods might be considered indirect discrimination, a personal experience from Student1 might be proof of direct discrimination. When Student1 in a mandatory course felt discomfort in conducting animal dissections and asked for alternatives, the teacher offered comments that she experienced as demeaning, such as "you should think about why you are here and if Biology is really your thing" and "so, what do you do to avoid hitting flies when you drive a car?". We think this could be an example of direct discrimination, as the student was treated less favorably than the other students through inappropriate comments that other students didn't get, which were associated with the Student1 personal beliefs. Such experiences can

promote exclusion of certain students from the exercise, and thereby have a negative affect on their learning process. Thus, we believe that this is further proof that students' animal welfare beliefs should is a ground for discrimination that is covered under the fourth ground ("religion or other belief") of the Discrimination Act of Sweden.

Our findings suggest that there is a need to review how animals are used in education at the Department of Biology. We think that non-invasive alternatives should be systematically offered to students. Possible alternatives could include articles, videos, digital softwares, interactive virtual reality, anatomical models, and visits to natural history museums, as long as they can be designed to be equivalent to the regular "active" learning methods. We also think that daily discussions on ethics in courses using animal-based samples would be a good way to establish a dialogue between teachers and students. Teachers will be able to explain the reasons why using animals during exercise and how it benefits the students' education. Also, students will be able to express their beliefs and concerns. Depending on the amount of time available for each course, including the students into the planning of the exercises using animals would also be a way to engage the student in active learning and promote inclusiveness in teaching activities including lab exercises. We would like to suggest that a short but mandatory introductory course involving lectures and open discussions about ethics and regulations should be designed for all students starting their biology education at Lund University. This course should be addressed to all students that are interested in zoology but also extended for botany. While this could help to pacify the concerns from students for whom animal welfare beliefs are very important, it could conversely set the limits to students who don't feel concerned at all. This would be a way to teach the "ground rules" for good uses and handling of any kind of living organisms in research and in education. Under "Judgment and approach" for bachelor level studies, one ILO is listed as "demonstrate the ability to make assessments in the main field of study informed by relevant disciplinary, social and ethical issues", which for master level studies is complemented by "and also to demonstrate awareness of ethical aspects of research and development work" (Appendix 1). We think that such a course would align very well with this specific ILO.

Conclusions

While the aim of this study was not to evaluate or improve the welfare of animals used for learning in biology education, we believe that the students' perception of animal welfare, as well as their own justification of using animals for research is a key component for student learning. We suggest that whenever possible, teachers should choose to teach with non-lethal or less invasive methods such as "catch and release" or to work with already dead museum material. And when the ILOs provide room for alternative learning methods, the students should be provided a choice. For example, a field exercise might be carried out as a botanical or non-lethal animal project, and a physiology lab might be taught through work with illustrations, models, videos or virtual reality. We also suggest that teachers should try to incorporate discussions around the ethics and justification of using animals in research, especially in connection to those exercises. The Department of Biology could potentially even provide mandatory or optional ethics workshops. This might relieve some of the students' concerns, make them more comfortable with proceeding with the exercise, and ultimately make them more receptive to learning. After all, how can we expect students to justify the research in their field of science to society if they can't justify it to themselves?

Acknowledgements

We would like to thank all the students that took their time in answering the questionnaire, as well as Student1, the director of studies, and Teacher1 for answering our interview questions, and granting us insights into their perspectives and beliefs. A final thanks goes out to the study counselor, who helped us to reach out with the questionnaire to the students and to the group that gave us feedback on the preliminary report.

Process report

All members of the team have contributed equally in the choice of the topic and the design of the study (the elaboration of the questions included in the questionnaire and the ideas that should be included in the report). The group project plan was drafted by Samantha but was revised by all members of the group before submission. David drafted the introduction in the report and made the main research on the relevant literature. Simon has performed the last edits of the questionnaire, incorporated it into Google Forms, and sent it to the person responsible to spread it among undergraduate students at the Biology Department. Samantha did send the questions addressed to the director of studies as well to the teachers. Simon sent the questionnaire to Student1 who agreed to share her story. David did not participate in the edits performed in the preliminary version of the report due to a schedule incompatibility (which he mentioned to the other members of the group early on). Simon and Samantha had daily meetings to discuss the progress of the report and shared ideas on how to structure it. The work was split daily between Samantha and Simon (focus on specific parts of the report) so that they could work independently most of the time and still ensure their teaching schedule. Simon drafted the Method section and the Results section and Samantha contributed with some edits in the main text and she designed the main figures. Simon took care of all Appendixes in the report. Samantha edited the original introduction which was revised by Simon. Samantha wrote the discussion and Simon wrote the conclusion, the abstract and the acknowledgments that Samantha has proof-read. All members of the team have contributed equally in the presentation of the report and in the feedback given on February the 23rd 2022. The new edits throughout the report were equally split between all members of the group. Simon added additional sections to the Appendix, Samantha wrote the process report as well as the feedback summary and David edited the figures according to the feedback. All members of the group have equally participated in the proof-reading process before handing in the final version of the report.

Feedback summary

Feedbacks received from group 8 were exhaustive and very useful. Group 8 thought that the study gave a good background on the learning situation and reflects very well the pedagogical problems/challenges experienced by biology students. However, some comments were addressed about specific parts in the report. For example, the abstract was considered as a good summary but was lacking a “teaser” sentence about the results, which was added in the final version of the report. The aims and goals mentioned in the introduction were properly investigated throughout the report but additional information was needed. For example, the report needs to refer to the ILOs for bachelor/master studies (added in the Appendix of the final report) and should mention which ones are specifically compromised in the discussion. Both suggestions were considered and were added in the final version of the report. The design of the study and the methods used were thought to be well suited in order to answer the aims of the study. The fact that the study was restricted to only one university and one department was also appreciated.

Group 8 thought that the proposed solutions to the problems/challenges were well discussed and included a critical examination in the discussion. However, course codes indicated in the text should be explicitly mentioned with their full denominations (i.e. titles of the courses). Also, it was advised to us to mention which courses specifically require animal handling and if these courses could be avoided by the students throughout their education. This comment led to a nice discussion about the fact that our study aims to find alternatives so that the students do not feel they have to avoid specific courses during their education. They rather should feel included whatever their beliefs are. Group 8 thought that what was identified as indirect discrimination should be further discussed but we think that the definitions were well exposed in the introduction of the report. A specific comment was made on the figures presented that were not “color blind friendly”. We adjusted the figures accordingly. In general, group 8 advised us to proof-read the report, correct grammatical mistakes and rephrase some sentences in the report before handing in the final version. Finally, group 8 suggested that while this report has focused primarily on animal’s welfare beliefs, the alternative learning activities suggested in the discussion could be also extended for example, to students having anxiety disorders such as phobia or disgust’s (aversion behavior). We decided to not include this extension in the report as this is not directly related to animal welfare beliefs, but rather to disability. Also, it was advised by our supervisor that people that were mentioned by their names in the first version of the report (director of study and Student1) should be mentioned anonymously in the final version of the report. This was to avoid online search engines being able to associate their names with this report.

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Appendix 1: Intended Learning Outcomes for studies in biology

Bachelor studies (including Biology and Molecular Biology)

Document

NGNAT, Sciences, 180 credits
First cycle degree programme
https://www.lunduniversity.lu.se/sites/www.lunduniversity.lu.se/files/2020-11/Science-bachelors-programme-syllabus.pdf, accessed 15/2 2022.

Decision

The programme syllabus is established by The Board of Faculty of Science 05-09-2017 (U 2017/281) and most recently amended by Study programmes board, Faculty of Science 25-05-2020 (U 2020/671). The amended syllabus is valid from 25-05-2020, autumn semester 2020.

Specialisations

ASTR Astronomy and Astrophysics, Astronomi och astrofysik, 180 credits
BIOL Biology, Biologi, 180 credits
KEMI Chemistry, Kemi, 180 credits
KEMO Chemistry/Molecular Biology, Kemi/Molekylärbiologi, 180 credits
KEFY Chemistry/Physics, Kemi/Fysik, 180 credits
MIHS Environmental Health, Miljö- och hälsoskydd, 180 credits
MIVE Environmental Science, Miljövetenskap, 180 credits
GEOL Geology, Geologi, 180 credits
ENMA Mathematics, Matematik (undervisning på engelska), 180 credits
MATE Mathematics, Matematik, 180 credits
MEBG Meteorology and Biogeophysics, Meteorologi och biogeofysik, 180 credits
MOBI Molecular Biology, Molekylärbiologi, 180 credits
INES Physical Geography and Ecosystem Science, Naturgeografi och ekosystemvetenskap, 180 credits
FYSI Physics, Fysik, 180 credits
ENFY Physics, Fysik (undervisning på engelska), 180 credits
FONE Science with Photons and Neutrons, Naturvetenskap med fotoner och neutroner, 180 credits
TEOF Theoretical Physics, Teoretisk fysik, 180 credits

Goals

Knowledge and understanding

For a Degree of Bachelor the student shall

- demonstrate knowledge and understanding in the main field of study, including knowledge of the disciplinary foundation of the field, knowledge of applicable methodologies in the field, specialised study in some aspect of the field as well as awareness of current research issues.

Competence and skills

For a Degree of Bachelor the student shall

- demonstrate the ability to search for, gather, evaluate and critically interpret the relevant information for a formulated problem and also discuss phenomena, issues and situations critically
- demonstrate the ability to identify, formulate and solve problems autonomously

and to complete tasks within predetermined time frames
- demonstrate the ability to present and discuss information, problems and solutions in speech and writing and in dialogue with different audiences, and
- demonstrate the skills required to work autonomously in the main field of study.

Judgement and approach
For a Degree of Bachelor the student shall
- demonstrate the ability to make assessments in the main field of study informed by relevant disciplinary, social and ethical issues
- demonstrate insight into the role of knowledge in society and the responsibility of the individual for how it is used, and
- demonstrate the ability to identify the need for further knowledge and ongoing learning.

Master studies in Biology

Document
NABIO, Master Programme in Biology, 120 credits
Second cycle degree programme
https://www.lunduniversity.lu.se/sites/www.lunduniversity.lu.se/files/2020-11/biology-programme-syllabus.pdf, accessed 15/2 2022.

Decision
The programme syllabus is established by Study programmes board, Faculty of Science 08-02-2017 (U 2017/32) and most recently amended 25-05-2020 (U 2020/668). The amended syllabus is valid from 25-05-2020, autumn semester 2020.

Specialisations
EKZO Animal Ecology, Zooekologi, 120 credits
EKLI Aquatic Ecology, Akvatisk ekologi, 120 credits
EKNA Conservation Biology, Naturvård och bevarandebiologi, 120 credits
ALLM General, Allmän inriktning, 120 credits
VBIO Plant Science, Växtbiologi, 120 credits

Goals
Knowledge and understanding
For a Degree of Master (120 credits) the student shall
- demonstrate knowledge and understanding in the main field of study, including both broad knowledge of the field and a considerable degree of specialised knowledge in certain areas of the field as well as insight into current research and development work, and
- demonstrate specialised methodological knowledge in the main field of study.

Competence and skills
For a Degree of Master (120 credits) the student shall
- demonstrate the ability to critically and systematically integrate knowledge and analyse, assess and deal with complex phenomena, issues and situations even with limited information
- demonstrate the ability to identify and formulate issues critically, autonomously

and creatively as well as to plan and, using appropriate methods, undertake advanced tasks within predetermined time frames and so contribute to the formation of knowledge as well as the ability to evaluate this work
● demonstrate the ability in speech and writing both nationally and internationally to clearly report and discuss his or her conclusions and the knowledge and arguments on which they are based in dialogue with different audiences, and
● demonstrate the skills required for participation in research and development work or autonomous employment in some other qualified capacity.

Judgement and approach
For a Degree of Master (120 credits) the student shall
● demonstrate the ability to make assessments in the main field of study informed by relevant disciplinary, social and ethical issues and also to demonstrate awareness of ethical aspects of research and development work
● demonstrate insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how it is used, and
● demonstrate the ability to identify the personal need for further knowledge and take responsibility for his or her ongoing learning.

Master studies in Molecular Biology

Document
NAMOB, Master Programme in Molecular Biology, 120 credits
Second cycle degree programme
https://www.lunduniversity.lu.se/sites/www.lunduniversity.lu.se/files/2020-11/molecular-biology-programme-syllabus.pdf, accessed 15/2 2022.

Decision
The programme syllabus is established by Study programmes board, Faculty of Science 24-01-2008 (N 2008-383) and most recently amended 25-05-2020 (U 2020/669). The amended syllabus is valid from 25-05-2020, autumn semester 2020.

Specialisations
ALLM General, Allmän inriktning, 120 credits
MEBI Medical Biology, Medicinsk biologi, 120 credits
MIBI Microbiology, Mikrobiologi, 120 credits
MGBI Molecular Genetics and Biotechnology, Molekylär genetik och bioteknik, 120 credits

Goals
Knowledge and understanding
For a Degree of Master (120 credits) the student shall
● demonstrate knowledge and understanding in the main field of study, including both broad knowledge of the field and a considerable degree of specialised knowledge in certain areas of the field as well as insight into current research and development work, and
● demonstrate specialised methodological knowledge in the main field of study.

Competence and skills
For a Degree of Master (120 credits) the student shall

- demonstrate the ability to critically and systematically integrate knowledge and analyse, assess and deal with complex phenomena, issues and situations even with limited information
- demonstrate the ability to identify and formulate issues critically, autonomously and creatively as well as to plan and, using appropriate methods, undertake advanced tasks within predetermined time frames and so contribute to the formation of knowledge as well as the ability to evaluate this work
- demonstrate the ability in speech and writing both nationally and internationally to clearly report and discuss his or her conclusions and the knowledge and arguments on which they are based in dialogue with different audiences, and
- demonstrate the skills required for participation in research and development work or autonomous employment in some other qualified capacity.

Judgement and approach

For a Degree of Master (120 credits) the student shall

- demonstrate the ability to make assessments in the main field of study informed by relevant disciplinary, social and ethical issues and also to demonstrate awareness of ethical aspects of research and development work
- demonstrate insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how it is used, and
- demonstrate the ability to identify the personal need for further knowledge and take responsibility for his or her ongoing learning.

Appendix 2: Questionnaire

We are three PhD students at the Department of Biology that are performing a study to evaluate whether practical work with live or dead animals as part of the education in biology is in conflict with students' animal welfare beliefs.

Our hope is that this study will bring forward any concerns among the students and to assess whether these have a negative impact on our students' learning. We will put these results in relation to the intended learning outcomes of the programme, and try to find suggestions for solutions and improvements to promote learning in an inclusive way.

You will be asked a few questions about your previous experiences, about your personal beliefs, as well as whether you feel that your animal welfare beliefs are in conflict with your education and learning process. At the end of the questionnaire, you have the option to provide some extra information about yourself.

- What is your age? (answer in years with a number).
- In which stage are you currently in your education in biology?
  - This is the first year of my bachelor's degree.
  - I am currently pursuing my bachelor's degree.
  - I am currently pursuing my master's degree.
  - I have completed my master's degree.
- Have you ever had a close relationship with a pet?
  - Yes, a pet that belonged to me/my family.
  - Yes, a pet that belonged to someone close to me.
  - No.
- What diet preference best describes you?
  - No food preferences. I eat meat.
  - Pescatarian (I mostly do not eat meat, but I make exceptions for fish and seafoods).
  - Vegetarian (I do not eat meat, but I eat animal products).
  - Vegan (I do not eat meat, nor animal products).
- During your education in biology, have you worked with living or dead animals (including invertebrates) during a lab session or field work?
  - Yes.
  - No.
- At Lund University, formal training in ethics, regulations, and handling is needed for independent work with research animals. These include all vertebrates, octopuses and lampreys. For other organisms, no formal training is necessary. Do you think this is an appropriate division of organism groups?
  - No formal training should be required for any organism group.
  - Some of the listed organism groups should not require formal training.
  - This is appropriate.
  - Invertebrates should also require formal training.
- In a course you are asked to euthanize an insect or to work with the tissue of a dead insect. What level of involvement are you comfortable with?
  - I can euthanize the insect myself.
  - I can let my classmate euthanize the insect while I am passive.
  - I prefer that the insect has already been euthanized before class.

    - I prefer to be excused from the exercise (the exercise is not mandatory and has no consequence for your grade).

- This time, you are asked to euthanize a mouse or to work with the tissue of a dead mouse. At what level of involvement are you comfortable with?

    - I can euthanize the mouse myself.
    - I can let my classmate euthanize the mouse while I am passive.
    - I prefer that the mouse has already been euthanized before class.
    - I prefer to be excused from the exercise (the exercise is not mandatory and has no consequence for your grade).

- Even if you feel that animal welfare is important, do you think that working with live or dead animals in biological research justifies the outcome?

    - Working with animals for research is always justified.
    - Working with animals for research is justified if the animals do not suffer and/or it will benefit conservation efforts or similar.
    - Working with animals for research is never justified.

- Before you started your education in biology at Lund University, did you think that practical work with live or dead animals would be part of your education?

    - Yes, I knew it would be.
    - I did not consider wheteher or not it would be.
    - No, I did not think it would be.

- Do you think that practical work with live or dead animals is a necessary experience for you to become a biologist?

    - Yes, it is a necessary skill or experience for me to have as a biologist.
    - The learning goals of these exercises are important, but they could be achieved with less invasive methods (such as instructional illustrations or videos).
    - No, it is a necessary skill or experience for me to have as a biologist.

- Do you feel that because of your animal welfare beliefs, your education in biology at Lund University is compromised?

    - No, I do not feel that my education is compromised.
    - Yes, I feel that my education is compromised.

- Do you feel that because of your animal welfare beliefs, you are being discriminated against in your education at Lund University?

    - No, I do not feel discriminated against.
    - Yes, I feel discriminated against.

- Do you approve of the way animals are used for learning in the education in biology at Lund University?

    - Yes, I approve.
    - No, I do not approve. I think that there could be some small changes.
    - No, I do not approve. I think that there needs to be major changes.

- Thank you for answering this questionnaire! If you want to add any further information about yourself that you consider relevant (a background in animal care/handling as a vet, or you grew up on a farm), please expand in the comment field below:

Appendix 3: Interview questions for Student1

1) Did you or any of your fellow students ever feel uncomfortable working with animal-based samples during your education at Lund University, and did you ever make any complaints?

2) What was the offered solution? Where you excused from the exercise or offered an alternative learning method?

3) Do you feel that the alternatives offered provided you with the same opportunity of learning as the other students? Did you feel that the learning outcome of the exercise was important for your goals as a biologist?

4) Other comments?

Appendix 4: Interview questions for teachers

1) Have you experienced any complaints from biology students attending lab session involving animal-based samples (live or dead animals, or animal tissues) at Lund University?

2) Do you know if alternatives are offered to those students? Which ones? (Example: alternatives to rat dissection)

3) Do you think that these alternatives may affect the Intended Learning Outcomes (ILOs) of these courses (in relation to the syllabus)?

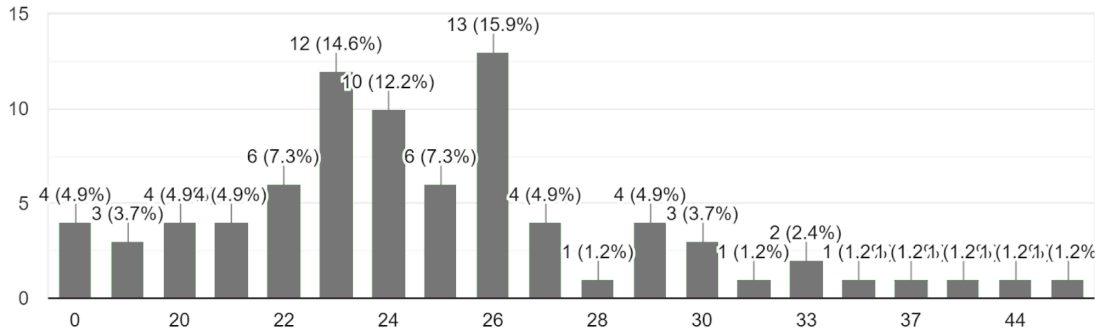
4) Comments?

Group 7: David Gomez-Blanco, Simon Jacobsen Ellerstrand and Samantha Mellinger
2022-02-25

Appendix 5: Raw data from the questionnaire

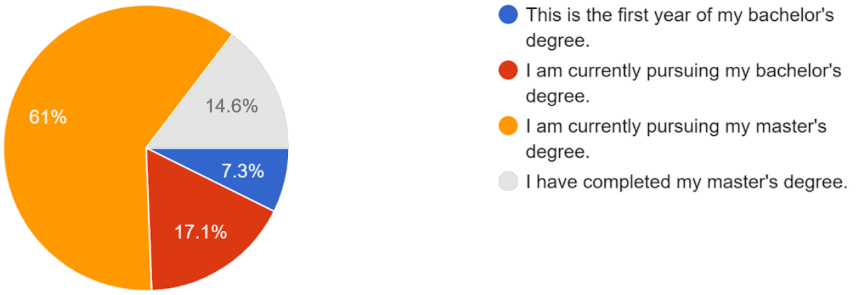
What is your age? (answer in years with a number).

82 responses



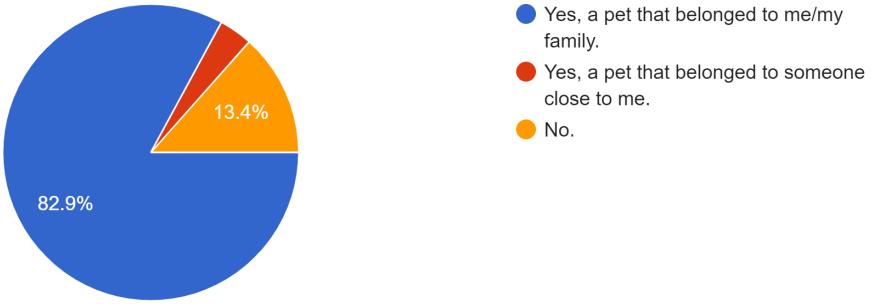
In which stage are you currently in your education in biology?

82 responses



Have you ever had a close relationship with a pet?

82 responses



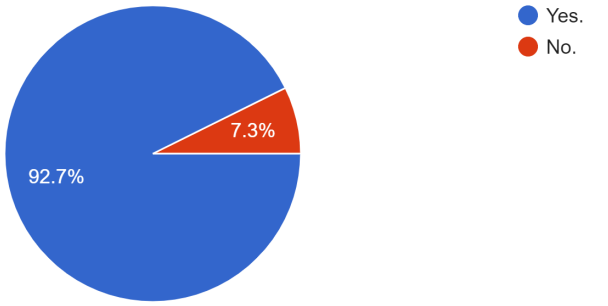
Group 7: David Gomez-Blanco, Simon Jacobsen Ellerstrand and Samantha Mellinger
2022-02-25

What diet preference best describes you?

82 responses

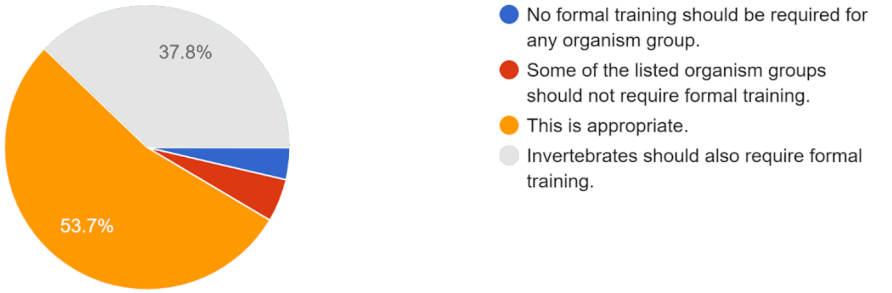
During your education in biology, have you worked with living or dead animals (including invertebrates) during a lab session or field work?

82 responses



At Lund University, formal training in ethics, regulations, and handling is needed for independent work with research animals. These include all verte...his is an appropriate division of organism groups?

82 responses



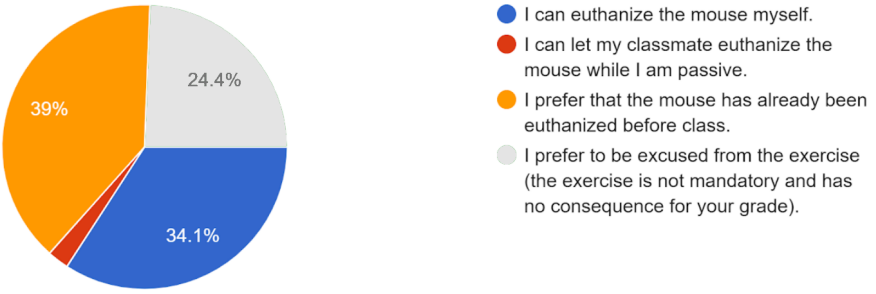
Group 7: David Gomez-Blanco, Simon Jacobsen Ellerstrand and Samantha Mellinger
2022-02-25

In a course you are asked to euthanize an insect or to work with the tissue of a dead insect. What level of involvement are you comfortable with?

82 responses

This time, you are asked to euthanize a mouse or to work with the tissue of a dead mouse. At what level of involvement are you comfortable with?

82 responses



Even if you feel that animal welfare is important, do you think that working with live or dead animals in biological research justifies the outcome?

82 responses

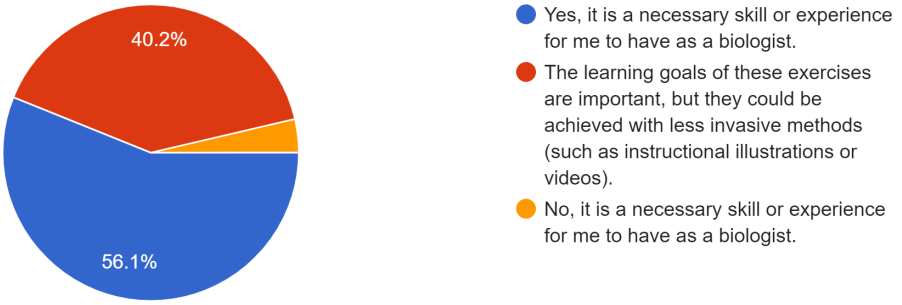
Group 7: David Gomez-Blanco, Simon Jacobsen Ellerstrand and Samantha Mellinger
2022-02-25

Before you started your education in biology at Lund University, did you think that practical work with live or dead animals would be part of your education?

82 responses

Do you think that practical work with live or dead animals is a necessary experience for you to become a biologist?

82 responses



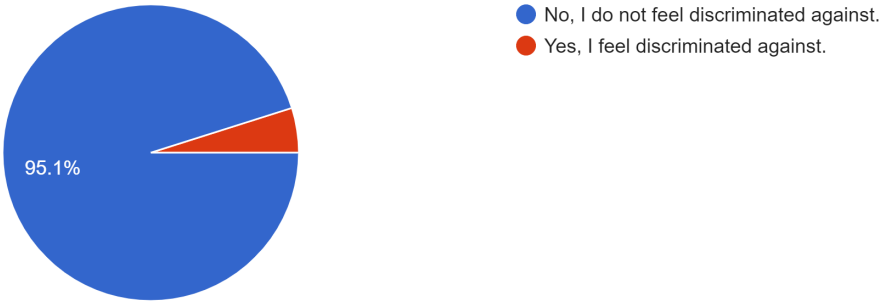
Do you feel that because of your animal welfare beliefs, your education in biology at Lund University is compromised?

82 responses

Group 7: David Gomez-Blanco, Simon Jacobsen Ellerstrand and Samantha Mellinger
2022-02-25

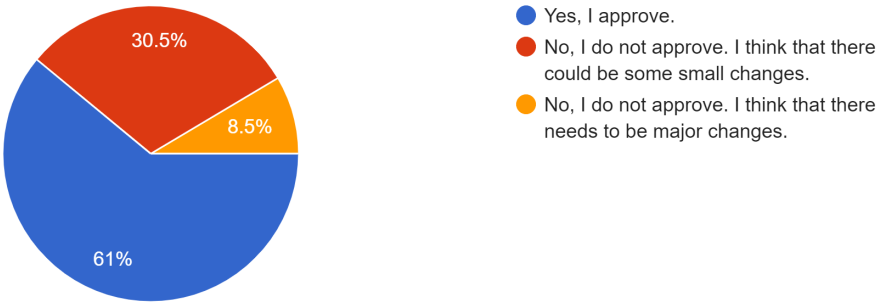
Do you feel that because of your animal welfare beliefs, you are being discriminated against in your education at Lund University?

82 responses



Do you approve of the way animals are used for learning in the education in biology at Lund University?

82 responses



Appendix 6: Courses with animals incorporated into learning activities.

Disclaimer: This is just a brief review by us of the courses offered by the Department of Biology at Lund University. This list may not include all courses incorporating animals into learning activities, and we might have misinterpreted whether some of the courses actually include animals. Further, there has of yet been no detailed evaluation by us to what extent animals are being used, whether the use of animals is mandatory or optional, if alternatives are provided, and whether the use of animals is needed to reach the course specific ILOs

Courses

Courses at the basic level

(* indicates that the course is mandatory in either the bachelor programme in Biology or Molecular Biology)

- Animal Behaviour BIOF08, 15 credits
- *Botany and Zoology BIOB10, 15 credits
- *Cell and Microbiology BIOA10, 15 credits
- *Ecology BIOC10, 15 credits
- *Faunistics and Floristics BIOB12, 7.5 credits
- Field Faunistics BIOF10, 7.5 credits
- *Human Physiology BIOC01, 15 credits

Courses at the advanced level

- Animal Ecology BIOR91, 15 credits
- Biolgical Monitoring BIOR39, 15 credits
- Limnology and Marine Ecology - Organisms and Habitats BIOR86, 15 credits
- Molecular Ecology and Evolution BIOR25, 15 credits
- Neurobiology BIOR58, 15 credits
- Ornithology BIOR51, 15 credits
- Pharmacology BIOR14, 15 credits
- Population and Community Ecology BIOR69, 15 credits
- Sensory Biology BIOR20, 15 credits