SUSTAINICUM COLLECTION
LEHRMATERIALIEN FÜR BILDUNG ZUR NACHHALTIGKEIT

beeomonitor

(Resource ID: 210)

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This teaching resource is allocated to following University:
BOKU - University of Natural Resources and Life Sciences Vienna

Institution:
Department of Chemistry (BOKU Vienna)

http://www.sustainicum.at/en/modules/view/210.beeomonitor

Individual work **Group work**	**5 to 10 students**	**1 lecture unit** **Up to 3 lecture units** **4-7 lecture units**	**Internet connection necessary**	**English, German**

A show-hive has been installed in Tulln and provided with sensors. The sensors (weight, temperature, humidity, frequency meter for tone and vibration of the bees, and IR camera) were set so that the hive can be externally observed and the data can be recorded in real time. Thus, the data can be used to explore a living colony of bees.

At the same time, the products manufactured by the bees (honey, wax) can be used as a biomonitor and analyzed in comparison with precipitation water, air and soil samples.

How to use the component – beeomonitor?

The entrance point to the biomonitor station is the homepage:

viris.boku.ac.at/beeomonitor

The learning guide and learning material can be found at
https://learn.boku.ac.at/course/category.php?id=47
log in as guest (or via your BOKU account). There is currently no password required.

The learning tools provided via this platform can be used in 5 steps:

Step zero is a basic information on honey bees, their function and their role in a sustainable ecosystem. This basic set of information provides basic knowledge about the honey bee and can be used in lectures directly.

Step one is a presentation linked to this basic information. This presentation can be used as such, divided in subgroups etc.

Moreover, the presentation already provides a direct link to the beeomonitor observatory to have an insight into the bee's life. (viris.boku.ac.at/beeomonitor) The on-line cameras and on-line data collection can be used within lectures.

Step two enhances the understanding of lectures or courses by making an excursion to the bee hive, where the students have the possibility to study the bee hive and the setup of an own monitoring experiment. Detailed explanation at the hive can be given by the excursion leader and after advanced registration, the project leader or a collaborating apiarist will be happy to assist at the site. The site is freely accessible.

Step three provides access to the monitoring station in order to embedd the collected data for enquiry based learning projects. Students can learn, how to collect and interprete data by making use of an online monitoring station.

The direct access to the monitoring station can be used in order to embed the on-line collected data for enquiry based learning projects.

Examples:

combine temperature and weight of the hive (are the activities of the bee dependent on the temperature?);
combine temperature outside the hive and insde the hive (do bees keep the temperature stable in the hive);
combine light and weight of the hive (bee activity dependent on a sunny day)

By using the setup of the hive (construction and monitoring tools), students can learn, how to collect and interprete data and they can start to build up their own online monitoring station by making use of the detailed construction plan.

Get more information and collect the data at viris.boku.ac.at/beeomonitor!

Step four provides access to the hive, addition of monitoring tools and provision of collected material by submission of a research proposal. The students can collect samples on-site, as well.

The collected material consists of water, soil, plants, honey, bee, wax, pollen – This material is collected regularely on-site to provide a distinct monitoring tool for student based projects.

Examples:

The heavy metals in soil or plant vs. honey can be measured.
Measure the accumulation of pesticides in honey/wax and compare to the pesticides found on the plants
Combine the humidity and the content of toxic elements
Analyse the stability of carbon isotopes
Analyse Boron or Strontium isotopes for e.g. determining an isotopic fingerprint for provenance studies.

Step four is linked to the sustainibility of the project:

You submit additional teaching tools, comments and add-ons to the provided tools as well as links, reports and publications of projects in connection with beeomonitoring.

Get more information and collect the data at viris.boku.ac.at/beeomonitor!

Teaching Tools & Methods

Written material formteaching_experiment

Contact details for borrowing physical devices

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Learning Outcomes

(1) The students learn about the honey bee, its environment, its role in the modern society. The live stream and the data can be used to explain the living of a bee and its hive, its growth and the swarming.

The interaction with the living hive enables the direct visualisation of a hive in a classroom. Moreover, the hive can be visited on-site and the bees activities can be monitored through the windows of the hive which can be opened from the side as well as from top.

(2) The students can use the continuously recorded data in small enquiry based projects and learn the evaluation of recorded data in a biomonitoring station.
The direct access to the monitoring station can be used in order to embed the on-line collected data for enquiry based learning projects.

Examples:

- combine temperature and weight of the hive (are the activities of the bee dependent on the temperature?);
- combine temperature outside the hive and insde the hive (do bees keep the temperature stable in the hive);
- combine light and weight of the hive (bee activity dependent on a sunny day)

By using the setup of the hive (construction and monitoring tools), students can learn, how to collect and interprete data and they can start to build up their own online monitoring station by making use of the detailed construction plan.

(3) The students can learn to setup their own research project (hypothesis, how can the hypothesis be proven, what is needed to prove the hypothesis...)
The continuously collected material (water, soil, plants, honey, wax, bees) can be used in enquiry based projects e.g. for biomonitoring of the effects of pesticides on the population (combine the measurement of pesticides in plants, honey and bees and combine it e.g. with the growth of the hive

monitored via the weight.

Relevance for Sustainability

Questions of sustainability and future development are mostly correlated with usage of resouces and energy, biodiversity and social living conditions.

How are we - as society - dealing with these questions?
How do we use energy and natural resources?
How do we act as society?

Here, we can dare a gaze in a bee-hive delivering a large potential of awareness and cognition:

Pollen, nectar and water suffice to guarantee the survival of a hive consisting of up to 50.000 individual bees and ensure a sustainable supply and maintenance of the hive.
The collective of all individuals - the 'Bien' - can be seen as super organism and has the ability to keep a constant temperature and humidity inside the hive (note: these data are measured inline inside the hive).

Moreover, honey bees are an essential link in natural processes, an important ecosystem service provider and are at the begin of the food chain. The perserve biodiversity and are an important factor to control and maximize food production based on agricultural products.

Honey as product is the essence of the surrounding landscape, a concentrate of the information representing the identity of its environment.

Bees help to understand natural cycles, food production and biodiversity. The usage of bees of biomonitor of their surrounding environment is just the logical next step. The continuous interaction of bees with their environment can be translated into data and the data can be used to visualize the continuous monitoring within the perimeter of the environment. (e.g. translate the heavy metal content in honey via the weight increase into an environmental information, or: use the amount of pesticides in combination with the growth of a hive in order to monitor the effect of pesticides on bees).

Related Teaching Resources

No specific previous knowledge / related resources required

Preparation Efforts

Medium

Access

Free

Sources and Links

Links

www.biene-oesterreich.at

apiary.be

www.bienen.de

www.hobos.de

www.beehacker.com/wp

www2.umt.edu/montanan/s96/bees.htm

www.bushfarms.com/bees.htm

www.themelissagarden.com/beekeeping.html

www.ciber.science.uwa.edu.au/

www.honeybeesuite.com/of-feral-colonies-and-varroa-mites/

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Funded by

Funded by the Austrian Federal Ministry of Science and Research within the framework of the call "Projekt MINT-Massenfächer" (2011/12)