Environmental Education and Educational Farms: a German Concept

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Abstract: The article provides an insight into a teaching unit designed for an educational farm in Germany. Environmental education and sustainable development are important aspects of the country's curricula for biology. As a part of environmental education in biology, children staying on the farm engage in authentic activities which are essential for life on the farm to function. The unit itself dealt with bees and other pollinating insects and lasted one day. It was an offer which young students staying on the farm for several days could choose from apart from other tasks. It consisted of a theoretical part dealing with various aspects of bees, their habitats, and pollination, as well as a practical part in the afternoon in which students could apply their knowledge and build an insect hotel.
Keywords: environmental education, educational farms, hands-on activities, teaching concept, pollinating insects,

1, The Concept

Lately, environmental education has received more and more attention, as discussions about sustainability have become central topic to the public and in the media (Stevenson et al., 2013). Environmental education and education for sustainable development are hard to separate, they both have the goal to "educate for a sustainable future or about environmental issues" (Smeds et al., 2015, p. 384). Stevenson et al. (2013) mention several characteristics of environmental education:

- deals with normative questions
- is interdisciplinary
- is concerned with "the agency of learners in participating and taking action (…)" (Stevenson et al., 2013, p.2)
- takes place outside of formal educational settings
- matters on the global and local level (Stevenson et al, 2013, p. 2)

Environmental education thus teaches about real life issues, implies hands-on activities rather than teacher-centered instruction with a focus on textbooks, and stresses interdisciplinarity (Pandey, 2007). Environmental education implies that "students are engaged in hands-on, active learning that increases their knowledge and

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awareness about the environment" (Pandey, 2007, p.19). It encourages inquiry and helps students develop "critical thinking, problem solving, and effective decision making skills" (Pandey, 2007, p.19). It is education in and from the environment, where learning occurs outside the classroom (Smeds et al., 2009).

The goal of environmental education is thus to create a kind of environmental competence, which includes cognitive, affective, as well as psychomotor and practical skills (Koutsoukos et al., 2015). It should foster and raise "awareness, understanding, and the skills necessary to obtain understanding" (Palmer & Neal, 1994 in Smeds et al., 2009, p.2). This understanding includes the concern about the "interdependence in urban as well as rural areas in terms of economic, social, political, and ecological aspects" (Dillon et al., 2006, p.110). Experiential learning has become a part of environmental education with putting the focus on the students' lives and their active participation (Koutsoukos et al., 2015). This approach makes learning "more dynamic" (p. 24) and fosters the development of confidence and autonomy. Students are more likely to understand the natural world they are living in when they observe and investigate it directly, being engaged into learning (Koutsoukos et al., 20015). The evidence from research around the world is that "field work can have a range of positive impacts on participants" (Dillon et al., 2006, p.110)

Particularly on educational farms, students build a connection to animals and plants, tools and machines, and also to their fellow students, farmers, and teachers. Apart from these aspects, students are immersed in tasks and their completion as well. When mastering tasks, this is reflected in "changed posture, body movement, in comments or exclamations, in their cooperation with others…" (Jolly & Krogh, 2011, p.3.). Students do something which is valuable to them (Jolly & Krogh, 2011).

Agriculture is a central part of science education, especially considering its crucial role for sustainable development. The fact that many young people "have lost their connection with agriculture in daily life" (Bickel, 2014, p.33) resulting in misconceptions and even prejudice seems to be even more dramatic considering the crucial role agriculture plays (Bickel, 2014). Also the results of the ROSE study (**r**elevance **o**f **s**cience **e**ducation) revealed that for the German sample, items regarding agriculture were rated the least interesting. The projectinvestigates and compares important factors for science learning (for more information see http://roseproject.no/?page_id=4). The same applied for other countries, such as England, Norway, and Sweden (Bickel, 2014). Taking into account the lack of connections students have to agriculture and the increasing theorizing in schools with practical work decreasing, which, in addition, "widens the gap between the local community and the school" (Jolly & Krogh, p.4), working on a farm can provide "meaningful contexts" (Bickel, 2014, p. 6) in which children are motivated to learn through practical experience and their senses. They thus get a chance to gain insights into "ecological connections" (Bickel, 2014, p. 6). The model by Smeds et al. (2015)

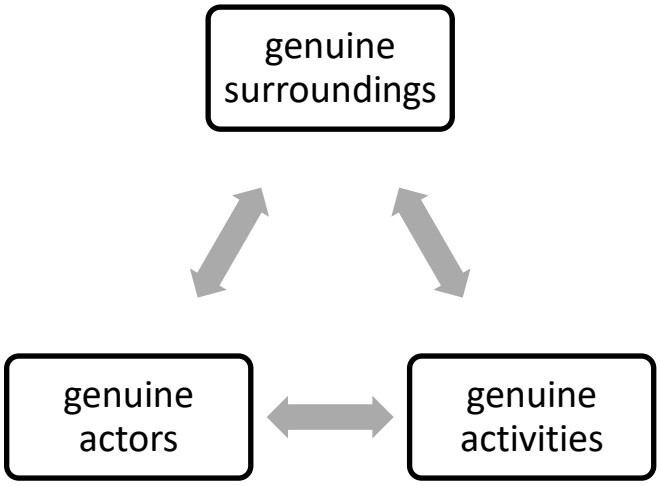


Figure 2. Farm Education and the farm as an authentic learning environment. Model adapted by Smeds et al. (2015).

illustrates the learning experience on such a farm (see figure 1): it connects genuine surroundings with authentic actors and activities. Only when all these components are present, one can talk about a truly authentic learning experience on a farm (Smeds et al., p. 15). There are several ways in which nature can be experienced,namely through the instrumental (e.g. including taking care of animals and plants on the farm), scientific (e.g. exploring plants and animals), social (e.g. establishing a relationship with animals on the farm), ecological (e.g. learning about ecosystems), as well as aesthetic (e.g. recognizing the beauty of nature) Farm education thus provides opportunities to experience nature in various ways. They are central to teaching about sustainability and can "contribute to the awareness for the conservation of biodiversity" (Bickel, 2014, p. 11).

Environmental education and raising awareness of sustainable development are embedded in German curricula for all school types from the elementary level to secondary education. In different science subjects, the importance of environmental protection and sustainable living is stressed. In addition, the curricula mention the importance of learning at places outside the classroom. For farm education specifically, there are many different models in Germany (Bickel, 2014). There are various offers, ranging from one- hour guided farm trips to a farm stay of several days (Bickel, 2014). Even though the offer is diversified, most of the programs focus on children or young adolescents (Bickel, 2014).

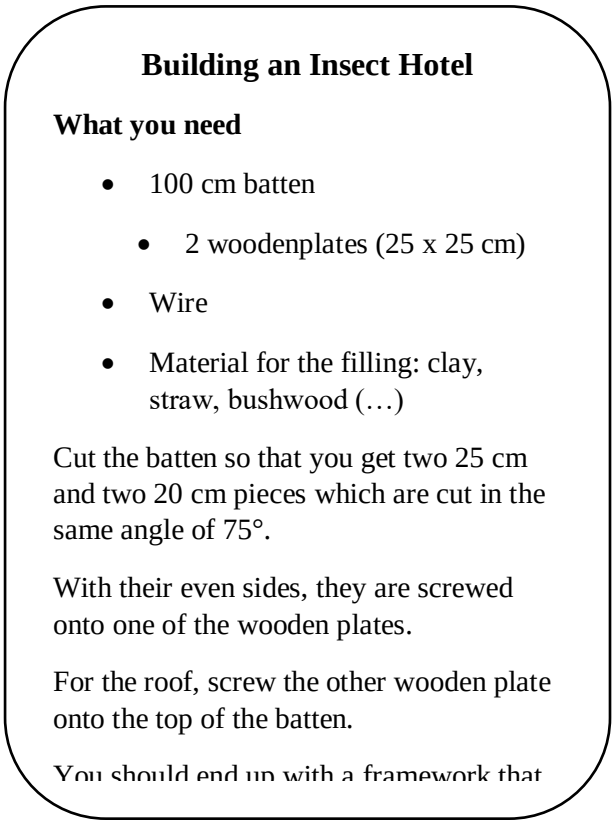
When looking at the effects of such programs on students, there are various positive outcomes that educational farms elicit. In his literature review, Bickel (2014) summarizes the effects of farm education and similar "educational settings" (p.12) as having an influence on the students' attitudes towards nature, their knowledge about nature and agriculture, their academic achievement, nutritional and social behavior, and their motivational levels. When Haubenhofer (2010) investigated different educational activities on a farm which differed in the time spent there, he found that teachers thought that regardless of the length of the stay, students appreciated the farm, physical work, and caring for the animals. Over the course of longer stays they stated that students also valued nature more,

improved the relationship with their peers, and gained more self-esteem. Haubenhofer (2010) also asked students directly for their opinion. They liked the chance to work in groups and on their own, the physical activity, working with animals and taking care of them. He also observed that in case children did not get the chance to engage in practical work, some aspects of working on a farm were not appreciated on their part. Another example of an evaluation of the effect of educational farms on pupils is the project *The Farm for City Kids.* It is an educational program in which children from urban areas get the chance to either visit a farm for a day or stay one week to gain insights into agriculture and farm life (Powers & Powers, 2006). An evaluation of the program showed that staying at a farm led to an increase in self-esteem and confidence, improved teamwork, a better understanding of agriculture, appreciation of nature and farm animals, as well as a healthy lifestyle (Powers & Powers, 2006). In a meta-analysis,Zelezny (1999) found that educational interventions like these, involving young participants and active work, improved environmental behavior most effectively.She also states that Dresner & Gill (1994) and Jordan, Hungerford& Tomera (1986) found a significant relationship between responsible environmental behavior and experiences in nature as well as active participation in activities outside the classroom.

The farm for which the concept was developed was the first of its kind in Germany when it was re-opened for educational purposes in 1985.Like many other concepts of educational farms, the idea behind the offer is to let students live like farmers in order to give them an insight into ecological and sustainable agriculture and lifestyles. Students usually stay on the farm for five days. During their stay several tasks are handed over to the students in order to ensure (efficient) life on the farm. They are divided into subgroups and take responsibility for the particular task they choose. While students carry out their tasks, they are supervised by staff working on the farm. Tasks which need to be carried out on the farm and which are essential for running it sufficiently and successfully include caring for the farm's animals, vegetable and fruit growing, arable farming as well as housekeeping. The concept of the educational farm thus follows the notion of active, learner-centered learning as a central part of environmental education. Students engage in authentic tasks which are crucial to living on a farm with animals and plants typical for this region of Germany. During their stay on the farm, they are guided by staff which is part of the farm. All aspects of truly authentic learning (see figure 1) are thus being followed.

The small groups they work in consist of four to five students. Group work is carried out two times a day: from 10 a.m. to 12 p.m. and 2:30 p.m. to 4 p.m. One part of a working group also includes working with bees.Students are expected to be somewhat familiar with the topic since it is part of the German biology curriculum for the particular grade. Like the general procedure of a day on the farm, students also take part in two working phases. The first one lasts approximately two hours. In this working phase students approach the topic through different stations dealing with individual aspects of the topic (for an overview of the day see table 1). Working on the stations, students build a theoretical basis for the practical part of the group work in the afternoon.

Figure 3. Instructions on how to build an insect hotel as a practical application for the knowledge the pupils acquired during working on their topic



Building an Insect Hotel

What you need

- 100 cm batten
- 2 woodenplates (25 x 25 cm)
- Wire
- Material for the filling: clay, straw, bushwood (…)

Cut the batten so that you get two 25 cm and two 20 cm pieces which are cut in the same angle of 75°.

With their even sides, they are screwed onto one of the wooden plates.

For the roof, screw the other wooden plate onto the top of the batten.

You should end up with a framework that

Table 3. Structure of the day for the group working with bees.

Working phase	Content/ station
10 a.m.-12 p.m.	Theoretical foundations through stations: I) morphology II) life in the colony III) pollination, diversity of pollinating insects IV) theoretical aspects of an insect hotel
2:30 p.m. – 4 p.m.	Practical work: Building an insect hotel

Working on the individual stations in the theoretical part is intended to last approximately 30 minutes. The first one deals with the honeybee's anatomy. For observing the insect's anatomy in detail, every students gets a binocular as well as a honeybee preserved in alcohol. The students have the task to carefully observe how the mouth parts are shaped.

To secure their results, they draw their observations on a control sheet. The second station deals with life in a bee colony. For this purpose, students observe bees in a showcase and get the chance to taste honey directly from the stock. Working on this station, students are intended to recognize that bees live in colonies. Working on the next station, students learn about pollination and other pollinating insects apart from the bee. Bees can also be observed in their natural habitat since the farm has an orchard. Students can thus experience pollination in real life. For further illustrating the process of pollination, a movie is shown and a model is used to explain the phenomenon in greater detail. This station is also used to talk about the ecological value of bees and other pollinating insects. The last station of the theoretical part is the insect hotel. Here students realize that different kinds of pollinating insects have their habitat in this "hotel". The students then discuss and work on the question what makes an ideal insect hotel. This station is intended to give students the theoretical basis for the practical part in the afternoon.

For the practical part students build their own insect hotel in the farm's wood work shop. Here they apply their newly acquired knowledge about the criteria for a good insect hotel since they get the chance to build their own one. They collect the material needed for their hotel outside. To support students when building their own hotel, instructions are handed out (see schema in figure 2). After finishing their work, students present the results of their work to the other groups which worked on different topics.

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