

Classroom



In this section of *Resonance*, we invite readers to pose questions likely to be raised in a classroom situation. We may suggest strategies for dealing with them, or invite responses, or both. “Classroom” is equally a forum for raising broader issues and sharing personal experiences and viewpoints on matters related to teaching and learning science.

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Environmental Education in a 'Green Classroom'

The ‘Green Classroom’ in the Botanical Garden of Ulm is an experiential learning forum outside school. Its educational concept is based on experimental learning and is geared towards expanding biological knowledge and developing positive attitudes towards small animals such as invertebrates and insects. The attitudes of 68 school students towards small animals, before and after they visited the ‘Green Classroom’, were assessed and the answers they gave in their questionnaires were compared with those of 60 students from a control group that was not yet exposed to this learning environment. Although the students spent only one morning in the ‘Green Classroom’, some of their attitudes towards small animals improved after their visit. These studies underscore the necessity for direct observation and familiarization of the environment including small animals such as invertebrates and insects for appreciating issues related to biodiversity and conservation.

Keywords

Environmental attitudes, experiential learning, learning outside school, small animals (invertebrates, insects).

Introduction

When children are asked to list animals they know, they usually talk about animals that are not found in their own environment



[1]. Remarkable and extraordinary vertebrates get mentioned whereas small animals (invertebrates and insects) are hardly ever discussed [2], [3]. Worse still, the small animals that do get a mention are associated with feelings of disgust and abhorrence. These feelings seem cultural universals, being found in different countries and continents [4]. Negative emotions towards small animals (of which the majority is harmless) pose a genuine obstacle for an effective ecological education [5] or education for sustainable development [6]. Moreover, if children are not familiar with the animals they encounter in their own natural environment, they will find it difficult to address issues of biodiversity and ecological problems [7], [8]. Invertebrates are essential for our ecological system, yet many of them are classed as endangered species or on the brink of extinction [9], [5]. There is an obvious need for an educational program that raises interest in and awareness of invertebrates, eradicating any negative emotions, such as disgust, along the way.

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Researchers assume an important relationship between knowledge about the environment on the one hand, and environmental attitudes and ecological awareness on the other hand [10], [11], [12], [13]. The rationale behind this assumption is that 'we can only protect what we know'. Furthermore, we can only miss a species if we have had some kind of attachment to it [7], [14]. Precise knowledge about the biology and ecology of living creatures is especially important in order to create an emotional bond with plants and animals as well as to foster appreciation for the environment [15].

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The Green Classroom

The 'Green classroom' is an environmental education program that wants to address knowledge, skills and attitude at the same time. It was founded 10 years ago and is visited by about 2,500 preschool children and school students yearly. The educational program for the visitors lasts usually half a day and offers several topics. There are broad topics where a whole habitat (e.g., meadow, forest or water) is explored. There are also special topics such as



Figure 1. Female spider (*Trochosa terricola*, Lycosidae) carrying spiderlings. The students find it fascinating how the spider takes care of her children. Spiders are normally considered as 'disgusting' – but here students get to know spiders as caring animals from a different perspective.

Photo: Dr. Jürgen Drissner, University Ulm, Botanical Garden.



the food chain, the adaptation of small animals, the different levels of a habitat and the phylogenetic relatedness among invertebrates. For further information see (www.uni-ulm.de/einrichtungen/garten/gruenes-klassenzimmer.html).

Learning in the 'Green Classroom' is organised in such a way that students encounter animals in their natural habitat, and what they observe is explained and put into context. Questions that arise from these encounters are addressed immediately. The topics that students deal with are about small animals that can be found in the environment of the children. The Botanical garden allows the students to explore the animals in their original habitat, e.g., meadow, forest and lake. The 'Green Classroom' is situated in the botanical garden not far from all the habitats. There, students receive an instruction about the habitat and its importance as well as about how to deal respectfully with the animals that live there. Then, students explore the habitat and carefully catch animals in small special boxes. These boxes are taken back to the 'Green Classroom'. There the animals are observed through magnifying glasses. Students are asked to produce, depending on their age, drawings of the animals themselves or of their food chains and habitats. Students begin to empathise and care for these animals in this process. Given below are the results of our study with a group of school children.

The Participants: The sample comprised 128 grade 4, 6 and 8 school students between 10 and 14 years of age. Of these, 68 students formed the intervention group and visited the 'Green

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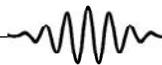
Classroom' for one morning. The remaining 60 students from the parallel classes (same school, same grade) served as the control group.

The Study: Attitudes towards small animals such as beetles, woodlice, centipedes and spiders were recorded with the help of a semantic differential [16]. Students were asked to specify where their position lies on a scale between two bipolar adjectives (for example: 'Boring – Fascinating', 'Useless – Valuable' or Disgusting – Cute). Altogether students marked their choice for 13 bipolar adjective pairs that focused on the perceived value of animals and the emotions towards them (e.g., fear and disgust). Students of the intervention group completed the questionnaire to obtain a baseline level of their attitudes between 5 and 7 days before their visit to the 'Green Classroom'. Students of the control group completed an identical questionnaire at the same time. The three classes of the intervention group visited the 'Green Classroom' in the botanical garden from 9 am to 12 pm on their assigned day. Back in school, over the next 5 to 7 days, students in both the intervention as well as the control group completed the questionnaires for the second time as a follow-up measure.

Students of the intervention and control groups did not show statistically significant differences in their attitudes towards small animals at baseline measurement. The intervention group showed a significant improvement on 7 of the 13 bipolar adjective pairs after the visit to the 'Green Classroom'. These students rated the small animals more fascinating, cuter, more interesting, better, more appealing, cooler, more precious and there was a tendency to rate them more necessary than before. The students in the control group also changed their ratings at the second time of inquiring but only on three of the bipolar adjective pairs. They rated the small animals as more dangerous but cuter and funnier than at the first time. The results are presented in *Table 1*.

Only one of the three changes in the control group was also seen in the intervention group. We reason that the changes in the

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	Intervention group				Control group			
	<i>m</i> pre	<i>m</i> post	<i>z</i> -value	<i>p</i> -level	<i>m</i> pre	<i>m</i> post	<i>z</i> -value	<i>p</i> -level
boring – fascinating	3.88	4.35	2.22	0.026*	3.56	3.67	0.57	0.568
dangerous – safe	5.75	5.57	0.69	0.491	5.64	5.06	2.19	0.029*
useless – valuable	4.90	4.99	0.95	0.342	4.78	5.02	0.90	0.367
disgusting – cute	3.19	3.50	1.97	0.049*	3.23	3.63	2.16	0.031*
uninteresting – interesting	4.34	4.74	2.44	0.015*	3.89	3.88	0.19	0.850
unnecessary – necessary	4.87	5.26	1.95	0.052+	4.56	4.73	0.88	0.379
bad – good	4.61	4.96	2.25	0.024*	4.40	4.63	0.69	0.489
morbid – natural	5.93	6.00	0.56	0.575	5.73	5.25	1.61	0.107
repulsive – appealing	3.99	4.40	2.25	0.025*	4.19	4.41	1.01	0.314
uncool – cool	3.94	4.33	2.56	0.011*	3.84	3.94	0.21	0.837
dull – funny	4.17	4.00	0.41	0.680	3.97	4.42	2.52	0.012*
weird – harmless	5.39	5.14	1.30	0.192	5.19	5.19	0.59	0.555
worthless – precious	4.88	5.24	2.15	0.032*	5.11	4.92	0.86	0.390
* $p < 0.05$; + $p < 0.10$								

Table 1. Means for pre and post test of attitudes towards small animals for intervention and control group, statistical significance of differences was computed by the non-parametric Wilcoxon test for paired samples. (z-value: value of test statistic (to determine the significance of the finding) p-level: significance level of the finding.)

intervention group are not only due to thoughts elicited by the pre-test but also due to the visit to the ‘Green Classroom’.

We have several reasons to believe that the attitudinal changes of the intervention group are due to the intervention. (i) We found many more attitudinal improvements in the intervention group (7 + 1 tendency) compared to the control group (2 improvements, 1 decline). (ii) The results replicate a previous study [17] that examined only fourth graders. In this study subjects showed similar (if not stronger) effect: seven attitudinal improvements for the 40 students of the intervention group against one decline for 38 students of the control group. (iii) The attitudinal improvements of the intervention group reflect the issues that were addressed in the ‘Green Classroom’. Students were told that capturing animals from their natural habitats to examine them more closely is just like going to a library and borrowing a book. We ‘own’ neither the animals nor the books, but simply borrow them, treat them carefully and return them unscathed. Further-



more, students learn interesting facts about the biology and ecology of the small animals including the 'tasks' of the animals. When a student recognises the world from the animals' view they appear more interesting and fascinating. This may prompt ideas and thoughts about the usefulness of small animals. Taking together the experiences with small animals in their environment and the new facts that the students learn about them may be strong enough for the attitudes towards these small animals to change [18]. Attitudes are normally not easily changed. However, since students hardly know the small animals in their environment, maybe their attitudes towards them are not fixed at all.

In this study we cannot argue for any sustained change in attitudes. However, a previous study [17] could show differences in knowledge and emotions of students who did and did not visit the 'Green Classroom'. These differences were found years after the visit when secondary school students were asked to write an essay about small animals. The essays were evaluated in terms of positive (*Spiders are peaceful creatures*) and negative emotions towards small animals (*Small animals are disgusting and annoying*) as well as conceptions (such as: *Small animals are an important part of the food chain*) and misconceptions about them (*The ladybug shows its age by the number of points on the back*). The students who visited the 'Green Classroom' reported more correct knowledge and more positive emotions towards the animals even though the visit for some of the students was 5 years ago. Possibly, the 'Green Classroom' has fuelled the interest and had students adopted a positive attitude towards small animals.

Conclusion

Children and teenagers acquire their environmental knowledge and opinion mainly at school, from the lessons as well as from extra curricular activities such as school trips [19]. Educational institutions need to be aware of their impact and direct their programs for environmental education accordingly. As mentioned before, children hardly think spontaneously of small animals and if so often mention them with feelings of disgust and abhorrence.

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Valuing other species and showing positive emotions towards them is already one puzzle piece towards education for sustainable development.

However, invertebrates are essential for our ecological system. But people will only protect what they know (and like). Many of the invertebrates are classed as endangered species or on the brink of extinction. There is an obvious need for an educational program that raises interest in and awareness of invertebrates, eradicating any negative emotions, such as disgust, along the way. The 'Green Classroom' tries to deliver such an educational program. It is a program that works with schools and teachers in a way that can be integrated into their routines. This study has shown that this program can impact upon the development of attitudes towards small animals. The visit of the 'Green Classroom' may be an important formative influence for the students regarding their attitude towards the small animals in their environment. Valuing other species and showing positive emotions towards them is already one puzzle piece towards education for sustainable development.

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