



Comparing Effects of a Teaching Unit on Rural and Urban Students' Emotional Constructs Joy, Interest, Boredom, Frustration at an Educational Farm in Germany

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Abstract

The study investigated the effects of a three-day stay on an educational farm in Germany on the emotional constructs joy, interest, frustration, boredom, as well as on knowledge gain and perception of the activity-based methodology applied. A questionnaire was used to compare means scored in each dimension between secondary school rural and urban students (n=15 each). Results showed that while there were no significant results for knowledge gain, perception of the unit, and interest, rural students were significantly more bored and frustrated throughout the unit and less joyful than students belonging to the urban group. Even though the findings were limited, particularly in terms of sample size and reliability, they still hint at the importance of such programs for improving urban students' interest in agriculture, nature, and sustainable development. Based on these findings, suggestions for further investigations and improvements in farm education programs are given.

Key words: Comparative study; educational farms; environmental awareness; environmental education

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1. Environmental education and educational farms

The majority of factors that lead to environmental degradation are caused by humans. Environmental education has thus gained “significant recognition” in recent years (Koutsoukos, Fragoulis & Valkanos, 2015, p. 23). Environmental education means raising awareness, as well as encouraging the adoption of environmentally friendly behavior (International Union for the Conservation of Nature, IUCN, 2003). As an outcome of the world’s first intergovernmental conference on environmental education in 1977, the Tbilisi Declaration marked the beginning of environmental education (Parker & Prabawa-Sear, 2020) and lists the goals of environmental education as the following:

- to foster clear awareness of and concern about, economic, social, political, and ecological interdependence in urban and rural areas;
- to provide every person with opportunities to acquire the knowledge, values, attitudes, commitment, and skills needed to protect and improve the environment;
- to create new patterns of behavior of individuals, groups, and society as a whole towards the environment (United Nations Educational, Scientific and Cultural Organization, UNESCO, 1977, p.26).

According to the environmental education theory by Palmer and Neal (1994), the approach includes “education about the environment which builds awareness, understanding, and the skills necessary to obtain understanding, education in or from the environment, where learning occurs outside the classroom, education for the environment, which has objectives related to nature conservation and sustainable development” (Smeds, Jeronen, Kurppa, & Vieraankivi, 2009, p. 2). The goals of environmental education are thus to foster an awareness and concern about the interdependence in urban as well as rural areas in terms of economic, social, political, and ecological aspects. The evidence from research around the world is that fieldwork can have a range of positive impacts on participants (Dillon *et al.*, 2006, p.110). Stevenson, Wals, Dillon, and Brody (2013, p. 2) mention several characteristics of environmental education, as it

- deals with normative questions;
- is interdisciplinary;
- puts the focus on learners getting active;
- takes place outside formal educational settings;
- is relevant to the global and local level.

The main quality of hands-on, active learning, which directly involves the people concerned, is an important property of environmental education (Pandey, 2007). This active involvement is also an essential part of the concept of experiential learning which is integrated into environmental education (Koutsoukos *et al.*, 2015). This approach makes learning “more dynamic” (p. 24). Students are more likely to understand the natural world they are living in when they observe and investigate it directly and when they are engaged in the learning process (Koutsoukos *et al.*, 2015). Being in line with the concept of transformative education, learners should become and active, and constructive, not only appreciating nature but also remain critical and question established social norms and traditions, particularly in the light of globalization (Parker & Prabawa-Sear, 2020).

Educational farms can be seen as a valuable way of linking education about the environment and sustainability with practical experience for students, as it implies “using farms as authentic real-life learning environments” (Smeds *et al.*, 2015, p. 383). The term authentic in this context means the implementation of three elements: genuine surroundings, actors, as well as activities (Smeds *et al.*, 2015). During their stay on the farm, students build relationships related to the tasks they are carrying out. These tasks can be social (e.g. to fellow students, the teacher, the farmer), relate to tools or physical skills, or to “elements in nature” (Krogh & Jolly, 2012, p. 2). There are many different models for farm education in Germany, which mostly differ in the length of the stay. However, almost all of them focus on children and adolescents (Bickel, 2014).

The usefulness of educational farm programs seems to be even more relevant when taking into account the growing distance urban societies develop towards agriculture, “spatially, socially, as well as culturally” (Smeds *et al.*, 2015, p. 1). This, in turn, results in insufficient knowledge about agriculture (Smeds *et al.*, 2015). Students show a very limited interest in agriculture, as the results of the relevance of science education (ROSE) questionnaire showed. Items dealing with agriculture were rated the least interesting compared to other aspects of science in Germany and other countries in Europe (Bickel, 2014). The so-called youth report nature further reports a consistent decline in knowledge of and interest in nature by German students (Brämer, Koll & Schild, 2010; 2016). This trend seems to be even more concerning when considering the increasing theorizing in schools (Jolly & Krogh, 2014).

2. Emotions and learning

As the study investigated the effects of an educational farm offer as a part of a field trip, the connections between emotions and learning will be presented briefly to illustrate the relevance of such projects for the school context. The components tested in the study (interest, joy, boredom, frustration) will also be introduced to describe their connection to learning.

Emotions, thought, and action are connected. Emotions can affect learning by fostering or inhibiting it (Darling-Hammond, Orcutt, Strobel, Kirsch, Lit & Martin, 2003). Students experience a multitude of either positive or negative emotions during lessons (Pekrun, 2014). Darling-Hammond *et al.* (2003) mention ways in which emotions can influence students’ learning: they can a) limit the capacity to balance emotional issues with school work, b) create anxiety specifically about school work and c) trigger emotional responses to classroom events (Darling-Hammond *et al.*, 2003, p. 90). Pekrun (2014) names four groups of emotions which are particularly relevant in the school context: Achievement emotions relate to “achievement activities and success and failure resulting from these activities” (p. 8), epistemic emotions are caused by cognitive problems, topic related emotion arise due to feelings towards topics presented in lessons, and social emotions involve relations with teachers and fellow students (Pekrun, 2014).

Going into more detail, emotions can be divided into positive activating (such as enjoyment or excitement), positive deactivating (such as relief), negative activating (such as anger or frustration), and negative deactivating (such as sadness or boredom) (Pekrun & Linnenbring-Garcia, 2014). The effects of emotions on performance are influenced by “students’ motivation to engage in achievement striving, the accessibility of cognitive resources, the nature and extent of the learning strategies employed” (Pekrun, 2014, p. 315).

As for the component *interest*, which is one of the dimensions tested in the study, Schiefele (1991) describes it as

- content-specific
- related to specific tasks/activities/topics,
- long or short term
- general or specific
- a “directive force” (Schiefele, 1991, p. 301).

In his research, Schiefele (1991; 2012) concluded that interest correlated with deeper levels of processing, the use of learning strategies, as well as enjoyment, activation, and involvement. Ainley and Hidi (2014) describe interest and enjoyment as separate feelings, but which are still likely to occur together. Enjoyment and interest are positive emotions that contribute to knowledge acquisition (Ainley & Hidi, 2014).

According to Warner (1980), *enjoyment* consists of a harmonious relationship between three elements and includes three vital concepts: engaging in an activity involving cognition and feeling, an activity leading to positive affect (e.g. happiness), and meeting a person’s needs (fulfillment). Enjoyment is different from pure pleasure since it includes the accomplishment of

something new and challenging. The activity itself becomes a source of enjoyment, regardless of future outcomes caused by that activity (Lopez, 2011). Yi & Hwang (2003) thus describe enjoyment as a type of intrinsic motivation. Enjoyment has a positive effect on learning (Hernik & Jaworska, 2018).

The component of *frustration* can either result from something external to the individual or be an internal part of the individual (Coon & Mitterer, 2008). Frustration takes away cognitive capacities (Gulzar et al., 2012) and has effects on motivation, internal effects on information processing, and thus on the performance of a specific task (Jonassen et al., 1993). Frustration arises when progress to the desired goal is blocked or delayed (Sevilla et al., 1988) and increases the more significant the goal is (Mangal, 2008, p. 40-41). In psychological terms, “frustration is a general emotional retort to antagonism” (Gulzar et al., 2012, p. 7). The sources of frustration can be internal (individual deficiencies, e.g. lack of confidence), or external (conditions outside the individual). Individuals can either cope and take action or be overwhelmed by frustration.

Boredom is commonly experienced in educational settings (Pekrun, 2014). Boredom moves attention and cognitive resources away from a task that is perceived as boring, leading to negative effects on motivation, learning strategies, which then, in turn, has negative effects on performance (Pekrun, 2014). It is thus negatively correlated with learning (D’Mello et al., 2012).

3. Previous Studies

Generally, when it comes to the effects of field trips (in environmental education), some studies particularly focus on changed attitudes due to the trips. Mills (2015) evaluated a field trip to a science center with 151 elementary students. She found that all groups reported greater interest in science and the desire to become a scientist, after having attended the trip. For environmental education, Nadelson and Jordan (2012) asked students about their attitudes and what they could recall right after and one month later following the trip. Positive attitudes towards the trip were evaluated, as well as the highest recall rate for hands-on activities. Such activities in which the students were only passively involved showed very low recall rates.

Bickel (2014) summarizes the potential effects of educational farms on students in his dissertation. They include positive impacts on student attitude towards nature, knowledge about nature and agriculture, academic achievement, motivation, nutritional and social behavior. When investigating stays on educational farms which differed in length, Haubenhofer, Hassink, van der Meer, van der Kamp, Schreurs and Schuler (2010) found that teachers thought the stay affected students appreciating the farm, physical work, and caring for the animals, regardless of the length of the stay. During longer stays, it indeed could be observed that students valued nature more, improved relationships with their peers and teacher, as well as their self-esteem. As a part of local communities committed to sustainable development, educational farms can contribute to raising students’ environmental awareness (Robina-Ramirez & Medina-Merodio, 2019).

Other positive effects included knowledge increase and perception of agriculture (Luckey et al., 2013; Smeds, Jeronen & Kurppa, 2015b), also with a change in conceptions of agriculture (Smeds, Jeronen & Kurppa, 2015a), as well as attitudes towards nature in general (Mittelstaedt, 1999). In an evaluation of the program, *The Farm for City Kids*, in which students from urban areas got the chance to stay on a farm and experience farm life for several days, Powers & Powers (2006) found that the stay increased students’ self-esteem and confidence, improved teamwork, led to a better understanding of agriculture, the appreciation of nature and farm animals, as well as a healthy lifestyle. Such farms further offer learning opportunities for lower and higher ability students alike (Smeds, 2017).

When comparing rural and urban groups of students staying on such a farm, rural students seem to achieve better results in terms of knowledge about agriculture (Frick et al., 1995; Smeds, Jeronen & Kurppa, 2015; Wright et al., 1995). When Pense et al. (2006) compared knowledge

about the agriculture of rural and urban students, rural ones had more knowledge concerning agriculture, however, overall scores were fairly low in both groups.

Given the importance of emotions for learning, the study at hand investigated the effects a teaching unit as a part of a trip to an educational farm had on the emotional components of joy, interest, frustration, as well as boredom on a group of rural and urban students respectively.

4. Teaching unit

The unit was carried out at an educational farm in Germany as part of a 3-day stay as a field trip (Wegner et al., 2016). It dealt with bees and other pollinating insects and was one of the offers students could choose from during their stay. Apart from a theoretical background, students also had the chance to build their insect hotel to apply their theoretical knowledge acquired throughout the unit. The unit was part of the general concept of the educational farm: students stayed on the farm for several days and during that stay had to take responsibility for tasks that are essential for living on a farm. The tasks they had to carry out were closely connected to sustainable agriculture as well as environmental protection.

Like any other “workday” on the farm, there were two parts of the unit, one taking place in the morning and the other after lunch in the afternoon (Table 1). Students acquired the theoretical basis of the topic “bees and pollinating insects” through learning stations with different foci: morphology and way of life, living in the colony, the bee as a social insect, pollination as well as its ecological importance. Working their way through the stations, students got to know other pollinating insects as well. Working on the last station, students build their theoretical knowledge for building an insect hotel. During the second part in the afternoon, students applied their knowledge and built an insect hotel themselves in the farm’s wood workshop. Staff working on the farm provided help when needed.

Table 1. Overview of the teaching unit dealing with bees and their (theoretical) content.

Working phase	Content/ station
10 a.m. – 12 p.m.	Theoretical foundations through stations: <ul style="list-style-type: none">• morphology and way of life• life in the colony• pollination, diversity of pollinating insects,• theoretical aspects of an insect hotel
2:30 a.m. – 4 p.m.	Practical work: <ul style="list-style-type: none">• building an insect hotel

5. Method

First, the evaluation sought to find out whether the teaching unit had a positive effect on the students’ emotions whatsoever. The fact that two groups of students were asked about the unit, led to the research questions whether there would be differences in students’ emotional constructs due to their urban or rural background. Since literature expects urban students to know less about agriculture and nature due to their urban surroundings and thus a lack of experience with agriculture-related activities. Their living background was also the reason why they were assumed to evaluate the activity-based methodology more positively. Thus, the following hypotheses were generated:

- H₁: Students from the urban area have a significantly higher knowledge increase than those from the rural area.
- H₂: Students from the urban area rate the activity-based teaching unit significantly better than those from the rural area.

- H₃: Students from the urban area significantly rate positive emotions (enjoyment and interest) higher than rural students.
- H₄: Students from the urban area significantly rate negative (frustration, boredom) emotions lower than rural students.

5.1. Participants

Two groups of students visiting the 5th grade of secondary education were asked to fill out the questionnaire. Their age ranged from 11 to 12 years old. Each group stayed on the farm as a part of a field trip offer of their schools. The two groups visiting the educational farm as part of a field trip differed in terms of their living circumstances. While one group was from a school in a densely populated area from the Ruhr area (Germany), the other one went to school in a more rural region. The two groups stayed on the farm at different times. Students who had chosen the teaching unit dealing with bees were asked to complete the questionnaire after the unit. The two classes did not voluntarily choose the field trip to the educational farm, rather their teachers selected the offer and planned the trip. A total number of 30 students participated in the study, 15 in each group (rural and urban). The two groups were assumed to be relatively homogeneous in terms of prior academic background and other preexisting characteristics, as a) they roughly were of the same age, b) visited the farm as an extra-curricular offer of their biology class, c) voluntarily choose the unit dealing with bees and other pollinating insects from what was offered to them and their fellow peers at the farm, d) took part in the unit under the same conditions (e.g. weather) and e) were instructed by the same person.

5.2. Instrument

A questionnaire consisting of six dimensions (knowledge gain, activity-based methodology, interest, joy, frustration, and boredom) was used to investigate the research question. It consisted of 24 items in total with four in each dimension, with one in each dimension being coded reversely. The instrument was based on a questionnaire used by Wegner (2009). The dimensions of knowledge gain and activity-based methodology were constructed in addition to those found in Wegner (2009). The wording of the remaining dimensions was slightly adjusted to fit into the context of the teaching unit.

For providing a sufficient degree of objectivity, the students had to fill out the questionnaire in a separate room and received instructions on how to fill out the test from someone working on the farm they did not know. For evaluating the closed questions, a Likert-type rating scale from 1 (fully agree) to 6 (fully disagree) was used. For evaluating the questions' reliability, Cronbach's α was calculated and compared to the Cronbach's α values of Wegner (2009) (see Table 2).

Table 2. Cronbach's α for individual dimensions of the questionnaire in the present study and Wegner's study (2009).

Dimension	Present study	Wegner (2009)
Interest	0.600	0.87
Knowledge gain	0.214	/
Activity-based methodology	0.519	/
Enjoyment	0.597	0.93
Frustration	0.671	0.84
Boredom	0.376	0.79

The reliability measured by Cronbach's α calculated with our sample is rather moderate: the results for the dimensions interest and frustration were above 0.6, activity-based methodology, and enjoyment above 0.5. The results of the others scored below 0.5 (knowledge gain 0.214, boredom 0.376, see table 2) and were thus not sufficient. Since the sample size is quite small and

the questionnaire has been already proven reliable in other studies, we used the results for further calculations.

5.3. Procedure

To investigate the research question and hypotheses, the questionnaire was conducted directly after the 210-minute teaching unit (i.e. after the practical part) in the two groups of students (n=15) which chose the same working group dealing with bees and pollinating insects during their stays on the farm. Students had to evaluate the statements of the questionnaire which belonged to the different dimensions (joy, interest, frustration, boredom, knowledge gain, activity-based methodology) on a six-point Likert scale. The raw data was then transferred into the statistics program SPSS to evaluate the results. Means of the two groups (rural and urban) were then compared with a t-test testing for significant differences within the questionnaire's dimensions ($p < 0.05$).

6. Results

Generally, ratings concerning the teaching unit were overall very positive in both groups. Ratings for perceived knowledge gain were fairly positive within the two groups with a mean of 1.82 for rural students and 1.78 for urban students. Additionally, both groups positively evaluated the activity-based methodology applied during their farm visit. Urban students evaluated the activity-based methodology slightly more positively (mean of 1.63) than the rural group (see table 3). Positive dimensions, such as *interest* and *enjoyment* received relatively much agreement. Rural and urban students' ratings for interest were relatively similar with a mean of 2.02 and 2.03 respectively. For the dimension joy, the mean value of the urban students answering the questionnaire was 1.50 compared to that of the rural students with 2.00 with a significant difference in means.

The negative emotional dimensions *frustration* and *boredom* were rated with more disagreement on the Likert scale. Means of boredom and frustration were higher for the urban students, indicating that rural students felt significantly more bored and frustrated during the teaching unit (5.57 compared to 4.8 for boredom, 5.67 compared to 4.9 for frustration respectively, see table 3). For the constructs knowledge gain, activity-based methodology, as well as interest, no significant differences in means of the two groups could be observed.

Table 3. Rural and urban students' means and standard deviations (SD) for individual constructs as well as Levene and t-tests for each construct. * marks a significant result.

	Mean		SD		Levene Test	T Test
	Rural	Urban	Rural	Urban		
Knowledge gain	1.82	1.78	0.39	0.66	F = 2.535 p = 0.123	T(28) = -0.168 p = 0.868
Activity-based methodology	1.83	1.63	0.61	0.74	F = 0.481 p = 0.494	T(28) = -0.818 p = 0.421
Interest	2.02	2.03	0.49	0.92	F = 3.093 p = 0.090	T(28) = 0.062 p = 0.951
Enjoyment	2.00	1.50	0.57	0.70	F = 0.998 p = 0.326	T(28) = -2.148 p = 0.040*
Frustration	4.9	5.67	0.75	0.57	F = 1.256 p = 0.272	T(28) = 2.729 p = 0.011*
Boredom	4.8	5.57	0.71	0.57	F = 0.609 p = 0.442	T(28) = 3.247 p = 0.003*

7. Discussion

Referring back to the previously stated hypotheses, several statements can be made about the results of the questionnaire after the teaching unit. H_1 has to be rejected since there was no significant difference between rural or urban students' perceived knowledge gain. Apart from their knowledge gained at school, both groups of students learned something during the teaching unit and their background did not play any obvious role. H_2 also needs to be rejected, as there were no significant differences in ratings for the activity-based methodology used throughout the unit. Both groups of students rated the methodology fairly good (means of 1.83 for rural and 1.63 for urban respectively with 1 meaning "fully agree"). This could hint at a sufficient and efficient methodology of the teaching unit. H_3 can be partly verified. While there was no significant difference in means for the construct *interest*, urban students significantly *enjoyed* the teaching unit more. High ratings for interest could be caused by the fact that this kind of methodology is hardly applied in the context of the regular school routine. Because of their high interest, students were likely to be more cognitively engaged in the lesson. As there were no differences concerning *how* the unit was taught, the significant result could be explained by the fact that those students from the urban area are not exposed to nature as much as those from the rural one. However, it has to be noted that values were high for both groups, indicating a successful teaching methodology. H_4 can be fully verified, as the differences in means for *frustration* and *boredom* were significant. Ratings for both groups were fairly low which again hints at the high methodological quality of the unit. Both groups rejected the items for boredom with means of 4.80 for rural and 5.67 (with 6 meaning "fully disagree") for urban students respectively. Relatively low values for boredom seem to confirm those results for the dimension interest since these two dimensions are opposing terms.

It can be noted that students rated the unit positively in terms of their knowledge gain as well as the emotions selected for the study. They were interested and joyful, rather than frustrated or bored. The results indicate the adequate quality of teaching and the teaching methodology applied throughout the unit. As there were no differences between the circumstances in which the two units were taught (e.g. weather or instructor) and the groups were also fairly similar in terms of size and behavior towards the instructor, it can be assumed that the significant differences between means for joy, frustration, and boredom were due to the living conditions of the students. Due to the lack of exposure to nature on the part of the group of urban students, more enthusiasm towards learning outside seems to be an adequate explanation for the differences in means.

Looking at results for the scales' reliability, relatively poor values were reached below 0.8. Concerning the low reliability of items on the test, one has to keep in mind that the sample size was relatively small. From a statistical point of view, a bigger sample size could have resulted in better results for Cronbach's α . However, the core concept of the teaching unit was based on working in small groups which in turn leads to the fact that increasing the sample size would have conflicted with the methodology applied. Some items were also left out in individual scales to see whether values for Cronbach's α would improve. A pilot testing the instrument with a bigger sample size in urban and rural biology classes would be useful to apply in this particular setting on educational farms.

Even though some items on the test had fairly low reliability, results showed a tendency when it comes to the effects of such a teaching unit on an educational farm as a part of environmental education. Generally, evaluations of the stay as such were fairly positive for both groups. Ratings were high for perceived knowledge gain, being in line with other studies that investigated student knowledge gain at educational farms (e.g. Luckey *et al.*, 2013; Robina-Ramirez & Medina-Merodio, 2019). Unlike expected (e.g. when looking at Frick *et al.*, 1995; Wright *et al.*, 1995; Pense *et al.*, 2006), the differences in means between rural and urban students were not significant for knowledge gain, i.e. students with a rural background did not gain more knowledge. The differences in means concerning enjoyment, boredom, and frustration were

significant, indicating that students with an urban background did enjoy the unit more, were less bored and frustrated. This could hint at the value of such programs in terms of raising positive emotions about the environment and sustainable development and related changes in attitudes towards nature (e.g. Bickel, 2014; Smeds, Jeronen & Kurppa, 2015a; Smeds, Jeronen & Kurppa, 2015b). This seems even more important given the fact that students become increasingly detached from nature/agriculture, particularly in urban areas (Brämer, Koll & Schild, 2010; 2016; Smeds *et al.*, 2015). Further evaluating on the observation of the connection between background and evaluation of this type of teaching (unit) could underpin the usefulness of this type of teaching at educational farms more, especially when it comes to teaching urban students about nature and agriculture. More investigations need to be conducted in the future to explore the effects of such programs on students, as they could significantly contribute to the improvement of environmental awareness.

Due to the potential effectiveness in terms of raising environmental awareness the number of farms providing these kinds of programs should be expanded. Also, the offer of farms already engaging in pedagogical work could be further developed. In connection with this, the range of topics covered in such teaching units should be further extended. This also includes stressing the link between sustainable development/ agriculture and quality of life more. Here, establishing collaborations with other local institutions/ manufacturers to increase the scope of the program and to further expand the issue of sustainable development to the personal lives of students could be an option. Courses/ trips for older students and adults could be developed to increase the range of target groups, as well as shorter trips and seminars. Collaborations between universities and farms could be a valuable investment when it comes to the development of further teaching units by future teachers. This would go hand in hand with evaluating the lessons taught on a larger scale to continuously improve offers and underpin the value of these programs through more empirical evidence. To make educational farms a valuable experience not only for students but also for teachers, seminars for further training in sustainable development could be offered.

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