Experiential learning with living ants

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ABSTRACT

Experiential learning implying living animals is a powerful tool for accessing positive emotions such as curiosity as well as for changing attitudes or acquiring new values for the further development of the pupils or students. However, formal curricula in schools is legally binding document for ensuring its contribution to agreed competencies, skills, attitudes and values. Therefore, the classical manuals are more cheap and easy to be implemented in the class. However, curricula are not excluding the development of activities in the class in the same curricula in Romania as in many other countries. The purpose of this article is to evaluate knowledge generation based on experiential learning. As a methodology specific lessons and methods have been implemented in curricular and extracurricular activities implying living ants during the biology class of VI grade under the curricula lesson entitled Insects. Our results proved that implementing activities with living animals is positively correlated with an increased curiosity, self-reflection, responsibility and prejudice phasing out. Moreover, tested pupils passed all evaluation tests even they mist, some of activities compared to control group that was learn by classic methods. Parents tests results proved that these emotions and attitudes are also observed during their home activities.

Keywords: experiential learning, living ants, emotions, knowledge generation.

INTRODUCTION

In the last 20 years, experiential learning gains more credits for its beneficial effects on the formal and non-formal education of young generation (Kolb & Kolb, 2005). The roots of formal experiential learning are not very long (Beard & Wilson, 2002) and starting with 1975 it is well known that David Kolb's experiential learning theory is one of the best known educational theories (Kolb et al., 2001). Its application for different disciplines proved to be relevant for acquiring among others knowledge generation especially based on accessing positive emotions (Abe, 2011; Kolb, 2014). These results associated to experiential learning quickly developed methodologies for teachers how to teach students or pupils (Beard & Wilson, 2006; Seligman & Csikszentmihalyi, 2014). But maybe biology classes accessing living animals are among the most relevant lessons for supporting experiential learning inclusion in the formal curricula (Hays, 2016; Wünschmann et al., 2016). During zoology classes pupils or students are getting in direct contact with a complete new world for them: animal world. These lessons proved to access positive emotions such as curiosity or change of attitude or behaviors in positive ways (Meyer et al., 2016). However, living animals coupled with their habitats during experiential learning will further develop new desired attitudes and values for students or pupils (Randler et al., 2016; Schönfelder & Bogner, 2017). Relevant are
also the environment for learning and for presenting the animal, applied approaches for learning to accomplish the desired aims for education. Thus, during 2013-2016 the project ELENA or Experiential learning for environment and nature awareness (Antofie & Sava 2015) introduced in four countries Germany, Georgia, Hungary and Romania the concept of Tiere Live (Berthold & Sturm, 2010). Different lessons have been published related to wild biodiversity and environmental problems such as wolf, dogs, reptiles, butterflies, earthworms that present different activities in a very specific way according to scientific findings of the German scientist. Entrepreneurial skills for innovation (Garcia et al., 2017) were relevant for ELENA project considering nature awareness (Antofie & Sava, 2015). In this case for each species have been developed activities that relates the species to ecosystem services (i.e. hunting, crop production), social life or waste management for accessing the development of new skills connected to nature protection. In case of ant’s proposed activities, they may also provide ideas for further develop new way of communication and to understand better complex situations with multiple variable. Moreover, accessing for more than two weeks’ certain activities proved to become important for knowledge generation relevant for medium term and positive change in attitude towards nature (Erhabor & Don, 2016). The scope of this article is to test activities with ants on two different classes of VI grade for zoology class. It was chosen the curricular lesson for insects and provided activities with ants for tested class or classical lessons for insects for general control class. In the tested class have been used video clips with ants’ life in natural habitat that have been continued with extracurricular activities for visiting ants’ nests as well as for constructing an ant farm. In the third stage ants are subjects of observations inside the class during the normal pauses for two weeks. The second control was realized by absent pupils during these two weeks of observation. Teachers also observed and evaluated pupils for curiosity, responsibility, self-reflection and phasing out prejudgmen

**MATERIAL AND METHODS**

**Teaching materials**

As teaching material ELENA modules regarding activities with ants have been applied (Gheoca et al., 2016). Principles, methods and approaches are according to Tiere live (Berthold & Sturm, 2010). The used species was the black garden ant *Lasius niger* L., a European common ant species.

**Subjects and place of implementation**

Two group of 25 pupils each, of 12 years old, and the VI grade of the Gymnasium School „Constantin Ioan Motaș” from Mediaș, Sibiu county, Romania were the subject of this study.

**Time of implementing and methodology**

This study was implemented starting with May 2016 as part of the national curriculum for biology VI grade, and supplementing the Insect lesson. The activity was continued as an extracurricular activity in the same day, as an outdoor lesson following ELENA module for ants (Gheoca et al., 2016). The teacher received the permission of the Director of the School to conduct activities with living animals and signed parents ‘consents. The safety of pupils was closely observed and the welfare of animals as well. The current regulatory framework is not forbidding to perform lessons with living animals if they are not protected and they are not harmful for pupils. Curiosity, self-reflection, responsibility and prejudge methods followed principles proposed by Litman and Spielberger in 2003 as a combination between pupil’s evaluation and teacher observations. A series of activities in five separate stages have been implemented in two separate classes (control and tested) for the curricular lessons regarding the “insects”.

1. First stage: indoor activity: [1.1.] Teacher is evaluating the knowledge bases of pupils related to insects before starting the class. They have been asked four simple questions such as: do you know what an insect is? Can you name three insects? Do you know ants? Do you know how they multiply
themselves? [1.2.] Teacher is presenting the introductory part of the lesson according to ELENA module and additionally add video clips with living ants in their natural habitats and their social life; [1.3.] Teacher is evaluating knowledge generation after the introductory module on a scale from 1 to 10; [1.4.] Students are evaluating their interest towards this activity based on a Likert scale (table no. 1) and [1.5.] Teacher is evaluating for each pupil the following: curiosity, responsibility, self-reflection and phasing prejudice if there exists regarding ants and activities with ants (i.e. fear of touching ants).

2. Second stage: outdoor activities: [2.1.] Teacher is inviting pupils in an extracurricular activity as an outdoor lesson – in the park of the school for studying an ant nest; [2.2.] Students are evaluating their interest towards this activity based on a Likert scale (table no. 1); [2.3.] Teacher is evaluating for each pupil the following: curiosity, responsibility, self-reflection and phasing prejudice if there exists regarding outdoor activities with ants; [2.4.] Teacher is inviting pupils to construct ant farms in small groups of four; [2.5.] Students are evaluating their interest towards this activity based on a Likert scale (table no. 1); [2.6.] Teacher is evaluating for each pupil the following: curiosity, responsibility, self-reflection and phasing prejudice if there exists regarding outdoor activities with ants.

Table 1 The Likert scale applied for pupils’ evaluation on activities with living ants

|                                | Fully agree | Rather agree | Undecided | Rather disagree | Fully disagree |
|--------------------------------|-------------|--------------|-----------|----------------|---------------|
| I feel interested             |             |              |           |                |               |
| I feel well                   |             |              |           |                |               |
| I feel uncomfortable          |             |              |           |                |               |
| I feel annoyed                |             |              |           |                |               |
| I feel boring                 |             |              |           |                |               |

3. Third stage: ants are invited in class: indoor activities: [3.1.] Teachers are inviting pupils to perform for maximum two weeks, activities such as ant’s farm observations and nourishment; [3.2.] Students are evaluating their interest towards this activity (table no. 1); [3.3.] Teacher is evaluating for each pupil the following: curiosity, responsibility, self-reflection and phasing prejudice if there exists regarding outdoor activities with ants.

4. Fourth stage: parents testing. All parents received an evaluation form for evaluating their own pupil interest towards ants’ activities (table no. 1). Parents submitted in the end of activities filled in tables to the teacher.

5. Fifth stage knowledge accumulation tests consists in testing pupils after one week and after four week since the last activity ended. Pupils have been marked between 1 and 10. During all these activities pupils have been encouraged that marks are not relevant to diminish the stress. The control was ensured for the tested class on one hand, by the absence and on the other hand by another class following the classical lesson for insect.

RESULTS AND DISCUSSIONS

1. First stage: indoor activity

Teacher tested the existing knowledge of pupils just before starting ELENA module on ants. The average mark was 4.87 and this was considered as low (Table no 1). Only two marks of 7 have been granted and the general opinion is that the pupils are not sure about their answers. During the presentation of the introductory part with ants, teacher evaluated again their knowledge that was above 7.02 with 15 pupils of 25 granting marks over 7. This may be positively correlated with the increased interest of students towards the subject and the manner of presenting the lesson. Thus, 20
pupils felt that they are interested in the presentation and 19 are feeling well. It seems that 21 pupils claim that the lesson is not boring and 24 that is not annoying. 20 pupils considered that the presentation with living animals is also not uncomfortable. All pupils were decided to answer the questions (Fig.1).

Figure 1 Introductive indoor activity with ants. Left: the pupils interest towards the introductory part of ants. Most of the pupils are feeling well, interested, comfortable they consider that it is not an annoyed or boring lesson. Right: teacher evaluation of pupils regarding curiosity, self-reflection, responsibility and prejudice phasing out.

These results are positively correlated with the expression of curiosity in following living ants in movies. They became more attentive and responsible for learning. Also, more than 70% of the pupils started to share their own emotions related to the subject.

2. Second stage: outdoor activities

The second part of experiential learning was set for going in nature and exploring the ants’ nests in the school garden. ELENA module proposes two interconnected activities: exploring the nests and constructing an ant farm. Considering that this extracurricular activity took 2 hours compared to 50 min of indoor activity the results of the tests are encouraging. Thus, for visiting the ants’ nest it was recorded only agreements for being interested (22 of 25 fully agree) and feeling well (18 of 25). Nobody felt boring or uncomfortable (Fig. 3 and 5). The same results have been recorded for constructing a farm from jars taken from home. In both situation pupils revealed an increased curiosity, self-reflection, responsibility and prejudice in phasing out for visiting the ant nests. However, due to prolonged long time spend in nature it was recorded a slight decrease for all these attributes (Fig 4 and 6).

Figure 2 Left: pupils interest towards outdoor activity – visiting the ant nests. Most of the pupils are feeling well, interested, comfortable they consider that it is not an annoyed or boring lesson. Right: teacher evaluation of pupils regarding curiosity, self-reflection, responsibility and prejudice phasing out for visiting the ant nests.
### Table 1 Knowledge tests results in applying activities with living ants

| Subjects no. | Results before activities | Results after first activity | Results after one week | Results after four weeks | Subjects in control test |
|--------------|---------------------------|------------------------------|------------------------|--------------------------|--------------------------|
| 1            | 6                         | 7                            | 9                      | 9                        | 5                        |
| 2            | 6                         | 9                            | 9                      | 9                        | 6                        |
| 3            | 7                         | 10                           | 10                     | 10                       | 6                        |
| 4            | 6                         | 10                           | Absent                 |                          | 6                        |
| 5            | 4                         | 8                            | 8                      | 9                        | 3                        |
| 6            | 6                         | 9                            | 9                      | 10                       | 6                        |
| 7            | 3                         | 3                            | 6                      | Absent                   | 4                        |
| 8            | 5                         | 9                            | 8                      | 8                        | 5                        |
| 9            | 5                         | 6                            | 7                      | Absent                   | 5                        |
| 10           | 5                         | 8                            | 8                      | 8                        | 7                        |
| 11           | 6                         | 8                            | 9                      | 8                        | 3                        |
| 12           | 5                         | 7                            | 5                      | 8                        | 5                        |
| 13           | 5                         | 9                            | 9                      | 8                        | 3                        |
| 14           | 2                         | 3                            | 5                      | 5                        | 4                        |
| 15           | 5                         | 7                            | 8                      | 9                        | 4                        |
| 16           | 6                         | 6                            | 8                      | Absent                   | 6                        |
| 17           | 6                         | Absent                       | 7                      | 6                        | 4                        |
| 18           | 3                         | 5                            | Absent                 | 6                        | 4                        |
| 19           | 7                         | 8                            | Absent                 | 6                        | 6                        |
| 20           | 3                         | 5                            | 6                      | 5                        | 4                        |
| 21           | 3                         | 8                            | 7                      | 7                        | 4                        |
| 22           | 4                         | 7                            | 9                      | Absent                   | 4                        |
| 23           | 4                         | 6                            | 6                      | 7                        | 5                        |
| 24           | 3                         | 7                            | 7                      | 8                        | 6                        |
| 25           | 6                         | 8                            | 9                      | 9                        | 6                        |
| Average      | 4.84                      | 7.208333                    | 7.782609               | 7.789474                 | 4.8                      |

**Figure 3** Left: The pupils interest towards constructing an ant farm. Most of the pupils are feeling well, interested, comfortable they consider that it is not an annoyed or boring lesson. Right: Teacher evaluation of pupils regarding curiosity, self-reflection, responsibility and prejudice phasing out for visiting the ant nests.
3. Third stage: ants are invited in class: indoor activities

The third stage of the lesson was finalized with indoor activities such as observing and nourishing ants inside the ant farms that are present in the class. Pupils received specific tasks for observing and for nourishing ants and teachers observed pupils as well. It is obviously according to results presented in fig 3. Left that pupils preserved their interest in observing ants and they feel well and comfortable during their pauses close to living animals. On the other hand, teacher observed that their curiosity is increasing also due to the increased activity in the ant farm. During this period ants digs tunnels and ponds eggs. Pupils observed the geometry of the nest and different tasks for different ants. Also, they observed different larva stages. Thus, living animals in their habitats may trigger curiosity for more time.

![Figure 4: Pupil's interest towards observing and nourishing ants.](image)

**Figure 4** Left: The pupils interest towards observing and nourishing ants. Most of the pupils are feeling well, interested, comfortable they consider that it is not an annoyed or boring lesson. Right: Teacher evaluation of pupils regarding curiosity, self-reflection, responsibility and prejudice phasing out for observing and nourishing ant.

4. Fourth stage: parents testing.

To avoid any subjectivism parents have been asked for observing their own kids and filled in the same forms as pupils in the classroom. The general shape of the diagram doesn’t change. However, there are more reflective answers in family, where are not present other pupils. There is a change between fully agree and rather agree and between fully disagree to rather disagree. The excitement form the class is disappearing and their answers are no more objective. These results are consistent with the general interest towards the subject and all pupils proved that they are interested, they are feeling well. No one pupil declared that is uncomfortable or annoyed or getting boring in the school.

![Figure 5: Test results applied by parents observing pupils.](image)
5. Fifth stage: knowledge accumulation tests

Teachers applied tests for evaluating the knowledge related to the lessons and activities applied for both classes: tested and control (Table no 1). The average media for the tested class was 7.82 and it is maintained after four weeks to the same extent. Not a single pupil fails the tests. Taken into consideration the control represented by absent pupil during the time it appears that the contact with living animals has a strong positive impact on learning as no one failed the test. Thus, it can be said that such experiential lessons accessing positive emotions such as curiosity or positive attitudes such as self-reflection, responsibility and phasing our prejudice are relevant for supporting knowledge generation. To note all pupils from the testing class that failed the test accumulated knowledge noted between 5 and 9. Among these three pupils failed the first tests but recovered and were quoted with 9 after the medium-term evaluation. This may be considered as a success considering that all class acquired the minimum of knowledge that is required for classes. It is not the case for the control class that never attended ELENA modules. In this case, the interest towards nature is diminished and the average media is 4.59 with 11 pupils of 25 failed the test after four weeks of teaching Insect lesson according to the classical type of learning. There are no differences between classes recorded in time, as it is supported by the first evaluation test that is alike the tested class (i.e. 4.82 average for tested class and 4.8 for control class).

CONCLUSIONS

Experiential learning in biology classes is maintaining the expression at elevated levels of curiosity in all pupils for medium term (four weeks after ending teaching). These positive emotions are responsible for increasing attention and changing attitude towards the learned subject. These results support the idea that accessing positive emotions become more and more important for grounding new skills in pupils or student education (Immordino-Yang, 2016). Thus, pupils revealed constant self-reflection, increased responsibility and change in prejudice towards living ants for an extra one month. Observing living ants and understanding their social life for two additional weeks during the pauses as an extracurricular activity, but indoor also, further supporting knowledge generation and maintenance. These studies may further be investigated based on professional approaches for curiosity according to Litman and Spielberger (2003) and interest accessing according to Silvia (2006).

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