

Young Scientists Discovering Food Web: An IBSE (Inquiry Based Science Education) Activity at Zoo Delle Maitine (Benevento, Italy)

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Abstract The IBSE approach in the study of science allows pupils to formulate themselves the questions to which they need to find an answer. Is a highly stimulating approach that was used in an Educational Activity about food web at the Zoo. Starting from the observation of living creatures (from insects to reptiles and small mammals as well) and then posing themselves questions, kids were stimulated to find answers and to hypothesize conjectures. The success, calculated by questionnaires, both between kids and teachers, and checking every five minutes the attention of students, was great and the lesson about food web in nature was, for sure, learned. A total of 480 students participated in the activities; 69 teachers were present and questioned at the end of activities: 25 had the IBSE lab, 44 the non IBSE. Opinions about both activities, IBSE and NON IBSE, were generally good but the activity conducted with the IBSE method scored a higher value so the IBSE method was a great success.

Keywords: IBSE methodology, zoo, zoo education, conservation education, food web

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1. Introduction

Teaching about science and nature out of the classroom, as we do in the Zoological Gardens, is an excellent instructive practice that facilitate the knowledge acquisition process. Educational activities in the Zoos are inevitably enriching and dynamic; this has to be like this because of many visitors, school groups included, the motivation to visit a zoo is not principally associated with education but recreation, or just to watch animals [1,2,3].

The role of a modern Zoo is much more than simply watching animals. Modern zoos should inspire their visitors to care about the environment and instil a sense of personal responsibility for making behaviour changes that support sustainable lifestyles; moreover Zoo Education aim at making aware visitors of biodiversity as Aichi Target 1 state clearly [4]. The potential of zoos and aquariums to be influential in achieving Aichi Target 1 should not be underestimated; with more than 700 million visitors worldwide every year [5] zoos and aquariums may be considered unique places to contribute to the goal of raising understanding of biodiversity.

All the activities offered to school have the same aim to make young and schoolers aware of what it is Biodiversity and how the natural world works. The education outdoors

is very important when speaking of natural sciences. People get more easily inspired outdoors [6,7].

2. Materials and Methods

The protagonists of the activity “What’s in your dish?” were simple handling living creatures: insects (leaf insects, hissing cockroaches), rats, snakes, maggots, plants and fruits. All of them safely closed into appropriate fauna boxes that allowed kids to see through permitting a punctual observation of the animals.

Pupils were organized in tables of 5 or 6 with two or three animals each. On every table paper, pencils and pens were at their disposal for the students to take notes and make drawings.

Questionnaires were given to teachers at the end of the activity to assess the liking of the activity. Furthermore, an educator, not the one leading the activity, took records on the level of attention of the students every 5 minutes, in order to have an evidence on the efficiency of the method applied.

A control group was formed with those group who chose a more formal way to conduct the activity (frontal lesson with a powerpoint presentation).

The method used applied the IBSE (Inquiry based Science Education) method for the teaching of science, described below.

2.1. The IBSE Method

Science education encourages children to develop an understanding of the world around them, and how to think critically about problems and solutions. Inquiry-Based Science Education (IBSE) is a form of science education that - unlike the traditional model where the teacher provides facts and the students learn them - gives children the opportunity to explore “hands on”, to experiment, to ask questions and to develop responses based on reasoning [8].

An important aspect of IBSE is the use of open learning that is described as a teaching method with no prescribed goals or outcomes students have to achieve. Open learning techniques were promoted by many scientists now recognized as precursors of modern teaching techniques such as constructivism, inquiry-based science, and inquiry learning. Students should not be taught only facts, but should be made to understand and explain what they are learning.

Open learning plays an important role especially in teaching through experimentation and direct observation. In this way students should understand what they see, what they do and how they are doing it [9].

IBSE is an approach to teaching and learning science that comes from an understanding of how students learn the nature of science inquiry, and a focus on basic content to be learned [10].

IBSE engages students in the investigative nature of science, helps students put materials into a meaningful context, develops critical thinking and supports positive attitudes toward science [11,12]. The emphasis is placed on teaching science as inquiry rather than on teaching science as the memorization of facts and terms. IBSE moves from a system that promotes science primarily as recall of factual information and rote computation to one that emphasizes conceptual understanding and logical process skills.

2.2. The Activity Proposed at Zoo delle Maitine

In the activity called “What’s in your plate?” about food net, pupils are exposed to a variety of living organisms. They have to observe them and they are asked to pose themselves questions about them. As every

scientist they then need to focalize on one or two questions trying to find the right answers. The most common question is always “What does it eat?” and using books, articles and the expertise of the biologist that lead the activity, they find the right answers. But the activity is not yet finished, one more step needs to be taken.

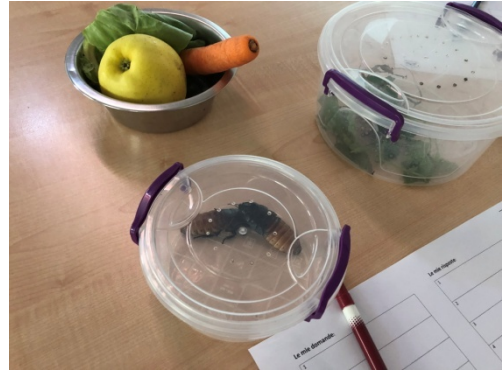


Figure 1. One of the tables prepared for the activity

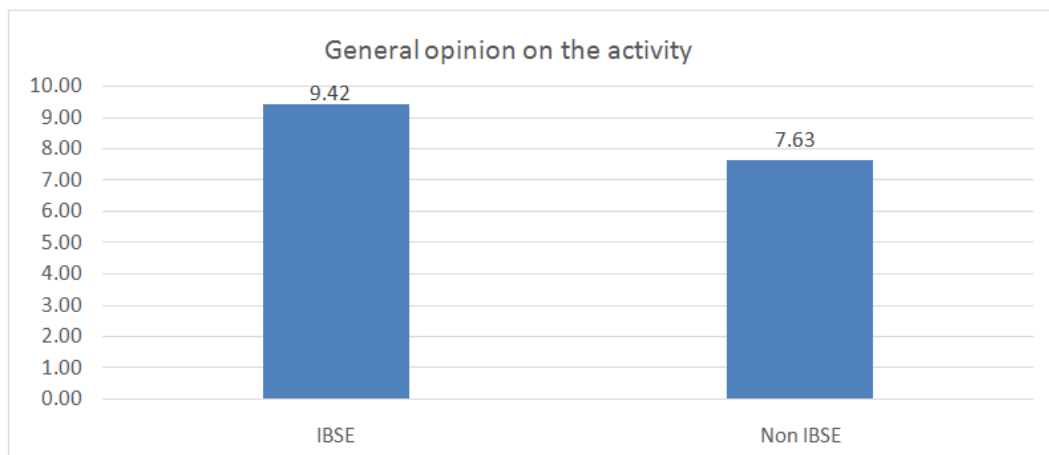
Once every single working group have found the principal characteristics of the living thing they had, it is time for an overall discussion and conclusion. The educator present all the organisms one by one asking the linked working group to provide the right answer to the question they pose themselves. Every single link between organisms in the room is done in reality using a thin rope.

The snake eat mice, the table with the snake is linked to the one with mice. Mice are omnivorous and eat vegetables and insects, so two ropes links are made. At the end of the discussion the conclusion pop up by itself under the shape of a real net built by the students themselves..

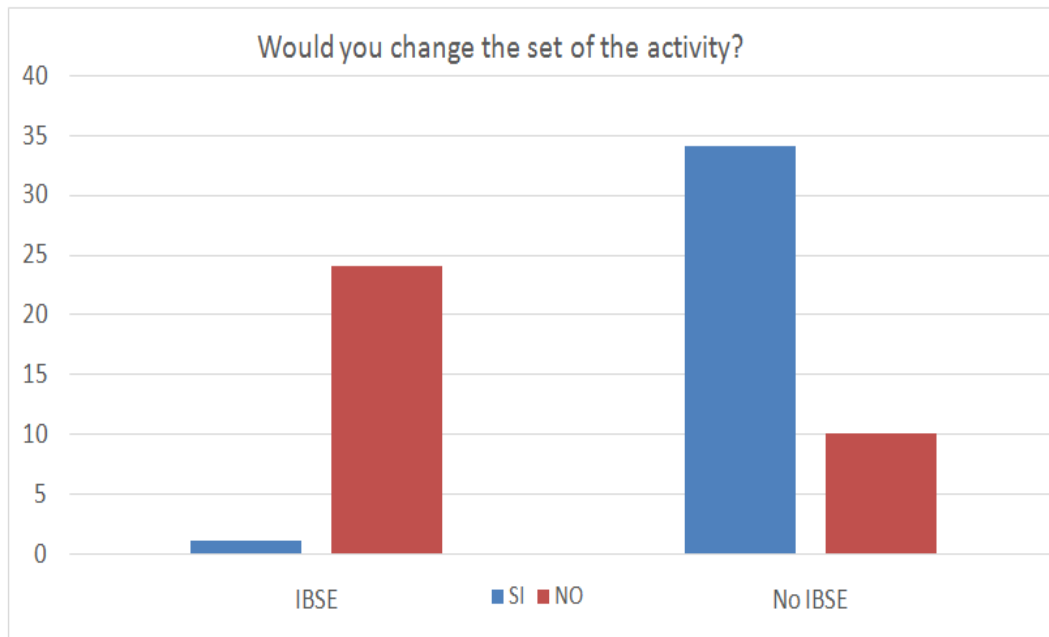
3. Results and Discussion

A total of 480 students participated in the activities: 200 of them sperimented the IBSE method, the other 280 participated in a more formal activity. 69 teachers were present and questioned at the end of activities: 25 had the IBSE lab, 44 the non IBSE.

Opinions about both activities, IBSE and NON IBSE, were generally good but the activity conducted with the IBSE method scored a 9,42 up to 10 where the classic approach reached a 7,63.



Graphic 1. The opinion of teachers about the activity



Graphic 2. The opinion of teachers about methodology

At the question “Would you change the set of the activity?” the grand majority of the teachers that experimented the IBSE method said “No” asking for more info about the method and how to use it in the classrooms as well. On the other hand a great percentage, 34 teachers up to 44, answered the same question “Yes”,

meaning that also if many of them liked the activity they would prefer to do it in another way than the frontal lesson.

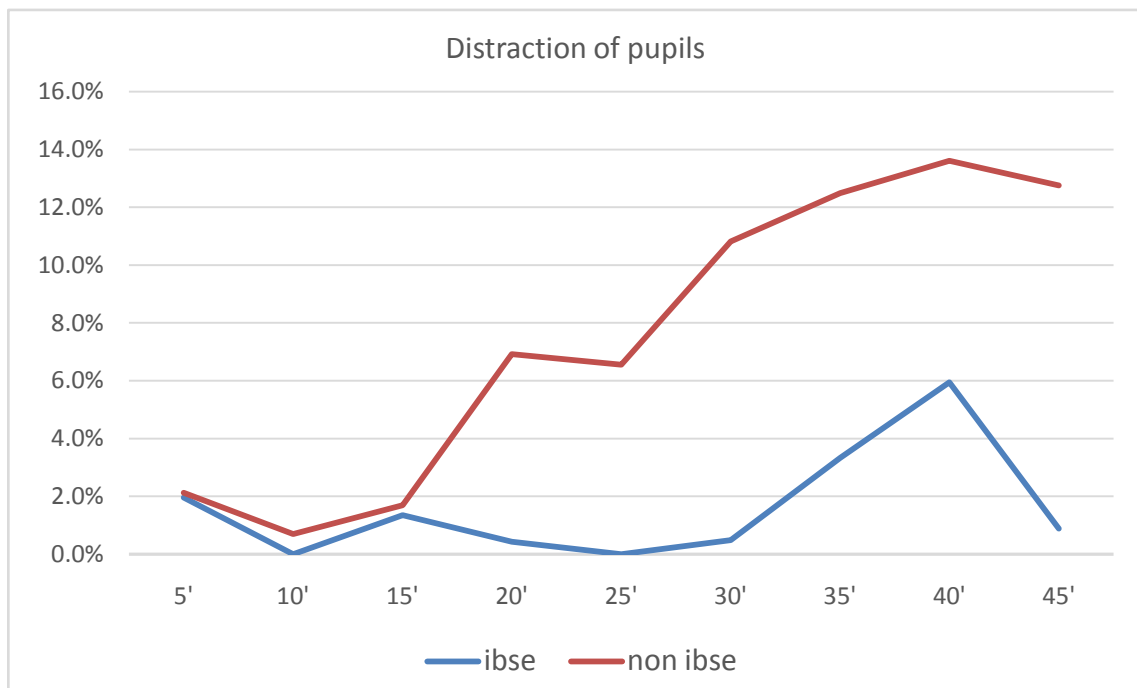
The level of attention of the pupils was checked every five minutes by another educator present in the classroom. Data are shown in the charts below.

Table 1. Distraction of students with IBSE method

IBSE METHOD									
	5'	10'	15'	20'	25'	30'	35'	40'	45'
24	1	0	0	0	0	0	1	3	1
	4.2%	0.0%	0.0%	0.0%	0.0%	0.0%	4.2%	12.5%	4.2%
22	0	0	0	0	0	0	1	1	0
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.5%	4.5%	0.0%
19	1	0	0	0	0	0	1	1	0
	5.3%	0.0%	0.0%	0.0%	0.0%	0.0%	5.3%	5.3%	0.0%
23	1	0	1	0	0	1	1	0	0
	4.3%	0.0%	4.3%	0.0%	0.0%	4.3%	4.3%	0.0%	0.0%
25	0	0	0	0	0	0	0	2	0
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	8.0%	0.0%
26	1	0	1	0	0	0	1	3	0
	3.8%	0.0%	3.8%	0.0%	0.0%	0.0%	3.8%	11.5%	0.0%
26	0	0	0	1	0	0	1	2	1
	0.0%	0.0%	0.0%	3.8%	0.0%	0.0%	3.8%	7.7%	3.8%
20	0	0	0	0	0	0	0	0	0
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
25	0	0	1	0	0	0	1	1	0
	0.0%	0.0%	4.0%	0.0%	0.0%	0.0%	4.0%	4.0%	0.0%

Table 2. Distraction of students with not IBSE method

NON IBSE METHOD									
	5'	10'	15'	20'	25'	30'	35'	40'	45'
24	1	0	0	2	3	5	6	5	6
	4.2%	0.0%	0.0%	8.3%	12.5%	20.8%	25.0%	20.8%	25.0%
19	2	0	0	5	3	6	7	6	0
	10.5%	0.0%	0.0%	26.3%	15.8%	31.6%	36.8%	31.6%	0.0%
25	0	0	2	4	2	5	3	6	7
	0.0%	0.0%	8.0%	16.0%	8.0%	20.0%	12.0%	24.0%	28.0%
26	1	0	0	1	1	5	2	2	4
	3.8%	0.0%	0.0%	3.8%	3.8%	19.2%	7.7%	7.7%	15.4%
25	0	0	0	2	2	3	2	3	3
	0.0%	0.0%	0.0%	8.0%	8.0%	12.0%	8.0%	12.0%	12.0%
22	0	0	0	1	1	1	4	0	1
	0.0%	0.0%	0.0%	4.5%	4.5%	4.5%	18.2%	0.0%	4.5%
23	1	1	1	2	2	1	2	3	4
	4.3%	4.3%	4.3%	8.7%	8.7%	4.3%	8.7%	13.0%	17.4%
27	0	0	0	0	0	0	1	2	2
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.7%	7.4%	7.4%
20	0	0	1	1	2	2	2	3	3
	0.0%	0.0%	5.0%	5.0%	10.0%	10.0%	10.0%	15.0%	15.0%
21	1	1	1	1	1	0	2	2	3
	4.8%	4.8%	4.8%	4.8%	4.8%	0.0%	9.5%	9.5%	14.3%
26	0	0	0	0	0	0	0	1	1
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.8%	3.8%
22	0	0	0	1	2	2	3	3	3
	0.0%	0.0%	0.0%	4.5%	9.1%	9.1%	13.6%	13.6%	13.6%



Graphic 3. Distraction of students compared

Data collected gave us a few evidence about teachers, students and approaches.

The majority of the teachers chose the more formal way for the activity and this appened probably because they feel more safe with something they know already, they feel more comfortable with an approche they apply everyday in their classroom, the frontal lesson. Luckily a great part of them, 25 up a total of 69, showing open minds, chose to experiment something new, something they could also learn, the IBSE method. This highlights also one of the aim of the existence of a Zoo, the stimulation of children and adults not only about the conservation of the nature, but also about the effectiveness of approaches in the educational process as already shown by the litterature [13,14,15,16].

Teachers were more keen to participate with their students to the activity and a few of them declare that they learnt something new from it. So the method used, IBSE, stimulated students but also teachers giving us evidences that the approach is winning.

Students were deeply engaged in the work; they felt to be real scientists and, as shown in the charts 1 and 2 they hardly get bored. This goes in the direction already studied by other authors that state that educators and teachers need to focus on developing ways for children to observe and look for meaning in nature [17,18]. The IBSE method is perfectly applicable. Using different strategies and designs, the IBSE uses methodological pluralism, accepts differences instead of a single scientific designs and learners keep experiencing the excitement of solving question or problems o their own or as part of a team [19].

4. Conclusion

As a result of the study described in this paper, IBSE methodology will be applied at every activity possible in the zoo, both for school and for generic public. The more formal approach, the frontal lesson, will be abandoned; instead, something more active by the side of students, will be used.

Specific training session about the method will be organized for all the teachers interested in using the IBSE methodology also in their classes; the method works but it is not easy to use it at the beginning.

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