

## TEACHING BIOSCIENCE IN PRIMARY AND MIDDLE SCHOOL AND CHILDREN'S ECOLOGICAL AWARENESS

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***Abstract.** In the article, the aims of teaching bioscience in primary and middle school have been introduced. Core curriculum has been mentioned as well, and the tools that may be used by a teacher to convey theory and practical knowledge in the most efficient way have been discussed. Furthermore, it has been noticed that various ecological ventures have a positive impact on children's ecological awareness. In the second part of the article, results of surveys conducted among primary and middle school students have been introduced. It embraces also questions and answers, in which children describe their knowledge level about the condition of environment and talk about their attitude towards taking care of nature, and what are the stimuli of such demeanours. In addition, the task of surveys was to find out which issues teachers pay particular attention to. The last two questions were to check the knowledge.*

***Keywords:** bioscience in primary school and middle school, children's ecological awareness.*

### **Introduction**

Responsibility for cultivation of ecological awareness and children upbringing in the spirit of respecting natural environment, in times when development of industry and communication, and increasing water and energy intake caused a considerable and constantly progressing degradation of nature, is shouldered by natural science education. Its aim is to stimulate students' sensitivity to the problems of contemporary world, and seeking and analysing the culprits and outcomes of ongoing phenomena. In the first place, however, it should make every student want to be a friend of nature, who segregates the waste, saves water and energy, and follows the idea of balanced development through their whole life.

## **Teaching bioscience in primary school**

On primary school level, teaching pupils to respect the animate and inanimate nature and enabling active learning of natural concepts and phenomena is an elementary goal.

The aims of natural science and environmental education can be divided into several groups:

1. aims connected with the development of child's personality in terms of moral-social facet,
2. aims concerning learning the natural environment and its protection,
3. aims related to children's hygiene and their health care,
4. aims connected with the student's development of cognitive skills (Depesova et al. 2008).

The first group of aims is realised by induction of pupils in the class and school social life, and teaching them polite behaviour in adequate situations. Pupils also learn about the life in the country and city, human work and social roles. The second group of aims is realised, among the others, by familiarising pupils with the variety of fauna and flora, enforcing them to observing natural phenomena on their own, analysing and generalising their conclusions, shaping their sensitivity to the beauty of nature, and understanding of people's connections with the natural world and their role in maintaining balance in nature. The task of the third group of aims is to set teacher's work on incorporation of pupils to their health or life protection, getting them familiarised with the safety code, and passing them the knowledge, skills, and habits concerning their health. The last group of aims, the fourth one, results from the methods that are used by a teacher while the curriculum is realised.

In reference to pupils from the beginning classes, ecological education should be realised so that pupils maintained contact with the natural environment. As far as possible, the so-called nature corners should be created in classrooms or pupils should be provided with trips and classes in botanical or zoological gardens. Core curriculum defines what skills pupils have to acquire after finishing the educational phase of integrated teaching in classes I-III. Apart from basic skills acquired by students during early school education, such as reading, writing, comprehensive and communicative skills, there are ones that are strictly connected with natural science education. A pupil who finishes the third class should have skills connected with: observing natural experiments, describing life in chosen ecosystems, naming characteristic elements that are typical of a certain topography, listing typical of a chosen region of Poland animals and plants, explaining phenomena dependently to the season, undertaking actions aiming to protect the environment (waste segregation, saving water), learning about the influence of inanimate nature on people and

animals' lives, following the rules of healthy nutrition, and taking care of health and safety of themselves as well as the others (Gzyl & Jarosz, 1996).

In order to realise the contents of ecologic education in classes I-III, apart from integrated teaching, pupils' attendance in extracurricular activities is important. Setting those activities spirally is most optimal. Constant repeating in consecutive classes allows to extend the knowledge correspondingly to the increase of intellectual-perceptual abilities. Learning the contents should combine theory with practice, and concern pupil's environment. In order to make the education efficient, methods and forms of teaching should be adequately picked.

Nature science education is described as „the axis, around which the educational process can be organised and curriculum aims realised.”(Kowalska et al. 2015) The most efficient ways of are those that activate the students as much as possible. Observations, research with experiments , discussions or drama exercises, owing to which pupils may acquire knowledge concerning ecological education in a more conscious way, are counted among such methods.

Natural science education should be realised on each educational level on two surfaces. The first one exists within the education system, beginning with preschool education, and ending with higher learning. It is a so-called formal education, which is possible owing to the tools such as „technical course books, catalogues, incorporating to the curricula ecological contents, subject contests” (Kozuchowski 2007). The second surface, that is informal education, may affect in an active or passive way. Actively, pupils might be involved in arranging environmental events that aim at familiarising the closest surrounding with issues connected with caring about the environment and nature. The passive influence uses mass media, brochures, leaflets and prospectuses adjusted to the pupils' age.

Natural science education in the second educational phase (classes 4-6), basing on the core curriculum, obliges a teacher to accomplish certain objectives and requirements that students are supposed to acquire during the process of learning. Since the natural science education in classes 4-6 is unified as one subject, core curriculum defines five divisions, in which educational objectives that are developed in particular subject curricula have been described. In general requirements, there are:

- 1) interest in the natural world
- 2) hypothesising on natural phenomena and processes and their verification
- 3) practical use of bioscience knowledge
- 4) respecting the nature
- 5) observations, measures, and experiments (Noga 2005).

Core curriculum does not arrange the contents to particular classes, but the set of divisions implies that teachers and curricula authors should realise the contents that are most familiar to students in class 4 (me and my surrounding, territory orientation, observation, natural experiments and modelling, closest neighbourhood, human and the environment). In class 5, core curriculum proposes contents included in actions concerning the features of substances, topography of Poland and Europe, human organism, health and care about it, and electric and magnetic phenomena in nature. Owing to the skills of abstract thinking and generalising the content, the abilities of class 6 student are much more considerable thus the last implied divisions are: Earth and the universe, lands and oceans, world topography, substance transformations, and movement and forces in nature. Core curriculum pays „particular attention to pro-health education and cultivating behaviours that concern safety. There are also entries referring to the observation of closest environment contamination, the influence of every day behaviour on environment condition and actions favouring the natural environment, and respecting the nature, organisms, and objects being under the legal protection.” (Parczewska 2006) It is worth to mention that contents referring to ecology and natural environment protection may be realised during the industrial arts. Recycling, waste segregation or topics connected with renewable energy sources belong to the issues that are touched upon during those lessons.

In natural science education, activating methods, owing to which not only do students learn the material, but also are taught the team work, improve their cognitive skills, and learn how to solve problems on their own and draw conclusions. In teaching bioscience in classes 4-6, the following forms belong to the activating methods (Piaskowska et al., 2015):

- 1) experiment - a student, independently conducting an experiment, develops their learning enthusiasm. Experiments make lessons more attractive. Simple experiments that may be repeated by students at home shape their ability of drawing conclusions and finding the cause-effect relationship;
- 2) terrain exercises - owing to the change of surrounding and going out of school, students maintain contact with nature and natural environment. During such lessons, students can notice what are positive and negative effects of the human's activity. The exercises improve invention and the team work as well;
- 3) educational games - they constitute a complement to the substantive contents during lessons. Owing to them, students develop their memory, consociating facts, and perceptiveness. Opportunity of adjusting the difficulty of questions and tasks, owing to which they are

- doable for both the stronger and weaker students, is nothing more but an advantage;
- 4) drama – a method consisting in identifying oneself with a particular role, for example a traveller. It is an option of conducting lessons, during which students are arrangers jointly responsible for the course of the lesson. Active participation develops students; creativity and helps to keep good relations in a group;
  - 5) practical exercises - they are dominated by the use of acquired knowledge to accomplish a task. Students independently check knowledge level and the ability of its use in practice. It is one of the most efficient ways of learning.

### **Teaching bioscience in middle school**

In the core curriculum, the main task of school, that is continuation of cultivating students' skills, is clearly defined. School should also focus on teaching bioscience and science, and not forget, as in educational phase II, about health education. Beginning the learning process in middle school, students, unlike the ones from classes 4-6, instead of one subject, that is science in the second educational phase, face 4 separate subjects: biology, chemistry, geography, and physics. Each subject has strictly defined objectives and requirements that have to be taken into consideration while creating curricula. after the change of industrial arts in middle school into the modular teaching, in which teachers chose a particular type of activities, such as model making or tailoring, problems of environment are mentioned more and more rarely.

Taking into consideration the fact that issues connected with the environment and its protection are most closely related to biology, the core curriculum analysis is going to be devoted to nothing else but only this subject.

In a frame plan of the subject, there are cumulatively 4 hours per week that should be realised in a period of three years. Biology curriculum in the middle school classes has to cover objectives defined by the core curriculum, and fulfil the general and specific requirements.

General requirements embrace:

- „conversancy of biological variety and basic biological processes,
- conversancy of biological research methodology,
- seeking, using, and creating information,
- correct comprehension and argumentation,
- conversancy of human's health conditioning.” (Praužner & Ptak, 2014)

Among ten chapters, in which specific requirements are included, the two ones concern nature: ecology, and global and local environmental problems. The chapter connected with ecology is realised with the reference to a systematic

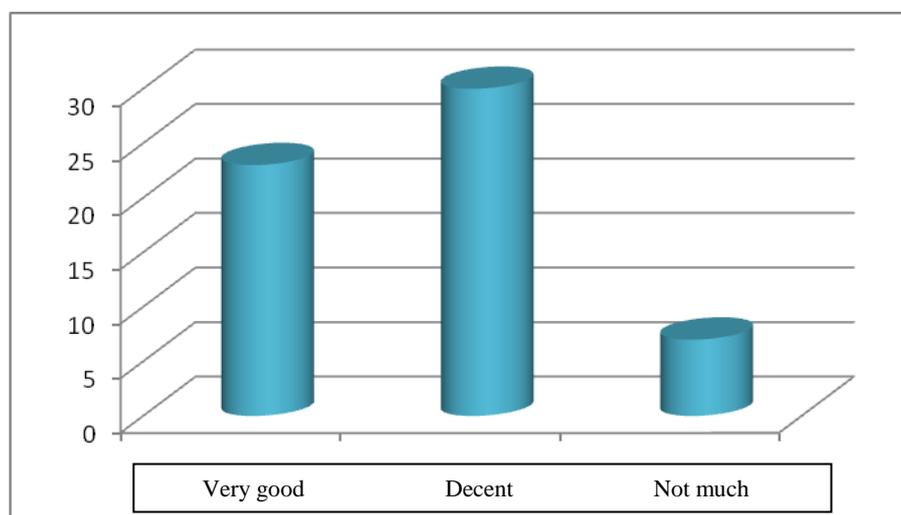
organism survey (Praużner & Ptak 2013; Sobczyk et al. 2015). In another chapter that touches upon global and local problems of environment, there are topics referring to the climate changes, waste segregation, and water and air contamination (Tuszyńska 2006).

### **Research in ecological awareness of students from primary and middle school**

As a research method, it has been classified to use diagnostic survey method in the form of questionnaire, which is to test the children's ecological awareness.

The research has been conducted in the Lesser Poland voivodeship among the primary school students from classes 4-6 and among the middle school students from classes 1-3, attending both urban and rural schools. The survey has covered 60 students in total, 38 (63 %) girls and 22 (37 %) boys. As the data says, it is the middle school students who stated the majority of interviewees - 39 people (65 %), and in 21 cases (35 %), the research concerned the students from primary school.

In question 1, students were obliged to evaluate the level of their knowledge on the natural environment condition. The most numerous group, that is 30 people (50 %) claimed it was decent, 23 people (38 %) stated their learning level was very good, and 7 students (12 %) chose answer 3 (not much).



**Figure 1 Level of students' knowledge on the condition of environment**

Question 2 was supposed to check which interviewee group undertake in their daily life actions that foster the environment protection. 36 students (60 %) answered they did so, 7 ones (12 %) replied negatively, and there were 17

(28 %) people who were not able to describe their contribution in the environment protection.

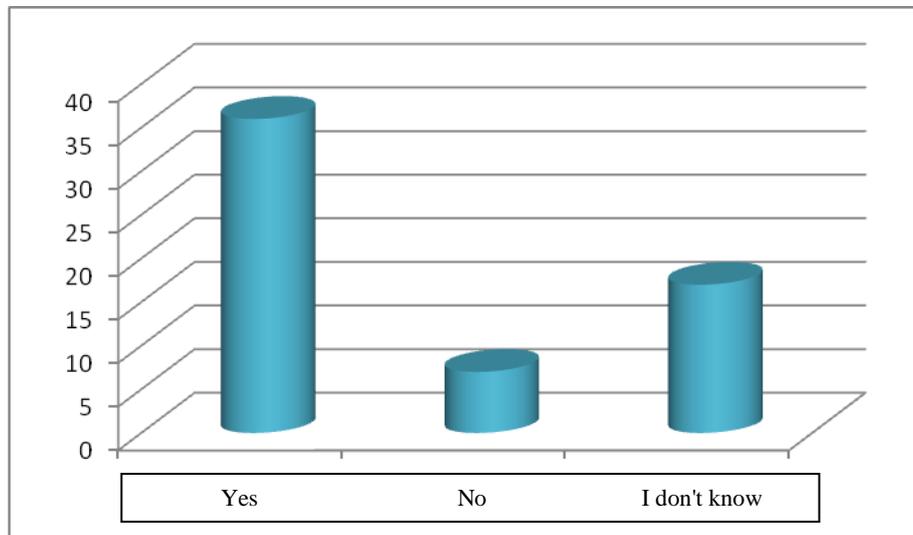


Figure 2 Undertaking actions fostering the environment protection

In question 3, the interviewees replied what, in their opinions, is the main stimulus that makes people care about the natural environment. The most numerous interviewee group - 54 people (42 %) claimed that the main reason was care about their health. The second result, that is 30 students (23 %), opted for the concern about limits, for example of water. A considerable part of survey participants, that is 26 people (20 %), chose following the trends and being so-called „eco”, and the fewest, 18 interviewees (14 %) ticked it is values and beliefs that make people want to care about the surrounding.

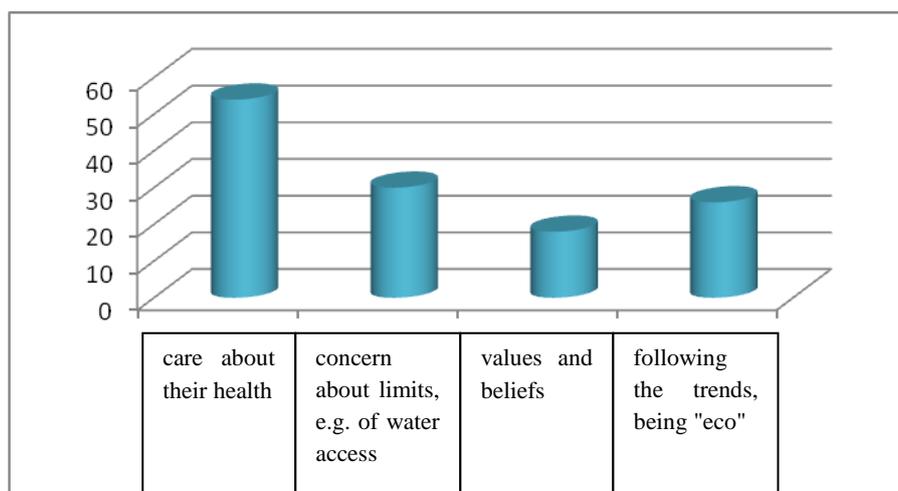


Figure 3 Direct stimuli of people's caring of the environment

In question 4, the survey participants could tick a few options on the subject area, which is realised during their classes and which concerns ecology and environment protection. Almost all the interviewees (58 people) ticked they raised an issue of waste segregation. A considerable group chose air contamination (54 people), greenhouse effect (48 people), and water contamination (50 people) as well. About a half of surveyed students ticked the issues connected with: water intake limit (32 people), energy intake limit (31 people), renewable energy sources (25 people), and eco-signs on packets of different products. The fewest interviewees (17 people) chose an issue referring to the dangers resulting from vanishing of certain types of plants and animals.

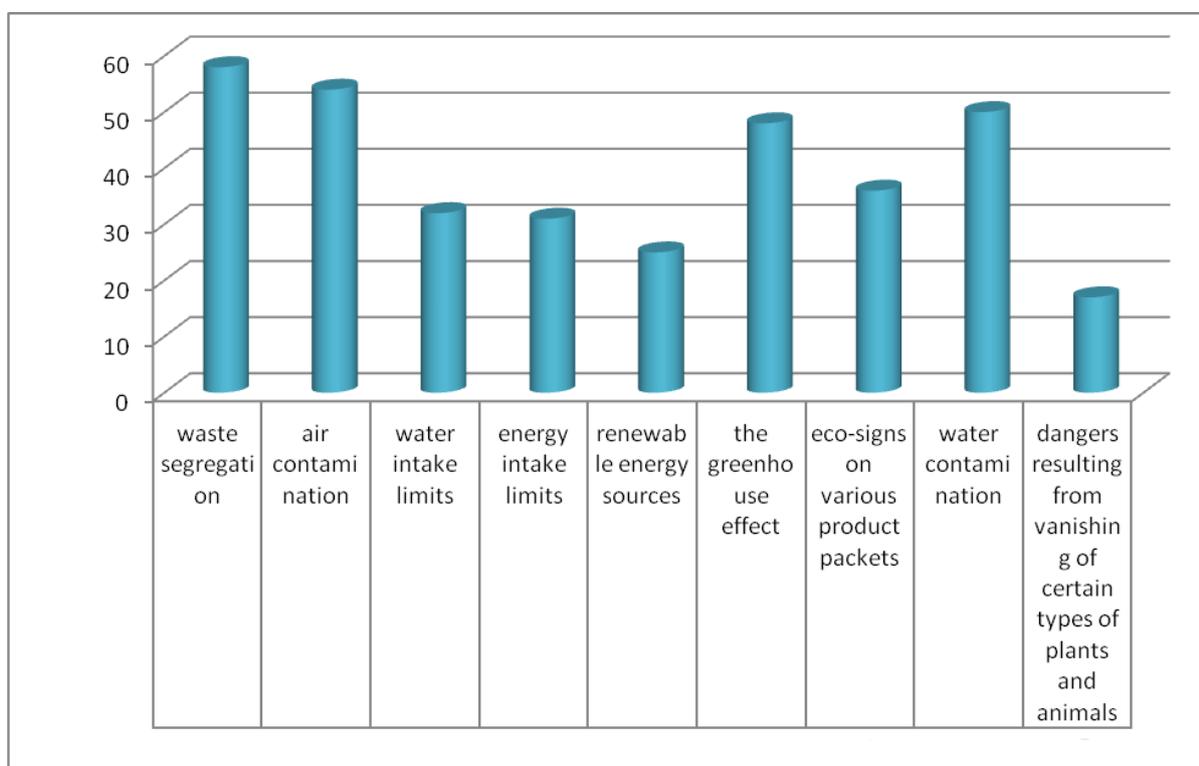


Figure 4 Subject area of classes

In question 5, the surveyed students were supposed to tick a correct set of container colours, that is assigned to specific sorts of waste. The correct set is: blue-paper, yellow-plastic, green-coloured glass, white-colourless glass. The good answer was chosen by 52 people (87 %).

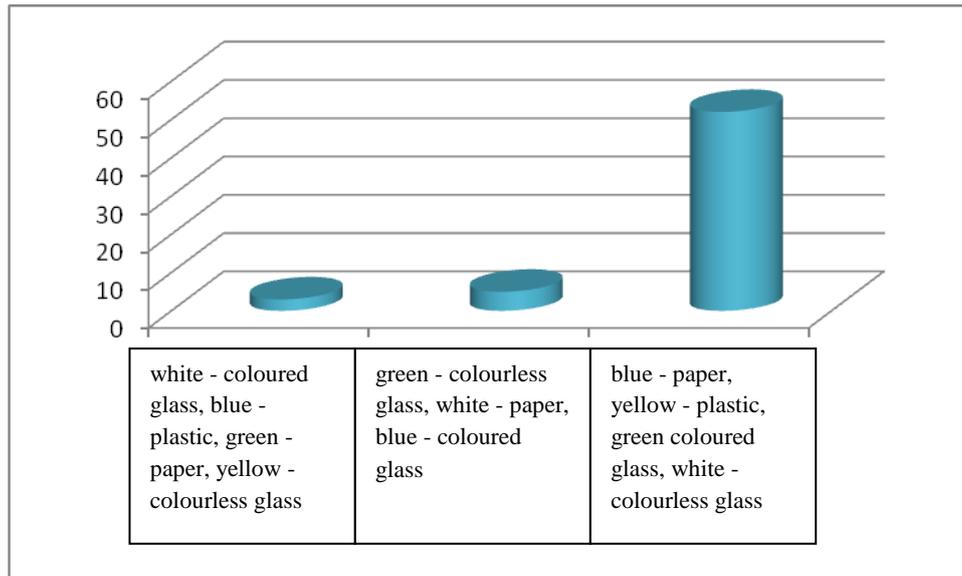


Figure 5 Set of colours of waste segregation containers

In question 6, the interviewees were obliged to evaluate, using scale from 1 to 4 (where 1 defines the biggest impact), what is, in their opinions, the main cause of air contamination. 23 people assigned 1 to the influence of car fumes. Another cause in sequence, according to the students, is factories, and the third one - cigarette smoke. The least danger grade was assigned to household smoke emission (27 people).

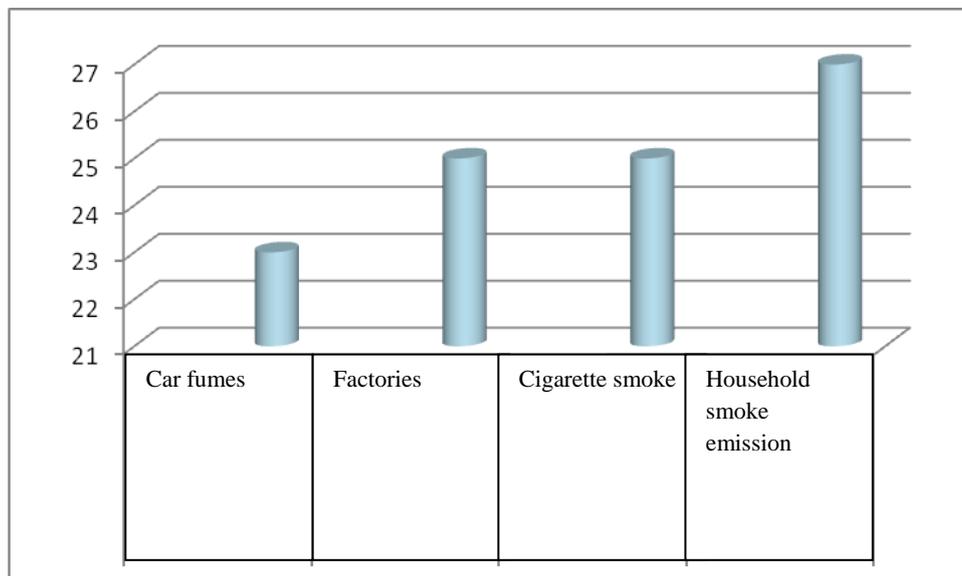


Figure 6 Causes of air contamination

## Conclusions

On the basis of the above-mentioned survey results, one may postulate the good students' self-evaluation, concerning their knowledge about natural science, has its reflection in reality. This is not confirmed by studies carried out by Noga, Sobczyk and Kozaczyński (Noga et al. 1997.). The need for such research was shown by Noga on several occasions (Noga 2014). In conducted researches and studies, there are no references to other authors because such studies have not been performed.

Only in the last question, the children, putting various factors of the air contamination in order, set smoke from household chimneys in the last place, just after the cigarette smoke. It may result from two factors. First of all, an issue of low emission is barely ever mentioned. Secondly, there is a common stereotype that says the air in rural environment is pure since there is no industry and as well-developed transit as in urbanised areas, forgetting thereby coal is the main material that is burnt in the majority of country houses, and it contaminates the environment the most. In the question concerning actions fostering the environment protection, as many as 60 % of students ticked they undertake them, explaining it is caused by the health care (42 %). When it comes to the subject area of lessons concerning ecology and environment protection in primary and middle school, it is dominated by the issues that are most familiar to the students, that is waste segregation, air and water contamination, and the greenhouse effect.

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