THE SCIENCE EDUCATION TOOLS AND WAYS OF PRODUCING THEM IN THE COOPERATION PROCESS

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The content of natural science education gives a chance to the dynamics and structure of the educational process. However, the adaptation of natural science knowledge system depends on both the teacher (choosing and applying teaching methods and forms, etc.) and the pupil (the methods of learning, motivation, general abilities). The diversity of teaching and learning content, forms and methods, activities are typical of natural science education. All that makes the educational process effective: develop intellectual knowledge and skills, set out conditions for intense pupils' activities, shape thinking, foster aesthetic feelings, etc.

It is logical that the educational process should be promoted keeping in mind the following regularities:

- the textbooks, workbooks and other sorts of teaching/learning material of natural science profile, including ***observation and experimentation,*** should be creatively used as an integral part of a balanced curriculum of the educational process. The course of natural science education is mostly auspicious for the development of children's quick eye;
- pupils have to be provided opportunities and conditions to versatile research, raise questions (general and problematic), to establish and define the main direction of activities. Textbooks should be used to extend and improve knowledge;
- the integration of natural science material reading and individual experimentation is suitably effective.

The natural science knowledge and skills gained by pupils in the educational process form the content of teaching natural and world science. Anyhow, the process of natural science education includes the teacher and children's activity based on direct and indirect relations. Children are interested in the classes of science when the content of the taught material is comprehensible, attracts attention and imagination, encourages to intensively work and is problematic. A highly effective component of natural science education is the presentation and examining of problems. It can be expressed in three ways: 1) asking questions about the relevant subject; 2) presenting demanding tasks; 3) facing serious problems.

Hence, the following fundamental moments can be emphasized:

- successful natural science education is a sample of the most important concepts of natural sciences (natural science). They explain the main structure of natural sciences and increases the learner's natural science perception moving to the higher form;
- successful natural science education is a sample and discernment of the concepts that deepen and broaden general natural science understanding;
- the understanding of concepts plays a leading role at school as well as in everyday life as they create an opportunity for people to better understand each other, predicates about verbal communication (Arends, 1998);

- in order to explain concepts and phenomena, primary school pupils' thinking peculiarities (ontogenetic aspect) definitely require picturesque specific cases. The most advantageous way to reach an effect is practical children's activities.

Secondary natural science education, first of all, is very complicated for the teacher. It is concerned with teacher competence as well as with his/her motivation in terms of the interaction with nature. Far more relevant aspect is that teachers arrange activities from the position of the adult, i.e. they somehow 'obtrude' the opinion upon children.

Natural science education form is an intrinsic structure of the educational process. The forms of natural science education depend on various factors such as:

- the number of the pupils in the classroom/group;
- an environment/place of the educational process;
- the contingent of the pupils agreeably to the parameters of psychophysiology;
- the applied teaching technology;
- the balance between the teacher and schoolchildren's activities;
- a teacher's natural science and general didactic competence;
- the style of a training process organization, etc.

Modern didactics highly recommends to apply the methods that make the teacher and the pupil's activity more heightened and intense. The following methods could be recommended: netting, the volition-aversion method, interview, nine ribbed "diamond", mixed priority, free writing, the method *I know-I want to know-I have learnt*, the method of intensive specifying, "The book of natural complaints", the essays of variable length, etc. (Lamanauskas, 2001). Work in groups and work with projects become particularly relevant.

Integrated natural science education creates theoretic and practic conditions because (Lamanauskas, 2003):

- an integrated environment (*content, process, forms, activities, etc*.) helps pupils to properly aware that human being and nature is a concern for a number of scientists of different areas and that the concepts of the unity between nature and human being, the majesty of nature, the limitation of universal perception are further formulated;
- the combination of natural science integration with the knowledge (in a broad sense) of other areas (humanities, social, arts, etc.) creates conditions for pupils' socialization, makes their intrinsic world ecologic (*the issue of the ecologic worldview and ecologic consciousness formation*), inspires warm feelings of love, duty, respect and responsibility for nature (ecologic imperative);
- the forms of integrated natural science education (*classes, excursions, conferences, etc*.) produce the media for expressing scientific, creative, spiritual, aesthetic components. Every learner runs an opportunity to obtain interesting and useful information, to express creativity and initiative, to more precisely acknowledge the world.

Interdisciplinary integration does not satisfy the requests of regular classes, and therefore the teacher must look for distinct educational ways and methods. Interdisciplinary integration seems to be the best way to develop schoolchildren's thinking, astute observation, stimulate interest, emotions, self-expression, wish for learning, etc. The teacher must know the following algorithm of their activity:

- the decision has to be made in order to find out the kind of the applied model of integrated natural science education (interdisciplinary, internal integration, etc.);
- the main didactic consistent patterns are evaluated (the hierarchy of the elements of the educational system): **educational objectives** (*Why to teach? What to teach?*) → **educational content** (*What to teach?*) → **educational methods** (*How to teach?*) → **teaching aids /resources** (*What is used for teaching?*) → **educational forms** (*Where and when to teach?*) → **control and diagnostics** (*What are educational results?*) →

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key insights for the future and improvements (What do you want and able to do in the near future?);

- integrated natural science education curriculum is designed (it reflects the elements of the educational system). Scrupulous attention should be directed to content sampling. Content requires purposefulness (for example, *ecologic – environmental protection* and *value-based* orientation of content);
- the curriculum of integrated natural science education is implemented and corrections are made.

The integration of natural science education with other educational subjects should present pupils the knowledge of natural sciences as well as the material produced in the textbooks and workbooks that are linked with the current affairs of school, with the customs and traditions of the schoolchildren and their relatives of the inhabited locality. The closest natural objects such as the park, forest, lake, mound, etc. are not out of the way. Hereby, the learners are encouraged to show interest in an environment of their inhabited locality, are stimulated to know more and more, their thoughtful evaluation of nature is developed, etc. Integral natural science education requires a different approach to the educational process itself.

The following forms of natural science education can be applied in school:

- a class/lesson;
- educational/sightseeing excursion (regional, ethnographic, biology studies, etc.);
- home tasks;
- practice;
- field research practice (research work in nature creates a considerable opportunity for developing moral and psychophysical qualities: diligence, independence, humanism, the delight of knowledge, practical research knowledge is acquired, etc.);
- extracurricular/coextensive training (coteries, sections, clubs, etc.);
- projects (local, regional, national or even international level);
- centres of interest, etc.
- advice.

The success of natural science education determines a well organized educational process, properly produced didactic teaching/learning material as well as available teaching resources (stock).

One of the main problems in science education is visualization. Students usually have many problems understanding dynamic three-dimensional processes (Lamanauskas, Vilkonienė, 2008).

There are different strategies and methods for teaching science. Also there are many different ways in which science teachers can effectively teach students. The problem consists in that how to choose the most effective methods and strategy in each concrete situation. It is obvious, that the information itself is known as the *content*; how that content is shared in a classroom is dependent on the teaching methods. For example, lecture is a way of providing students with basic knowledge. On the other hand it is well known that lecture has the least impact on students as well as the lowest level of student involvement. It is not so good from point of view of constructivistic teaching. The one of the main points of constructivistic approach is to increase the level of impact and involvement for students. It is clear that reflective inquiry has the highest level of student involvement. On the other hand, reflective inquiry offers opportunities for students to use knowledge in a productive and meaningful way. It is important to notice that teachers should recognize from their practice that inquiry-oriented approach brings deeper understanding, better results of students and their higher motivation and interest to study science (Nezvalova, 2011). Different methods can be effectively used in science teaching: lecture, reading information, audio-visual presentation, demonstration, observation, field trips, interviewing, brainstorming, small group discussions, experimenting,

problem-solving activities etc.

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