ALEKSANDER HERD'S TEACHING LEGACY IN THE CONTEXT OF THE DEVELOPMENT OF MODERN NATURAL SCIENCES EDUCATION

M. M. Holovkova, A. A. Korobchenko, Y. I. Popeleshko
Melitopol Bogdan Khmelnitskiy Pedagogical University (Ukraine)

Abstract. A review of the pedagogical achievements of Aleksander Yakovlevich Herd (1841 – 1888) is presented. Aleksander Herd is the most talented pedagogue of the second half of the 19th century and one of the brightest figures in the history of school natural sciences. He worked out the system of teaching natural sciences at school, paying attention to its educational importance, and he connected the methods of teaching with the content of subjects. He was the first who criticized the dogmatic method of A. Luben, a German educator, and he was also the first of Russian educators who tried to introduce the idea of historical development of nature into the curricula and textbooks of Russia in the 19th century. Aleksander Herd advocated the use of the evolutionally biological direction in teaching natural sciences. He worked out the methods of teaching the course of inanimate nature for junior pupils.

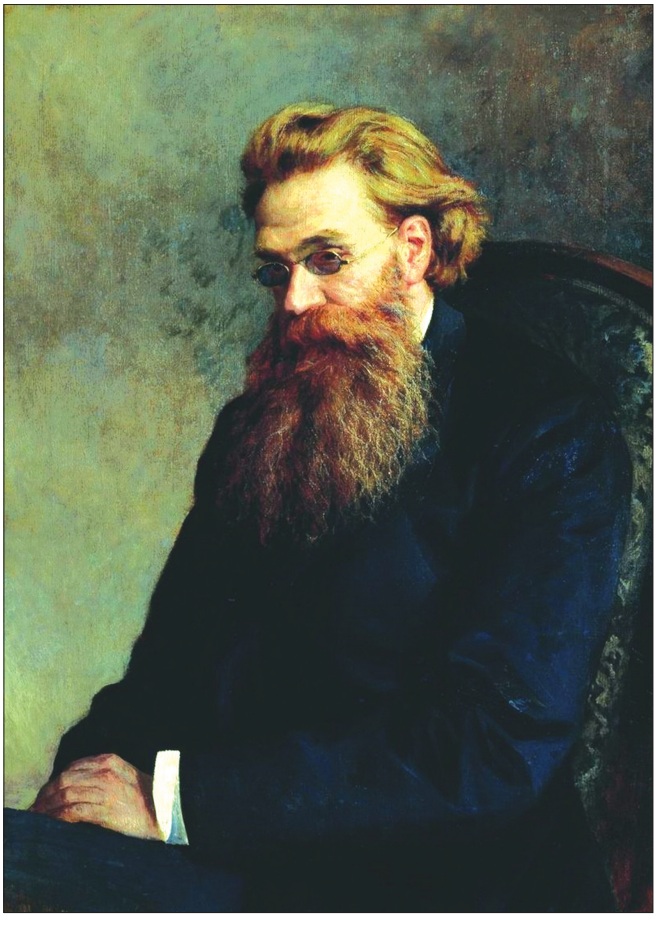
Keywords: A. Herd; natural sciences; methods of teaching school natural sciences

Introduction

Modern natural sciences education contributes to the creation of a whole idea of the scientific picture of the world, the realization of his place in the world by man as an integral part of nature, the social adaptation of young people to life in quickly changing conditions of the social and economic development. The analysis and consideration in the educational practice of historical and teaching experience in the field of organizing and reforming natural sciences education promotes the creation of the system of natural sciences training of young people, identical to modern international requirements, which takes the condition of scientific knowledge, the production development level and theory of teaching into account.

In this connection the teaching quest is activated, the interest in studying the history of school natural sciences education is increased. The experience of bringing up the mature man's attitude to nature, gained by previous generations, the formation of rational management of nature skills as well as the experience of giving the

environment knowledge should to a great extent conduce to rising the quality of modern school science education.



Aleksander Herd (artist: N. A. Yaroshenko)

The investigations of scientific conceptions of pedagogues of the past are carried out with the purpose of creative introducing their ideas into natural sciences education of children and young people. The scope of this research is the teaching legacy of Aleksander Herd (1841 – 1888), a famous Russian educator, the founder of methods of teaching natural sciences as a scientific subject and the methods of practical and laboratory activities as well as an author of textbooks and manuals of teaching natural sciences in primary and secondary school.

Short review of literature

According to the historical and pedagogical analysis of published works, the formation of methodics of teaching natural sciences remains up to now an inadequately studied sphere. Some issues of this problem in various aspects were the subject of the researches, carried out by I. Zverev, O. Kazakova, B. Raikov, M. Rykov, I. Suravehina, V. Fedorova, I. Shulha and others.

The authors of the articles about A. Herd were P. Veitberh, N. Denteln, M. Yermolin, R. Ohanov, A. Ostrohorskyi, O. Kazakova, N. Malko, M. Melnykov, L. Nikonov, F. Oleshkov, B. Raikov, D. Semenov, K. Yahodovskyi and others.

Instruments

For gaining the objective information in the studied problem the following methods were used: the searching-bibliographical and chronological method for the analysis of A. Herd's methodical aspects activity in the context of the historical epoch; the concrete-searching method for the quest and analysis of A. Herd's works, historical and pedagogical published works, the materials of modern investigations about A. Herd, the historic-structural method with the purpose of defining A. Herd's theoretical and practical activities, the interpretation and generalization of the worked up materials for formulating conclusions and recommendations in actualizing A. Herd's ideas.

Interpretation of the main material

Since the second half of the 19th century in school natural sciences the evolutionally biological materialistic direction, whose founder was considered to be in Russia A. Herd, originated. He was and Englishman's son who moved to Russia as a teacher of Belle-Lancaster schools. After graduating from the faculty of physics and mathematics in Saint Petersburg University he began his teaching activity in Vasylostrov Sunday school where he was one of the first teachers. A. Herd wrote his first textbook in mineralogy (Herd, 1884) for this school. After closing this school in 1865 A. Herd became a teacher of natural history in a military gymnasium. For 10 years he taught natural sciences in the woman college and Frebelev society college. In spring 1876 A. Herd was sent to England by the Military Ministry of Russia to the world teaching exhibition in Kenigston. From 1880 to 1833 he was an expert in the educational department at Saint Petersburg municipal college committee. A. Herd's scientific views were formed under the influence of the progressive natural sciences traditions of the 19th century, when in Europe, and after it in Russia, natural sciences entered the golden age period.

A. Herd considered natural sciences one of the main subjects not only in secondary but also in primary school. He gave proof of the system of studying nature in primary school – from the inorganic kingdom to plants, animals and man. The scientist suggested a new subject of science for primary school – "Inanimate

nature", which united knowledge of the earth, air, water and wrote the textbook "God's world" (Herd, 1883a) for the second and third form pupils for this course. The textbook considered of two parts – "The earth, air, water and "Plants, animals, man". The textbook of methodics "Subject lessons in primary school. Detailed instructions how to teach children using the book "God's world" (Herd, 1883b) was written for the first part of the book, that had for a long time been the main manual in the course of inanimate nature. He wrote "A textbook of geography" (Herd, 1877a) and "A textbook of zoology. For secondary schools and self-education" (Herd, 1877b). His books were a progressive phenomenon in methodics of teaching these disciplines in the second half of the 19th century.

His scientific works were republished many times. Thus, "A textbook of mineralogy for town schools" (Herd, 1884) was reissued 6 times, "A handbook in mineralogy for real schools" went through 5 editions, "A determination of minerals" – 3 editions. Under the editorship of Aleksander Herd the botanical part of "Origin of species" by Charles Darwin (1867 – 1868) and the second part of "Bases of biology" by H. Spencer were published. His scientifically popular lectures for population were great success.

Aleksander Herd improved the content and structure of the course of school natural sciences. The pedagogue endeavoured to build the course on the evolutional basis, to study the variety of plants and animals in the rising order – from low-organized to high-organized forms, to reveal the fitness of organisms to their habitat, to establish interconnections between the structure and functions of an organism. He stressed that "a pupil must understand the complete dependence of a plant on light, heat, soil, moisture and air. He (a pupil) must know how diverse animals are and how splendid they adapt themselves to the environment conditions. He must understand the connection between the animal and plant kingdoms. Finally, he must know the structure and life of the human body and become aware of the connection of man with nature surrounding him" (Herd, 1883a).

In determining the succession of studying animate nature Aleksander Herd proceeded from the fact that every theme should base itself on the previous one, that the evolutional idea should penetrate and unite all the content. He elaborated a general curriculum of the structure of the natural sciences course for seven-year school and determined the following order of studying the material: the second and third years – the inorganic kingdom, the fourth year – the plan t kingdom, the fifth – the animal kingdom, the sixth – man, the seventh – the history of the Earth. In the 7th form together with the issues of animate nature the organic kingdom evolution, the history of the development of the plant and animal kingdoms, Lamarck's and Darwin's theories were suggested for studying. The definite sequence in the arrangement of subjects was not a casual but a deeply considered demand for A. Herd.

The most essential is the fact that in suggested system of school natural sciences a new section was foreseen – the propaedeutic course of "The inorganic king-

dom", being brought to the foreground. A. Herd saw the educational significance of the course in promoting the mental development of pupils and accumulating the preliminary knowledge, necessary for understanding botany and zoology. It was foreseen that pupils not merely acquaint themselves with the most important bodies and phenomena of nature, but the interaction with the examples of the earth's crust are explained to them. By introducing this discipline, the author intended "… to rouse children's interest min their surrounding as well as to aid their development of independence and power of observation" (Herd, 1953). Suggesting studying the course of inorganic kingdom before studying plants and animals, A. Herd took the peculiarities of junior pupil's mentality into consideration. Junior age children, in the scientist's opinion, have a small stock of concrete notions of things and phenomena of nature, it is beyond their strength to understand complex physiological phenomena and reasons, causing them. Therefore, schoolchildren should better master the course, in which things are studied more than phenomena. According to the developed curriculum, in the 2nd and 3rd forms it was supposed to study the inorganic kingdom of nature in the scheme "earth-air-water" as subject lessons, whose task consisted in the following: (i) children's acquaintance with the structure of the Earth and its envelopes – the air one and the water one, – as far as it is necessary for studying organic bodies; (ii) the awakening of children's interest in their surroundings as well as their development of independence and power of observation" (Herd, 1883b).

According to A. Herd, the choice of the material in the suggested course is also determined by the formation of the integral knowledge of nature. The geographical knowledge of the distribution of land and water on the globe's surface is stated in the complex with studying the physical and chemical properties of water and air as bodies of nature; in the connection with the geological structure of the Earth, the problems of soil's origin and conditions, favourable to its fertility, are considered.

For the successful organization of teaching natural sciences A. Herd stipulated the following forms of activity: excursions, where pupils make themselves familiar with nature; experiments, demonstrating processes, taking place in nature; practical work at school and practical tasks, offered for doing at home; the demonstration of visual aids in studying the course (various collections); pupil's independent observations on living objects; discussions with children and their work with a book.

Aleksander Herd considered excursions an important form of teaching natural sciences. The famous slogan "Teaching natural sciences must as far as possible begin in a garden, in a forest, in a field, on a marsh" became a motto for the progressive part of teachers for many years in the pre-revolutionary and post-revolutionary times (Herd, 1866). In his article "On natural historical excursions" A. Herd insistently developed the idea that children should constantly be acquainted with nature in nature itself. He gives a number of methodical instructions to conducting excursions. He points out that a teacher must not keep to a narrow subject matter on an

excursion, he should further the fact that the material of an excursion must promote children's general development. A teacher should not distract children from issues of other fields of knowledge, in which they are interested, but, on the contrary, he must encourage such issues. Excursions should show children that everything in nature is interconnected, and they should do their scientific world outlook (Herd, 1866a). In his book "Subject lessons" A. Herd recommends conducting excursions after finishing every part of the course.

In studying natural sciences Aleksandr Herd suggested carrying out observations and experiments of plants and animals, considering that independent gaining of knowledge promotes the development of child's cognitive activity, that nature should be explained and not described. He made up lists of scientific and popular published works and made out recommendations in books, read by children. The experiments and observations, recommended by him, also required the organization of out—of-class and out-of-lesson activities. Thus, in the second half of the 19th century, when lessons of natural sciences usually were not accompanied even by demonstrations, A. Herd worked out a system on other principles. He did not manage to work many of his instructions out in detail and gave them in the form of schematic outlines.

Besides experiments, A. Herd recommended doing practical homework by children themselves. He stressed the necessity of such studies in his books "Subject lessons" and "Lessons of mineralogy". These practical activities should contribute to the development of pupils' "consciousness" and the rise of their cognitive activity. In addition, A. Herd attached great importance to working with determinants, because it accustoms pupils to independence. Independent observations of living objects must be carried out both on plants and on animals in the process of their development and growth.

For the successful conducting lessons in natural sciences A. Herd considered it necessary to use demonstrations together with experiments. Since all the course of natural sciences should be based on visual teaching methods, he advised a teacher to have at his disposal diverse herbarium specimens of plants, collections of minerals and other varied collections. Accidentally chosen samples must not be in collections.

In studying natural sciences Aleksandr Herd recommended conducting various talks with pupils, holding reading entertaining articles and books for them. These talks should preferably be accompanied by demonstrations which increase interest in the subject itself. In his textbook the pedagogue put short stories that were the material for class discussions and homereading. In his works he stressed attention to educational potential of a book.

A. Herd comes to a conclusion that in teaching school natural sciences three various methods can be used: the deductive method, built on the ready classification and directed the theory mainly to mastering this classification; the inductive meth-

od by A. Luben and the deductive method by E. Rossmesler. In A. Herd's opinion, none of them satisfies completely requirements of pedagogy: "Both methods give children quite a passive role, developing in them neither the power of observation nor independence, and they do not bring them closer to nature".

A. Herod's demands upon teachers are still topical: (1) A teacher must beforehand think over the content of the course and bring it into line with the number of lessons, given for the subject. Besides, the content of studied information must promote the formation of pupils' cognitive interest. A teacher must follow the fact that working at the lesson should be within pupils' powers and varied, and teaching should take place in the form of vivid talk; (2) A teacher should the day before compose an abstract of a lesson, carefully thinking over methods and ways of teaching the school material distinctly, clearly, logically and plainly for every pupil. A. Herd was an opponent of cramming; (3) For conducting subject lessons, a teacher must use various collections and different kinds of equipment; (4) Teachers must constantly master their qualification, improve their knowledge, seriously prepare for their lessons.

Conclusions

Aleksander Herd laid the beginning of scientific methodics of natural sciences with his scientific works, though he did not write a course of general methodics. His works give a vast material for constructing a strictly considered methodical system, based on Darwin, materialistic idea, taking, in addition, the connection of organisms with the environment into account. The scientist supplemented the system of natural sciences knowledge, that was at its time worked out by V. Zuiev (inanimate nature, botany, zoology), completed it and, for the first time, scientifically gave proof of it. In building the school course of natural sciences A. Herd suggested the following division of subjects in the school curriculum: the inorganic kingdom; the plant kingdom; the animal kingdom; man; the history of the Earth. In the first form he suggested introducing a short course on the human body structure and life.

Unfortunately, A. Herd's ideas were not widely practised in schools in the second half of the 19th century. In teaching the verbal method was mainly used, and in the content, knowledge on systematics prevailed as usual. The content and structure of his course contradicted the descriptive and systematic direction, dominant in science and education; that is why his manual was used only in private educational establishments and in some gymnasiums.

In his methodical works Aleksander Herd propagated the following teaching ideas: creating conditions which should ensure activity and independence of a child at practical lessons and on excursions; bringing school closer to living nature; using the research approach to studying nature; forming pupil's evolutionary world view; using the complex approach to studying nature in primary education.

A. Herd's principal ideas in the sphere of methodics of teaching natural sciences in primary and secondary schools remain perfectly in harmony with modern tasks and needs in the field of education.

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✉ **Prof. Angelina Anatoliivna Korobchenko**
(corresponding author)
Department of Pedagogy & Pedagogical Skills
Melitopol Bogdan Khmelnitskiy Pedagogical University
20, Lenin St.
72312 Melitopol, Ukraine
E-mail: angelina-korobchenko@mail.ru