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DEVELOPMENT OF THE NATURAL SCIENCE CYCLE OF DISCIPLINES IN MODERN EDUCATION BASED ON THE IDEAS OF THE RUSSIAN SILVER AGE PEDAGOGUES

DESARROLLO DEL CICLO DE DISCIPLINAS DE CIENCIAS NATURALES EN LA EDUCACIÓN MODERNA BASADO EN LAS IDEAS DE LOS PEDAGOGOS RUSOS DE LA EDAD DE PLATA

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ABSTRACT

The purpose of the study is to examine the specific pedagogical approaches that emerged during the 19th and early 20th centuries, shedding light on their relevance to modern education. Employing cultural-personal and historical approaches as the methodological framework, the article draws upon an array of scientific treatises and educational materials as primary source material. The research places the spotlight on pedagogues such as K.D. Ushinsky, V.F. Belinsky, A.I. Herzen, V.I. Vodovozov, and N.F. Bunakov among others. These researchers advocated for the inclusion of natural sciences in educational programs, advancing teaching approaches centered on the student, active student involvement, and the encouragement of curiosity instead of rote memorization. These innovative pedagogical methods laid the foundation for contemporary teaching practices, contributing significantly to the growth of natural science disciplines. By emphasizing learner-centric pedagogy, proactive engagement, and the cultivation of curiosity over rote memorization, these authors created a basis for more effective and meaningful teaching methods.

Keywords:

Pedagogical Experience, Teaching Methods, Educational Museum, Upbringing Methods.

RESUMEN

El propósito del estudio es examinar los enfoques pedagógicos específicos que surgieron durante el siglo XIX y principios del XX, arrojando luz sobre su relevancia para la educación moderna. Empleando enfoques culturales, personales e históricos como marco metodológico, el artículo se basa en una variedad de tratados científicos y materiales educativos como fuente primaria. La investigación pone el foco en pedagogos como K.D. Ushinsky, V.F. Belinsky, A.I. Herzen, V.I. Vodovozov y N.F. Bunakov, entre otros. Estos investigadores abogaron por la inclusión de las ciencias naturales en los programas educativos, promoviendo enfoques de enseñanza centrados en el estudiante, su participación activa y el fomento de la curiosidad en lugar de la memorización. Estos métodos pedagógicos innovadores sentaron las bases de las prácticas de enseñanza contemporáneas y contribuyeron significativamente al crecimiento de las disciplinas de las ciencias naturales. Al enfatizar la pedagogía centrada en el alumno, el compromiso proactivo y el cultivo de la curiosidad sobre la memorización, estos autores crearon una base para métodos de enseñanza más efectivos y significativos.

Palabras clave:

Experiencia pedagógica, métodos de enseñanza, museo educativo, métodos de crianza.

INTRODUCTION

At times, historical experience plays a considerable part in development processes. This experience can be conditionally distinguished into three groups. The first group comprises experience that retains its relevance under any conditions and in any historical period. The second group refers to historical experience relevant only under specific conditions and factors. Finally, the experience of the third type is relevant only during a specific period in history and becomes obsolete and undemanded in society as it ends. Pedagogical experience accumulated over many centuries is also subjected to this classification of historical experience.

The Russian education system is comprised of interacting and successive educational programs, state educational standards of varying levels and orientations, a network of educational institutions of different organizational and legal forms, types, and varieties, and a system of education authorities. It is an integral part of Russian society as one of its main social institutions. On the one hand, the socio-economic level of the country's development, its political system, and cultural, historical, and national characteristics determine the nature of the education system. On the other hand, the education system itself affects the development of society and contributes to socio-economic changes in the given historical period (Otrokov et al., 2023). At present, the innovativeness of the pedagogical process and its theoretical and methodological basis shape the nature of the reformation of the contemporary education system of Russia (Semenkova, 2023).

In our view, the pedagogical experience of the 19th and early 20th centuries is underestimated in pedagogical science. This period in history was extremely rich in political events and economic decisions stemming from them. All these changes could not but demand radical changes in education, the modernization of all educational institutions, the creation of new stages and directions of education, the development of public elementary schools, secondary specialized and pedagogical education, and the system of continuous education. As an outcome, a multitude of scientific works were published at that time that enriched the theory and practice of education and made a substantial contribution to Russian pedagogics. Solovkov (2000), refers to this period as the Silver Age of Russian pedagogical science. This experience remains relevant to this day, giving us the opportunity to examine trends in education through the lens of historical theories and practices. The purpose of this study is to define the specifics of pedagogical experience accumulated over the so-called silver age in the development of Russian pedagogical science.

METHODOLOGY

We believe that the complicated process of incorporation of natural sciences in the educational process can be evaluated by means of cultural-personal and historical approaches. Investigation and summarization of pedagogical experience were carried out through the general scientific methods of logic, comparison, and analysis with historicism and objectivity as the chief principles.

Scientific and pedagogical treatises and textbooks served as information sources. The utilized sources cover the essence of teaching methods, the forms of information presentation, and the features of visualizing information in natural sciences.

DEVELOPMENT

Notable pedagogues that made a profound contribution to the development of pedagogical science of the 19th and 20th centuries include V.F. Odoevsky, K.D. Ushinsky, V.F. Belinsky, D.D. Semenov, A.I. Herzen, V.I. Vodovozov, N.A. Korf, N.F. Bunakov, L.N. Modzalevsky, V.P. Vakhterov, K. Elnitsky, and P.F. Kapterev, to name a few. The views of these educators generally coincided. All of them to some degree supported Ushinsky's idea of nationality and the transition from the letter method to the sound method in teaching reading. They did not seek to cover all the topical pedagogical problems of the time, trying instead to focus on a few issues and make their own input to pedagogical science. This describes the value of the views of each of these scholars. The period in question was the time when the education system began to emphasize natural science disciplines.

A distinctive contribution to the development of Russian pedagogy was made by Ushinsky. He not only laid the foundations for the development of pedagogical science in Russia but also advocated in every possible way for the need for children to study natural sciences. Thus, Ushinsky paved the way for the development of this block of disciplines and shaped the basis of Russian engineering education.

Ushinsky was the flagship of Russian pedagogical science in the 19th century but even now his views have not lost their relevance. Ushinsky argued that a teacher should be not only a teacher but also an upbringer. In the 1990s, education in Russia was converted into the sphere of services, and upbringing was taken out of the responsibility of educational institutions and fully entrusted to the family, while parents at times lacked the knowledge and time to fully engage in the upbringing of the younger generation. In 2021, to strengthen the "upbringing component in educational, methodological, and extracurricular" (Pobeda, 2020) activities, Russia launched the implementation of

the federal project "Patriotic Upbringing of Citizens of the Russian Federation" as part of the national project "Education". As a result, upbringing is now being purposefully returned to educational institutions. In addition, Ushinsky encouraged teachers to love their profession, so that the issue of people ending up in the pedagogical profession by accident would be resolved. His anthropological principle of teacher training is still implemented in educational institutions. The realization of the principle of nationality in education assumed not only teaching in the native language but also accounting in the teaching process for the features of historical development and geographical and natural conditions of life of the people. This, according to the pedagogue, should contribute to the development of children's "patriotism and deep love for the Motherland". The realization of the principle of nationality was inconceivable to Ushinsky without the native language. As Ushinsky (1948), noted in the article "Native Word", *"language is the most alive, the most abundant and strong connection, linking the outmoded, living, and future generations of the people in one great, historical living whole. It not only expresses the vitality of the people, but is the very life itself. When the language of the people disappears, the people is no more!"*(p. 557). Furthermore, the educator put an emphasis on the realization of the principle of visuality in the pedagogical process, as he believed that it was visuality that provided children with "full-fledged knowledge and developed their logical thinking". Ushinsky (1948), also urged educators to depart from formality in the teaching process and turn to a comprehensive familiarization with academic subjects and the establishment of real connections between them. Furthermore, the pedagogue was not only a supporter of the study of grammar and arithmetic, but also advocated the need for children to learn natural sciences, which, in his opinion, *"develop the ability to observe life, interest children..., promote the development of logical thinking, and are of great practical importance".* (p. 144)

One of the most prominent contributions of Odoevsky to the development of natural sciences lies in his educational manuals, using which children were not only taught literacy, but also familiarized with basic information on natural science, geography, history, and the surrounding reality.

Belinsky, giving the lead role in the educational process to the humanities, also attached great importance to the study of natural sciences. Belinsky believed these sciences to be interesting for children, as they encounter nature at every turn. He insisted on cultivating children's interests, considering their age features and individual aptitudes. Standing against the mechanical rote learning of material, he strongly supported the use of conscious persuasion in the pedagogical process when studying scientific concepts. Later, Belinsky's views on the necessity of children's early study of the natural environment were supported by Ushinsky.

Herzen also upheld the necessity of studying natural sciences, as he believed them to have tremendous educational potential.

Vodovozov called for the wide use of the "real" or practical method in the study of natural science disciplines, which would be based on "free research, strict consistency in the consideration of the material, and inductive methods of analysis". Among the natural science disciplines, he listed physics, chemistry, economic architecture, physiology, elementary technology, and earth science. Vodovozov also assigned a special role to the rural school, as in its development he saw the economic and social revival of the Russian countryside (Popov & Semenchukova, 2023).

Bunakov consistently asserted the ideas of the public school, universal free primary education. In addition to reading, writing, arithmetic, singing, and drawing, he proposed to include elements of natural history, history, and geography in the school program.

Semyonov paid much attention to teaching Russian language and literature. However, this did not stop him from writing a chrestomathy, a textbook, and a methodological guide on geography, as well as several articles on topics related to geography as an academic subject.

Korf was another advocate of learning the native language. However, he also argued for the need to incorporate knowledge of history, geography, physics, and natural history into the teaching process. He considered observation of objects and phenomena of the surrounding world as the leading method of teaching.

Sevruk (1902), and the Soviet researcher Raikov (1947), were among the first researchers in the early 20th century to study the methodology of teaching the elementary course of natural science. The works of I.A. Solovkov, D.I. Tritak, and E.N. Arbuzov, who represent different scientific directions, are also devoted to the study of the pedagogical experience of the late 19th and early 20th centuries. The study of any pedagogical experience must necessarily be correlated with the historical stage in the development of pedagogical science in which it was acquired and practiced. Turning to the works of outstanding Russian scientists and teachers of the 19th to early 20th centuries in the field of natural science, we should clarify that the pedagogical experience of this period is represented by pedagogical practice that gave high sustainable results, contained elements of creative search and innovation,

and, having solidified in the work of teachers, became a classic.

The first half of the 19th century is distinguished by the presentation of natural science knowledge without any methodological association with learners' age characteristics (Goncharenko, 2011). At home, students mechanically learned text from their textbooks, which the teacher would later ask about in class. School textbooks on natural history had practically no differences from university textbooks (Verzilin & Korsunskaia, 1976), although as early as in the late 18th-century academician V.F. Zuev wrote a textbook "Inscription of natural history" (1776) (Zuev, 1807) and disclosed in it his own method of teaching natural science (Verzilin & Korsunskaia, 1976). The textbook covered not only the then-prevailing morphology and systematics but also elements of such emerging sciences as physiology, biogeography, anthropology, and ecology (Ponomareva, 2006). The main methodological techniques noted by Zuev in teaching natural history include:

1. Conversation rather than narration by the teacher.
2. Using natural objects in the teaching process, not just pictures and drawings of them.
3. Creating natural history classrooms with an emphasis on the works of local nature.
4. Increasing the amount of independent practical work in the classroom. In this respect, Zuev (1807), recommended using independent practical tasks with natural objects when studying natural history: "so that they [learners] in this way get accustomed to the actual recognition of things and their division into genera" or, when "learning natural history in this way", to hand out geographical maps to pupils "on which they should find those places where the objects of natural history are born and located". (p. 68)
5. Increasing the volume of students' homework.
6. Realizing the continuity of education, since, according to Zuev (1807), "all teachers and all subjects are in essence different links of the same chain". (p. 101)
7. Systematic presentation and scientificity, as the educational material should be arranged in a methodically and logically thought-out sequence, i.e., the presentation should be "built in an evolutionary manner, with the gradual complication of information about the life of nature, its development from simple to complex".

V.I. Dahl contributed to the further study and development of Zuev's pedagogical heritage. Selecting educational material with due regard for the audience and providing its pedagogical processing, he strived to ensure that the educational text educates and makes the learner think (Traitak, 2002).

In the second half of the 19th century, a particular popularity in Russia was gained by the metaphysical direction of the German naturalist-teacher, methodologist, and author of the first method of natural science A.-H. Luben, who in some respects repeated the ideas of Zuev. Luben proposed using handout materials for observation and beginning the study of a subject from studying the Motherland and locality and only then turning to the nature of other countries. In this, Luben paid particular attention to what is the most accessible to children and strongly emphasized the educational and upbringing importance of the subject.

Owing to Beketov and his proponents, natural science textbooks became widely used in schools in the 1860s, and there emerged a new direction in teaching natural science. A.Y. Gerd, the founder of evolutionary-materialistic direction in school teaching, also contributed to the methodological bank of natural science. A.Y. Gerd gave first place to teaching methods that fostered independent thinking, observation, and cognitive interest and, consequently, the formation of a materialistic outlook (Arbuzova, 2008). Gerd's methodological ideas were further elaborated in the work of L.S. Sevruk (1902), who asserted the necessity of combining language imagery with visualization because this connection contributes to the activation of thinking activity. In these years Ushinsky (1948), also described nature as one of the most powerful means of human education along with history: *"in the broadest sense of these vast concepts" and the study of natural history as "the most convenient for accustoming children's minds to logicality".* (p. 118)

The advanced pedagogical experience developed in the 19th and early 20th centuries was characterized by novelty, matched the modern achievements of didactics, had sustainable positive results, as well as contributed to the optimal expenditure of energy and resources of teachers and students.

Along with these outstanding educators, there were teachers and professors in Russian regions who developed their ideas and brought their experience and observations to the conceptual pedagogical thought, which made it possible to create specific methodological techniques of teaching and upbringing. This circumstance was emphasized in the works of pedagogical scientists of the 19th century. One of the so-called regional pedagogues who absorbed the best of the legacy of scientists of that time were the teachers at the Alexander Real School under the leadership of I.Y. Slovtsov, a famous teacher and encyclopedist scientist of Western Siberia (Zvonareva & Mazurak, 2009).

According to the memoirs of I.V. Pavlov, Slovtsov taught natural history so engagingly that he aroused an unprecedented interest in it among the students: "***Loving his subject with all his heart, he instilled this love in each of us... under his guidance we recognized plants, collected insects, observed the life of birds, found nests, gathered collections of eggs"*** (Wiebe, 2020, p. 79). Slovtsov recognized that it was impossible to teach natural history without practical experience and observations. For this reason, Zuev's method of teaching biology with biological and ecological illumination of the young generation was supplemented with archeological, ethnographic, and paleontological enlightenment.

CONCLUSIONS

The pedagogical innovators of the 19th and early 20th centuries made significant strides in shaping the pedagogical landscape of their time, particularly in natural science education. Their collective efforts were marked by several key principles that remain relevant in contemporary education:

Interdisciplinary approach. These educators advocated an interdisciplinary approach that integrated biological, geographical, archaeological, ethnographic, and paleontological knowledge. This approach promoted holistic thinking and emphasized the interconnectedness of nature and humanity;

Student-centered learning. The educators supported the active participation of students in the learning process, encouraging independent work, scientific research, and creative problem-solving. This, in turn, promoted scientific inquiry and creative problem-solving;

Visual and experiential learning. The didactic principle of clarity was adopted, with an emphasis on visual aids and practical experience;

Individualized learning. Recognizing the diverse needs and characteristics of students, these teachers adapted their teaching methods to different learning styles and ages;

Collaborative learning: extensive use of group work in the learning process, combined with interactive methods (discussion, concept network, concept field);

Continuous learning, which includes the interconnection of all disciplines taught.

The pedagogues followed the key pedagogical postulates that presupposed the introduction of new teaching methods and consisted in the development of students' mental abilities and instilling in them the skills of independent work, as well as the realization of such principles of learning as meaningfulness, activity, and visualization. Thus, they used a wide range of methods of student upbringing, as well as implemented the focus on autonomy in the learning process and active cognitive activity. These educators widely used the system-activity approach, which was little in demand in pedagogical activity at that time and was not just ahead of its day but even then created conditions for the formation of a developed personality.

In conclusion, the pedagogical methodologies that appeared by 19th and early 20th-century educators in the realm of natural science education have left a profound and lasting impact on modern pedagogy.

REFERENCES

Arbuzova, E. N. (2008). Genesis of educational publications on the methodology of teaching biology: A monograph. Publishing House of Omsk State Pedagogical University.

Goncharenko, O. N. (2011). Establishment of the Soviet intelligentsia in the Trans-Urals (1917-1941). Publishing house of Federal State Educational Institution of Higher Professional Education "Tyumen State Agricultural Academy".

Otrokov, O., Kovalenko, A., Stepanova, G., Gayazova, S., Sergin, A., & Shelygov, A. (2023). Role of education and politics in the formation of a public socio-educational space of human self-expression. Revista Conrado, 19(92), 485-490.

Pobeda. R. F. (2020). The new year will start with patriotism. https://pobedarf.ru/2020/11/22/39046845ya/

Ponomareva, I. N. (2006). 220-year anniversary of Russia's first natural history textbook: Origins of environmental education. Pedagogicheskii vestnik, 32, 6-9.

Popov, A., & Semenchukova, A. (2023). Impact of the development of higher education on the architectural and planning features of ussr universities (1970-1980). Revista Conrado, 19(92), 313-317.

Raikov, B. E. (1947). Sketches of the history of heliocentric worldview in Russia. From the past of Russian natural science. Publishing house of the USSR Academy of Sciences.

Semenkova, S. N. (2023). Traditional forms of educational process in the Alexander Real School. AIC: Innovative Technologies Journal, 2, 67-72.

Sevruk, L. S. (1902). Methodology of the elementary natural science course.

Solovkov, I. A. (2000). P.F. Kapterev – a prominent pedagogue of late 19th – early 20th centuries. Nachal'naya shkola, 1, 88-94.

Traitak, D. I. (2002). Problems of the methods of teaching biology: Works of the full members of the International Academy of Pedagogical Education. Mnemozina.

Ushinsky, K. D. (1948). Man as an object of education. The experience of educational anthropology: Part physiological. Collected works. Vol. 2. Publishing house of the Academy of Pedagogical Sciences.

Verzilin, N. M., & Korsunskaia, V. M. (1976). General methodology of teaching biology: Textbook for students of biology faculty of pedagogical institutes. Prosveshchenie.

Wiebe, P. P. (2020). Ivan Iakovlevich Slovtsov. In, V. Omsk, v publikatsiiakh XVIII – nachala XX vv. Series Antologiia omskogo kraevedeniia. (pp. 79-82). Omsk State Museum of History and Local Lore.

Zuev, V. F. (1807). Inscription of natural history, published for public schools of the Russian Empire by the highest command of the reigning Empress Catherine the Great. Tipografiya Breytkopfa.

Zvonareva, L. V., & Mazurak, N. S. (2009). From real school to academy. 1879-1959-2009. Tyumen State Agricultural Academy.