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Pedagogical hygienic expertise of innovative strategies in modern school

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***Abstract*—The article deals with the problem of hygienic expertise of school educational technologies in the context of innovation policy. The contradictions arising between the imperatives and priorities of secondary schools and the hygiene of the educational space, as conditions for the preservation of the mental, physical health of schoolchildren are characterized. Informal but cultivated values in the school space include normativity (given norm, standard compliance), controllability (discipline, diligence) and homogeneity (uniformity, sameness). They ultimately lead to the emergence of such negative psychological qualities among schoolchildren as indecision, uncertainty about their own abilities, lack of independence and initiative, immaturity. In the modern school education space the physical health of children is also impaired. The article analyzes the main causes of the deterioration of schoolchildren health during education and training. The results of studies show that the absolute majority of children get various diseases, including those of a chronic nature. The conclusion is made about the need for hygienic expertise for innovative educational technologies used in modern schools.**

Keywords—hygienic expertise, innovative educational technologies, educational organization.

I. INTRODUCTION

The effectiveness and quality of modern national education are traditionally evaluated according to criteria such as the level of students' progress, their success in mastering the knowledge and skills in the disciplines included in the curriculum of educational institutions and the degree of graduates' socialization. According to the Russian psychologist A. M. Lobok, "traditional educational expertise is mainly focused on finding out how effectively a teacher can cope with various educational tasks and how, ultimately, the student is prepared to the performance of functional duties" [1].

At the same time, assessing the quality of educational activities of pedagogical technologies, traditional educational expertise leaves the problems of preserving the physical and mental health of a student, the possibility of becoming a fully functioning personality beyond the scope of its research.

The physical and mental health of modern schoolchildren is of a great concern and shows a tendency towards a steady decline.

V.F. Bazarny, A.A. Medvedeva, A. M. Prikhozhan noted that by the end of the first grade 60–70% of children have various mental disorders; 80% of students complain of chronic fatigue, and doctors note that one out of four children have negative changes in the cardiovascular system [2, 3, 4].

According to Z.I. Kekelidze, the director of Serbsky Federal Psychiatry and Narcology Medical Centre, 70–80% of modern schoolchildren have mental disorders and developmental abnormalities, and 40% of them have school disadaptation [5].

By the end of the 8th grade, diseases of eyes are five times more likely detected than in elementary school; gastrointestinal diseases - four times; diseases of the nervous system - twelve times. By the end of school 85% of schoolchildren are diagnosed with diseases of the musculoskeletal system, posture disorders, scoliosis, osteochondrosis, various symptoms of motor neurosis, immunodeficiency - 90%, diseases of the endocrine system of varying severity - 75% [2, 6].

According to Federal Service for Supervision of Consumers Protection for 2017, the share of absolutely healthy children in our country does not exceed 10-12%, more than 50% of 7-9-year-old schoolchildren and 60% of senior students have chronic diseases. The frequency of functional disorders has increased over the last ten years by

one and a half times, and chronic diseases - by two.

Among the main factors [7] leading to the deterioration of the schoolchildren health are traditionally distinguished as environmental, social, educational, etc.

Without denying the importance of such factors as the ecological environment (quality of air, water, food; noise and radioactive contamination), social environment (level of social well-being and psychological comfort of a family, living conditions of a child, sleep schedule and nutrition), we should note that the most interconnected with the child's school life factor is the educational environment (increasing information flow, overstress and overwork, didactic enforcement, immobility in a learning process).

Thus, there is a need to study the "ecology" of modern educational technologies. Such a study can be carried out with the help of hygienic expertise. Its essence is to establish the nature and extent of the influence of classes on the mental and physical state of students and to assess the conditions conducive to the preservation of their health [9].

Additionally, hygienic expertise involves the study of modern pedagogical technologies for the presence of expansion and the forced "formation" of the student's personality methods. They are associated with invasion of unconscious human spheres affecting the range of sub-sensory perception with information capture bypassing consciousness.

II. Materials and Methods

The problem of the limitations of the subject methodology being under attention of the late XIX - early XX centuries philosophers and researchers (V.I. Vernadsky, V.M. Bekhterev, A.A. Ukhtomsky, A.A. Bogdanov, B.F. Porshnev, Y.V. Knorozov, E. Durkheim, M. Weber, W. Dilthey and others) led to the recognition of disciplinary distinction unproductiveness in science. Analysis of the existing forms of interdisciplinary cooperation revealed the potential and limitations of the interaction of socio-humanitarian and natural sciences. It’s about the humanization of natural science knowledge, and on the other hand, the penetration of natural sciences into social and humanitarian knowledge (M.M. Bakhtin). The interaction of the humanities and the natural sciences is noticeable in the application of the ideas of synergies in sociological, pedagogical, and historical researches (I. Prigozhin, L.I. Novikova, E.A. Dolgova, G.G. Ershova, and others).

The study methodology of innovative pedagogical technologies in hygienic assessment is based on a set of ideas related to the scientific rationality development of non-classical science (V.S. Stiopin, K. Hucker, D. Shapir). First, this is the scientific concept of sciences convergence (R. Gere, F. Kitcher, N. Kertreit, L. Laudan, W. Newton-Smith), which postulates integration, differentiation, mathematization, industrialization, informatization of research processes.

The synergetic approach (I. Prigozhin) as a strategic task sets the knowledge of general principles underlying the processes of self-organization in systems of the most diverse nature, including social systems. The concept of hermeneutics (G. Gadamer, E. Husserl, P. Ricoeur, M. Heidegger, F. Schleiermacher) turns out to be useful in terms of dialogical and binary provisions of the humanities method, the phenomenon of interpretation in social and humanitarian knowledge, human and social cognition using language structures.

In the context of the research methodology, the ideas of “soft” scientific activity regulation (T. Kuhn), the scientific knowledge direction (K. Popper), the scientific activity polytheoretical character, (I. Lakatos), and theoretical knowledge methodological pluralism (P. Feierabend) are actualized. The methodological impulse of the study is a normative-interpretative approach to scientific knowledge (M. V. Romm, T. A. Romm, and others), leading to the rejection of universalist claims to impose any science standards and the study of current, concrete-situational parameters of rationality in scientific activities.

Thus, accessing these methodological foundations made it possible to reason an approach taking into account the development trends of modern science, going beyond the traditional disciplinary perspective and concentrating around specific problems and allowing the resource combination of various disciplines, focusing their heuristic potential on joint solving of urgent problems.

III. Results and Discussion

The study showed that the intensity of studying work is higher if children are enrolled in enriching education programs. As can be seen from Table I, intellectual loads with the enriching education technology (amounted to 2.9 points (group 1), which is close to the 3rd class of studying work stress through the use of heuristic activities. They are aimed at projects developing, solution algorithms, non-standard approaches and projects. In group 2, intellectual loads were determined by performing simple tasks according to the instructions, processing, performing the task and checking. It made up the 2nd class of studying work stress (2.2 points) ($p < 0.05$).

TABLE I. Studying work stress

Indicator, points	Enriching education program (M±m)	Standard education program (M±m)
Intellectual loads	2.9±0.16	2.2±0.09[a]
Sensory loads	1.8±0.04	1.5±0.04 [a]
Emotional stress	1.2±0.11	1.0±0.01 [a]
Loads monotony	2.1±0.07	2.0±0.11
Work intensity	1.8±0.06	1.7±0.03

[a.] Statistically, values are significantly different ($p<0.05$)

Sensory loads were mainly determined by the duration of concentration time, the type and number of training tools used during a lesson, the observation time of video terminal monitors. In the group of enriching education, sensory loads amounted to 1.8 points and were close to the 2d class of studying work intensity, and in the 2d group, they were 1.5 points ($p < 0.05$).

In enriching education emotional stress was higher due to the significance of the assessment for the student and amounted to 1.2 points in group 1 and 1.0 points in group 2. In both groups of the study, the indicator of emotional stress corresponded to class 1 of the intensity of studying work, however, when comparing, it was statistically different ($p<0.05$).

The obtained data on the intensity of studying work allowed us to correlate the indicators of the intensity and the results of the neuropsychic development of children enrolled in various types of programs.

So, the Raven test scores (percentage of completed tasks) did not increase with the intellectual load increasing, as one would expect. The research showed an inverse relationship between the number of completed tasks and the intensity of intellectual loads.

TABLE II. THE RATIO OF CONDITIONS AND LEARNING RESULTS

Education program	Stress level (intellectual loads), points	Intelligence level, % and points
Enriching education	2.9±0.16	35.4±7.8% 21.3 points
Standard	2.2±0.09 [b]	39.8±7.6% [b] 23.9 points

[b.] Statistically, values are significantly different ($p<0.05$)

A qualitative analysis of the Raven test results showed that using the principle of interconnection establishing in a matrix structure, analyzing the structure of the main image and detecting these features in one of several fragments, merging the fragment and comparing it with the environment of the main part of the test pattern form equally well standard education ($p> 0.05$).

- The principle of identifying the analogy used in series B is statistically better formed in a group of children enrolled in standard programs (6 ± 0.3 points versus 4.8 ± 0.4 enriching education) ($p<0.05$).
- Series C of Raven's test involves identifying the principle of figures complication. If you find it, you can select a missing figure.

  There were no statistically significant differences for this indicator, but the children enrolled in the standard program showed the best results (2.3 ± 0.3 points versus 1.7 ± 0.2 points for enriching education) ($p> 0.05$).
- Series D defines the ability to speculative regrouping of figures in the matrix, both in horizontal and in vertical positions.

  There were also no statistically significant differences in this series, but the children enrolled in the standard program showed the best results (4.5 ± 0.4 points versus 4.1 ± 0.3points for enriching education) ($p> 0.05$).
- In series E, the missing figures can be found by understanding the principle of figures analysis and synthesis.

  This series was one of the greatest challenges. The children enrolled in enriching programs had lower scores (0.9 ± 0.2 points versus 1.2 ± 0.2 points for standard education form) ($p> 0.05$).

Absolute intelligence indicators in the Raven test for standard education program were statistically significantly higher and had a value of 23.9 ± 0.8 points, while for programs of enriching education were 21.3 ± 0.8 points ($p<0.05$) (see Table III).

TABLE III. RAVEN TEST SERIES INDICATORS

Progressive Raven table series	Enriching education program (M±m)	Standard education program (M±m)
A	9.8±0.4	9.9±0.4
B	4.8±0.4	6±0.3 [c]
C	1.7±0.2	2.3±0.3
D	4.1±0.3	4.5±0.4
E	0.9±0.2	1.2±0.2
Total points	21.3±0.8	23.9±0.8 [b]

[c.] Statistically, values are significantly different ($p<0.05$)

The analysis of educational texts using the Fog index and the Flash indicator showed that the textbooks used for teaching in the enriching education group are more difficult by the criterion of reading easiness (Flash indicator) than for the standard program. For example, enriching learning textbooks had the Flash indicator of 49.0 ± 4, and for standard program the Flash indicator was 51.8 ± 3.6, that is a statistically significant difference ($p <0.05$) (see Table IV).

TABLE IV. FLESH INDICATOR, STANDARD UNITS

Textbook for curricula	Enriching program textbooks	Standard program textbooks
Russian language	54.4±2.9	59.3±2.2
Literature	60.3±3.4	48.3±2.1 [d]
Natural science	39.8±2.7	39.6±5.4
Mathematics	35.4±3.9	58.0±4.0 [d]

[d.] statistically, values are significantly different ($p<0.05$)

Fog index shows the necessary level of education to understand the text. It is shown that textbooks for enriching education were easier to understand, it was 3.6 ± 0.3, and for textbooks of the standard program 4.1 ± 0.2 ($p <0.05$) (see Table V).

TABLE V. FOG INDEX, STANDARD UNITS

Textbook for curricula	Enriching program textbooks	Standard program textbooks
Russian language	3.2±0.7	4.4±0.2 [e]
Literature	3.6±0.9	4.5±0.7 [e]
Natural science	3.6±0.5	4.1±0.5 [e]
Mathematics	4.6±0.7	3.3±0.1 [e]

[e.] statistically, values are significantly different ($p<0.05$)

A study of the mental capacity of pupils showed that enriching education leads to an increase in the number of mistakes made by children (17.9 ± 0.7 for enriching education and 13.7 ± 0.4 for standard program education ($p < 0.05$)), which may indicate chronic fatigue (see Table VI). The productivity of mental labor in enrichment training tends to decrease.

TABLE VI. MENTAL CAPACITY INDICATORS

Indicators	Enriching education program (M±m)	Standard education program (M±m)
Number of viewed lines (c)	13.5±0.3	13.0±0.3
Number of mistakes (d)	17.9±0.7	13.7±0.4[f]
Mental work productivity (q)	7.3±0.3	7.7±0.6

[f.] statistically values are significantly different ($p<0.05$)

The study of short-term memory allowed to identify a statistically significant decrease ($p <0.05$) in the group of children enrolled in enriching education to 10.8 ± 1.0 points. This indicator for group of children enrolled in the standard program education was 14.9 ± 1.6 (see Table VII).

TABLE VII. SHORT-TERM MEMORY INDICATORS

Indicators	Enriching education program (M±m)	Standard education program (M±m)
Ray test points	10.8±1.0	14.9±1.6[g]

[g.] statistically values are significantly different ($p<0.05$)

So, in modern enriching educational technologies domestic and foreign concepts of manipulative nature are not-rarely used, having such “sonorous” names as “advanced development technologies”, “developmental training technologies”, “suggestopedology”, etc.

These technologies, in most cases, do not allow a person to remain a free subject of own learning and replace the deep meanings related to personal development with outside goals and values [10,11,12]. Many innovative technologies that are popular in modern education are focused on the excessive intensification of the educational process, which leads to information overload and not only learning problems, but also to the emergence of the so-called didactic stresses (stress associated with learning).

In addition to the technological component of the pedagogical process, a communicative component, determined by the style of pedagogical interaction, can also cause undoubted harm to the full development of the personality of schoolchildren. Often, the educational process is built on authoritarian ideology. In the communicative space of a comprehensive school, there is often a pronounced prescriptive style of pedagogical interaction, external evaluation of the school, social, and other successes or failures of schoolchildren.

Often, as an educational imperative, the requirements of student passive submission and unquestioning instructions following are put forward. Non-formal, but cultivated priorities in the space of comprehensive schools include: normativity (compliance with a given norm, standard), controllability (discipline, performance) and homogeneity (uniformity, sameness), that ultimately lead to the emergence of such child negative personal qualities as indecision, self-doubt, lack of initiative, “learned infantilism”, lack of desire for individual expression, creativity, etc. Naturally, in such conditions, such personal qualities as autonomy, the internal locus of control and the ability to coping behavior do not receive a relevant development. These same conditions do not contribute to the formation of a sense of personal dignity, self-esteem, and a positive self-concept.

Pedagogical enriching technologies aimed at “accelerated” and “advancing” education or artificially activating its natural development can also cause significant harm to psychological and somatic health, since they violate the principle of nature conformity and do not take into account age, neurophysiological, and psychological characteristics.

IV. CONCLUSION

Hygienic expertise focuses on the study of the criteria for the well-being and development of a child as a fully-functioning personality. “In the analysis of any pedagogical system, regardless of the specific upbringing and educational goals declared by its authors, it is necessary to identify the real impact of this pedagogical practice on the child as a person, on his/ her personal growth; to determine “personal cost” of results, whether they do not hinder the child’s mental and personal development” [12].

Hygienic expertise of national education in general and modern pedagogical technologies, in particular, should be widely used.

The hygienic expertise is particularly relevant for the evaluation of innovative pedagogical technologies since even the undoubted success in didactic and other pedagogical dimensions do not guarantee positive changes in the health protection dimension.

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