

ANNOTATION

dissertation of Tursymatova Orazkul on the topic «Scientific and methodological foundations for the formation of biophysical concepts in the process of training biology students in higher educational institutions», submitted for defense for the degree of Doctor of Philosophy PhD majoring in 6D011300 – «Biology»

The topic of the research. Scientific and methodological foundations for the formation of biophysical concepts in the process of training biology students in higher educational institutions.

The purpose of the study is to analyze the methodological foundations of the system of biophysical concepts and develop the methodology for the formation of biophysical concepts in the course of biology.

The objectives of the research:

-to characterize modern areas of biophysics and determine its place in the content of natural disciplines;

-to develop a structural–content model of the formation of biophysical concepts;

-to develop the methodology for the formation of biological knowledge and skills of students through biophysical concepts, implementation in the educational process;

-to show experimentally the effectiveness of the methodology for the formation of biophysical concepts.

The methods of the research: theoretical and empirical methods were used during the research. The analysis of philosophical, psychological, pedagogical and methodical literature has been the basis for the theoretical construction of the research. The empirical research methods enable to generalize the domestic and foreign experience in the field of biological education. The mathematical processing of research results through the elemental analysis was based on a survey conducted among students and teachers regarding the educational process and the content of biological knowledge, as well as on the specific experience of some teachers.

The main points submitted for defense (evidence–based scientific assumptions and other conclusions that are new conclusions).

- the formation of biophysical concepts increases the level of training of future teachers–biologists and the formation of their ability to apply the acquired knowledge in their future professional activities;

- the development of a structural–content model of the formation of biophysical concepts is focused on the correct organization of the future professional pedagogical activity of biology students;

- the method of formation of biological knowledge and skills of students through biophysical concepts is ensured by its use in the future professional activities of students.

The main research results:

-the description of modern trends in biophysics and identification of their place in the content of natural science disciplines;

-the development a structural–content model of the formation of biophysical concepts;

-the development of the methodology for the formation of biological knowledge and skills of students through biophysical concepts and its implementation in the educational process;

-based on the results of the research, the assignments were prepared to consolidate theoretical knowledge of biophysical content, test questions – for students’ individual work, laboratory and practical work – in the creative aspect and research nature, as well as the working curriculum of the elective course "Biophysics", including the theory and methodology of the discipline for various pedagogical specialties, an educational and methodological complex, a methodical manual for elective course "Fundamentals of biophysics" which was introduced into the educational process.

The substantiation of the novelty and significance of the results obtained:

- the novelty of the first conclusion lies in the fact that while training biology students in higher educational institutions, the theoretical foundations of the interaction of physical mechanisms based on biological processes and the theoretical foundations of modern areas of biophysics are determined. The significance of the obtained results is determined by the theoretical and methodological foundations for forming biophysical concepts in training biology students, the possibilities of implementation in the modern educational process are considered as well;

- the novelty of the second conclusion lies in the fact that the role of biophysical knowledge in the content of natural disciplines has been determined, a structural-content model of the formation of biophysical concepts has been developed in order to implement it. The significance of the obtained results determined the components of the formation of biophysical concepts and the criteria for the formation of concepts, and the possibilities of applying practical methods of physical, chemical factors to biological objects were considered;

- the novelty of the third conclusion lies in the fact that the content of biological education defines the peculiarities of the transfer of biophysical concepts, proposes a methodology for the formation of biophysical concepts in training biology students, a working curriculum for the elective course "Biophysics" ("Theory and methods of discipline for various pedagogical specialties") was developed, as well as an educational and methodological complex, and methodical manual "Fundamentals of Biophysics" are introduced into the educational process. The significance of the obtained results consists in the fact that the results of the dissertation research and the conclusions obtained can become the basis of scientific research conducted in this direction in the future. It

is recommended to widely use the obtained data in higher educational institutions, institutions of secondary vocational education, the system of professional training and advanced training of teaching staff and secondary schools;

- the novelty of the fourth conclusion lies in the fact that, the theory and methods of discipline for various pedagogical specialties have been developed in order to form biophysical concepts in the training of biology students. The significance of the obtained results has been analyzed, the results of the pilot research have been specified.

The compliance with the directions of development of science or state programs:

The main idea of the research work corresponds to the State Program of development of education and science of the Republic of Kazakhstan for 2020–2025, State Program “Digital Kazakhstan”, Address of the Head of State Kassym-Jomart Tokayev to the people of Kazakhstan dated from September 2, 2019, the Law of the Republic of Kazakhstan "On Education" regarding the development of the Kazakhstani education system, improving the quality of training specialists, the State obligatory standard of higher education and educational programs.

The contribution of a doctoral student to the preparation of each publication (the share of the author of the dissertation is indicated, measured as a percentage of the total volume of publications)

15 scientific papers have been published on the topic of the dissertation, including:

- 1 article was published in a scientific journal indexed in the Scopus database;
- 3 articles –in publications approved by the Committee for Quality Assurance in the Field of Science and Higher Education of the Ministry of Science and Higher Education of the Republic of Kazakhstan
- 9 articles – in the abstracts of international and republican scientific–practical seminars and conferences, 4 of which were published in the proceedings of foreign conferences;
- 1 methodical manual which was confirmed by the Academic Council of the Kyzylorda Korkyt Ata state university in the pedagogical and natural science direction, protocol No.3 from March 23, 2018;
- 1 the program of the applied course «Biophysics and nature» for students in grades 10 of secondary schools, considered by the Academic Council of the Institute for advanced training of teaching staff in the Kyzylorda region of the branch of JSC National center for advanced training «Orleu», protocol No.1 from January 24, 2020.

All publications were prepared in the course of dissertation research.

1.Features of the formation and development of biophysical concepts among biology students // Cypriot Journal of Educational Sciences, Volume 17, Issue 9, (2022) 3091–3102, <https://un-pub.eu/ojs/index.php/cjes/> (Co-authored with S.Ibadullayeva, A.Urgenishbekov, M.Dilmakhanova, A.Aimyrzayeva, Y.Kenzheyev. The contribution of the doctoral student to the preparation of the publication 75%) (Scopus). The article reveals the possibility of using conceptual cards that provide the formation and development of biophysical concepts of

students in the discipline of biology. The method of descriptive analysis was used when analyzing the research data.

2. Methodological bases of formation of biophysical science //Scientific journal of ToraygyrovPavlodar State University "Bulletin PSU", pedagogical series, ISSN 1811–1831, No.1(2019), p.359–365 (Co–authored with Ibadullayeva S., Zhumagulova K.A. The contribution of the doctoral student to the preparation of the publication 75%). The article deals with the analysis of the methodological foundations of biophysical concepts.

3. Methodological basis of biophysical knowledge in the content of natural science disciplines // Bulletin of the Abai Kazakh National Pedagogical University series «Pedagogical sciences», No.2(62), 2019, p.58–66, (Co–authored with Ibadullayeva S., Zhumagulova K.A. The contribution of the doctoral student to the preparation of the publication 80%). The article gives a description of modern areas of biophysics in the analysis of the methodological foundations of biophysical knowledge in the content of natural science disciplines, presents a methodology for the formation of biological knowledge and skills of students through a system of biophysical concepts.

4. The state of research of electrical phenomena in the development of biophysical science // Bulletin of the Shakarim State University, Semey, No.1 (89) 2020, ISSN 1607–2774, p.169–172. (Co–authored with Ibadullayeva S.Zh., Zhumagulova K.A. The contribution of the doctoral student to the preparation of the publication 80%). Based on the works of scientists who studied electrical phenomena in the development of biophysical science, the features of biophysical phenomena were considered in the article.

5. Formation of biophysical concepts in the conditions of the updated content of school biology // International scientific–practical conference «Perspective directions of research in the methods of teaching biology and ecology», «A.I. Herzen Russian State Pedagogical University», November 19–22, 2018, Saint Petersburg, p.158–162. The article deals with the specific features of biophysical concepts in the content of the updated education and considers the ways of formation.

6. Effects of radiation on the human body // «Continuity. Justice. Development», proceedings of the Republican scientific–practical conference among students of higher educational institutions. Korkyt Ata Kyzylorda State University, April 25, 2019, Kyzylorda, p.149–157. (Co–authored with Karabek G. The contribution of the doctoral student to the preparation of the publication 85%). The article considers the influence of radiation rays on the human body, as well as the harm and benefits of strong electromagnetic rays, their use in medicine.

7. The importance of forming scientific concepts in the teaching of biophysics //International scientific and practical conference «Shokan Readings–23», Kokshetau, April 26, 2019, p.395–398 (Co–authored with Ibadullayeva S.Zh. The contribution of the doctoral student to the preparation of the publication 80%). The article presents the effectiveness and advantage of the methods and techniques used in the formation of scientific concepts in the study of the discipline «Biophysics».

8. Ways to increase the cognitive activity of students when studying the course «BIOPHYSICS» // «Science and the World» international scientific journal, No.4 (68), 2019, Impact factor of the journal – 0.325. Russia, Volgograd. p.59–60. (Co-authored with Ibadullayeva S.Zh.The contribution of the doctoral student to the preparation of the publication 80%). The article discusses ways to increase cognitive activity, students' interest in the study of the discipline «Biophysics».

9. Theoretical bases of physical mechanisms of biological processes //Proceedings of the International scientific and practical conference «Actual problems of natural science education». Korkyt Ata Kyzylorda State University, November, 2019, Kyzylorda, p.325–328. (Co-authored with Ibadullayeva S.Zh.The contribution of the doctoral student to the preparation of the publication 80%). The article deals with the interaction of physical, physico-chemical mechanisms based on biological processes. The theoretical foundations of physical mechanisms in biological phenomena are also revealed.

10. Main principles for the development of biophysical research //International scientific conference «Process Management and Scientific Developments», November 14, 2019, Birmingham, UK. p.159–164. (Co-authored with Ibadullayeva S.Zh. The contribution of the doctoral student to the preparation of the publication 80%). The article analyzes the viewpoints of foreign and domestic scientists about biophysics as a science, when conducting research on the development of biophysical science from a modern point of view.

11. Pedagogical foundations for the formation of biophysical concepts in teaching biology at school // Proceedings of the International scientific-practical conference «Perspective directions of research on the problems of biological and environmental education», «A.I. Herzen Russian State Pedagogical University», November 19–21, 2019, Saint Petersburg, p.173–176. The concepts of studying the philosophical-methodological and psychological-pedagogical foundations of the formation of biophysical concepts in training of biology teachers were developed in the article.

12. The effectiveness of studying the applied course «Biophysics» in the context of specialized education // Journal "Biology at School", LLC «School Press» No.1, 2020,ISSN: 0320–9660e ISSN: 2409–877, Moscow, p.63–72. (Co-authored with Ibadullayeva S.Zh., Zhumagulova K.A.The contribution of the doctoral student to the preparation of the publication 80%). The article discusses and proposes ways to effectively use process-based innovative technologies in the educational process in the study of the applied course "Biophysics".

13. Fundamentals of biophysics // Methodical manua - Kyzylorda: Zhiennai, 2018. –p.95. The educational and methodical book is intended for students majoring in "Biology" and "Physics".

14.Biophysics and nature // Applied course program for 10th grade.The program of the applied course «Biophysics and nature» for students in grade 10 of secondary schools. It was considered and approved at a meeting of the Academic Council of the Institute for advanced training of teaching staff in the Kyzylorda region of the branch of JSC National center for advanced training "Orleu",protocol No.1 from January 24, 2020 (Co-authored with Ibadullayeva S.Zh. The

contribution of the doctoral student to the preparation of the publication 80%). The program of the applied course provides a theoretical and methodological analysis of the implementation of the educational goals of an integrated approach in teaching physics and biology according to the updated content of education, the assignments are presented for the formation of biophysical concepts of students based on interdisciplinary relationships of knowledge about the interaction of man and the environment.

15. The place of biophysical knowledge in the content of natural sciences // Proceedings of the International scientific–practical conference «Actual problems of biology and biotechnology», Al–Farabi Kazakh National University, May 27, 2021. Almaty, p.113–116. (Co–authored with Sumatokhin S.B., Ibadullayeva S.Zh., Zhumagulova K.A. The contribution of the doctoral student to the preparation of the publication 70%). The place of biophysical education in the content of natural science disciplines was considered in the article. The importance of natural science disciplines was determined by the role of biological, physical, astronomical and chemical knowledge in understanding the laws of nature, the material life of society, and the modern scientific picture of the world.

Depending on the content of the dissertation of the doctoral student, these publications are considered to be the works carried out mainly individually in accordance with the results obtained.