

ABSTRACT
to the dissertation of Abdraimov Rakhimzhan Turysbekovich
for the degree of Doctor of Philosophy (PhD) in Physics

Research topic – Methods of specialized teaching of high school students electricity and magnetism in the course of physics.

The purpose of the study: Create a methodology for specialized training in the "Electricity and Magnetism" section of physics course at schools and test it in practice.

Research objectives:

- to determine the content and significance of the implementation of specialized training at the level of general secondary education and consider modern state of the issue;

- to analyse the content of physics course in senior classes, to define the consistency of the curriculum of internal subject and higher education and methodological foundations of specialized teaching;

- to create a teaching methodology of the section "Electricity and magnetism" in physics course and the methodology of conducting the elective course "Applied electrodynamics" for grades 10-11 of science and mathematical direction

- to examine the effectiveness of the developed methodology using a pedagogical experiment and demonstrate of its result.

Research methods:

- analysis of scientific and methodological literature on the subject of research and on the topic of the State Educational Standards of the Republic Kazakhstan related to the specialized training of high school students in the science and mathematics direction of the section "Electricity and Magnetism";

- analysis and systematization of the content of model training programmes and textbooks of the subject "Physics" for grades 10-11 of the science and mathematics direction according to the updated content of education;

- the use of methods of mathematical statistics in the quantitative assessment of the results of a pedagogical experiment.

The key points of the dissertation to be submitted

- 1) substantive features of the implementation of profile training in high school, the content of the section "Electricity and Magnetism" of the physics course and its consistency with the content of the subject program and the Internal of this section in a higher educational institution;

- 2) the educational and methodological system of specialized training in physics at high school and its components, didactic principles, defining the content, organizational forms and methods of the teaching process on physics;

- 3) methodology of section "Electricity and magnetism" and methodological recommendations for the organization of elective course "Applied Electrodynamics" for students of grades 10-11 of the science and mathematics direction;

4) result of a pedagogical experiment confirming the effectiveness of the teaching methodology of the section "Electricity and magnetism" and the elective course in the senior classes.

The main results of the study:

- the content of profile training at the level of general secondary education, its significance and features of areas of implementation have been determined;

- defined the substantive features of teaching the course of physics in the senior classes, didactic and methodological principles, defining the content, organizational forms and methods of the teaching process on physics, continuity with intra-subject and university content and structural-content-process system of development of profile physics teaching;

- the methodology of teaching the section "Electricity and magnetism" and the elective course of "Applied Electrodynamics" to students of grades 10-11 of the science and mathematics direction has been developed and its effectiveness has been tested by a pedagogical experiment.

Novelty and significance of the obtained results:

The validity of the first scientific result is determined and proved by the content and importance of implementation based on the analysis of foreign and domestic experience in the organization of specialized training at the level of general secondary education;

The validity of the second scientific result is based on the analysis of the content of curricula and textbooks on the subject of "Physics" for grades 10-11, their features, didactic and methodical principles, defining the content, organizational forms and methods of teaching physics, of the formation of the content of the subject and individual methodological principles of teaching, the consistency of the section "Electricity and magnetism" with the content of the subject program and with the educational program of the university, structural-content-process system of development of specialized physics teaching;

The validity of the third scientific result is based on the methodological system of teaching the section "Electricity and magnetism" to students of grades 10-11 in the science and mathematics direction, active methods, forms and means of teaching (short lectures, physical tasks, experimental tasks (laboratory and practical work)), the possibilities of using digital technologies are shown, and also proved by the compilation of methodological recommendations on the organization of the elective course "Applied electrodynamics".

The significance of the obtained results: theoretical acknowledgment of the content of specialized teaching of physics of the senior class of the science and mathematics direction, consistency of connections, basic didactic and methodic individual principles of teaching, methodological features of teaching the section "Electricity and magnetism", as well as theoretical substantiation of the content and methods of organizing an elective course and the possibilities of its application in educational practice.

Compliance with the directions of science development or state programs:

The research work is based on the Law of the Republic of Kazakhstan "On Education" and the state mandatory educational standards of all levels of education of the Republic of Kazakhstan, the national project "Educated Nation" – quality education" approved in the country, the development of preschool, secondary, technical and specialized education in the Republic of Kazakhstan in 2023. It is determined by the management of the Concept of development of preschool, secondary, technical and specialized education in the Republic of Kazakhstan for 2023-2029, the standard curriculum on the subject of "Physics" for grades 10-11 of general secondary education in the science and mathematics direction. The dissertation research corresponds to the priorities established in the normative legal documents concerning the field of education and science of the Republic of Kazakhstan.

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

1. Students' Experimental Research Competences in the Study of Physics// International Journal of Environmental & Science Education. –VOL 11. –№18.-2016.- P.13069–13078. (CiteScore 0.9, Scopus-43), (co-authored by B.Kurbanbekova, T.Turmambekova, U.Baizaka, P. Saidakhmetova, A. Bekayeva, Share of doctoral student 60%).

2. Solving mineralogy problems with the help of the "origin" package // The Bulletin the National Academy of Sciences of the Republic of Kazakhstan.– Volume 4, Number 386 (2020), 6 – 12. (WoS-Q2), (co-authored by B.E.Vintaykin, P.A.Saidakhmetov, N.K.Madiyarov, M.A.Abdualiyeva, Share of doctoral student 70%).

3. The Effects of Using Digital Game Based Learning in Primary Classes with Inclusive Education //European Journal of Contemporary Education.–V.10(2). - 2021.- P.–450-461. (CiteScore 3.0, Scopus-79), (co-authored by G.Salgarayeva, G.Iliysova, A.Makhanova. Share of doctoral student 10%).

4. Calculation and visualization of the field of a coaxial cable carrying a steady current // News of the National Academy of Sciences of the Republic of Kazakhstan, Series of Geology and Technical Sciences.– V. 6(432), – 2018 - P. 55–65. (CiteScore 2.0, Scopus-43), (co-authored by K.A.Kabylbekov, Kh.K.Abdrakhmanova, P.A.Saidakhmetov, B.Sh.Kedelbaev, B.S.Ualikhanova. Share of doctoral student 60%).

5. Жаратылыстану-математикалық бағытта электродинамика тарауын бейіндік оқытудың әдістемелік ерекшеліктері// «Science and life of Kazakhstan» International popular-science journal. – Астана, 2018. - №3(58). -Б. 286-290. (co-authored by: Т.А.Турмамбеков, Б.А.Курбанбеков, А.Н.Ахметова, Share of doctoral student 70%).

6. Оқушылардың шығармашылық кәсіби маңызды оқу іс-әрекетін қалыптастыру //«Science and life of Kazakhstan» International popular-science journal, -Астана, 2018.- №7(70). -Б. 99-104. (co-authored by: П.А.Саидахметов, Ү.А.Байзақ, Б.С.Уалиханова, Share of doctoral student 70 %).

8. Компьютерные симуляторы лабораторных работ, требующих сложного оборудования, для физического практикума // «Science and life of Kazakhstan» International popular-science journal, - Астана, 2019.- №4(80).- С. 111-115. (co-authored by: Т.А.Турмамбеков, Б.Е.Винтайкин, П.А.Саидахметов, Уалиханова Б.С. Share of doctoral student 60 %).

9. Физика сабақтарында симуляторларды қолдану білім алушылардың танымдық белсенділігін арттыру // «Science and life of Kazakhstan» International popular-science journal, - Астана, 2019.- №5(2). -Б. 42-47. (co-authored by: Б.Қ.Рахашев, Г.М.Баубекова. Share of doctoral student 80 %).

10. Лабораторная работа прикладной направленности для физического практикума в университетах, адаптированная для школьного курса электродинамики // «Science and life of Kazakhstan» International popular-science journal, - Нур-Султан, 2020.-№2. -Б. 138-144. (co-authored by: К.З.Бексейіт, Б.С.Сайлау, А.А.Тілеуқабыл, Share of doctoral student 80 %).

11. Организация профессионально направленных лабораторных работ по разделу «Электродинамика» школьного курса физики // «Science and life of Kazakhstan» International popular-science journal, - Алматы, 2022.-Vol.-1, Number 395 (2022).-Б 98-105. (co-authored by: Б.С. Уалиханова. Т.А. Турмамбеков, Share of doctoral student 80 %).

12. Физикадан элективті курс негізінде зертханалық жұмысты ұйымдастыру. // Bulletin of Yassawi University, pedagogy and methods of teaching the subject, Түркістан.- 2022.-№3 (125). -Б 224–236. (co-authored by: Б.С. Уалиханова. 90 %).

13. «Calculation and visualization of a system- an electron in a deep square potential well, with use of the software package of MATLAB» International Scientific and Practical Conference “WORLD SCIENCE” ISSN 2413-1032.-№ 7(23).-Vol.1, July 2017.-P.7-14. (co-authored by Kabylbekov K. A., Abdrakhmanova Kh. K., Abekova Zh. A., Ualikhanova B. S., 50%).

14. Формирование творческой профессионально значимой учебной деятельности учащихся // Collection of materials of the XI International Scientific and Methodological Conference «Преподавание естественных наук, математики и информатики в вузе и школе».- РФ. Томск, 2018.-Б. 78-83 (co-authored by: Б.С.Уалиханова, Т.А. Турмамбеков, А.Т. Жолдыбек, П.А. Саидахметов 60%).

15. Профессиональная направленность обучения физике в школе // Актуальные научные исследования в современном мире. Переяслав-Хмельницкий, 2019.-Выпуск 1(45) Часть 4. - Б. 29-37. ISSN 2524-0986. (co-authored by: Уалиханова Б.С., Мирсалиев М., Баубекова Г. М., Жолдыбек Ә. Т. 70%).

16. Физика сабағында оқушылардың танымдық мүмкіндіктерін қалыптастыру технологиялары // «Әуезов оқулары – 17: «Әлемдік кеңістіктегі ғылым мен руханияттың жаңа серпілістері» collection of materials of the international scientific and practical conference.-3 том.-Шымкент, 2019.-Б. 9-13 (co-authored by: Б.Қ.Рахашев, П.А.Сайдахметов, Г.М.Баубекова, 70 %).

17. Реализация межпредметных связей. Трудностей и перспективы их решения. // «Әуезов оқулары – 15: «Тәуелсіз қазақстанға – 30 жыл» collection of

materials of the international scientific and practical conference. -Т3(2). - Шымкент 2021. -Б.91-95 (co-authored by: Құттыбай Г.Н. Саидахметов П.А., 80 %).

18. Жаратылыстану-математикалық бағытындағы бейінді сыныптарына арналған «Қолданбалы электродинамика» электифті курсының оқу құралы. - Шымкент ОҚМПУ - 2022ж -120 б (co-authored by: Б.С.Уалиханова, 90 %).