

ABSTRACT

on the dissertation of **Nursultan Ruslanovich Zhakupov**
submitted for the degree of Doctor of Philosophy
(PhD) in specialty 8D01520- Physics

Research topic: Methodological Features of Teaching School Students the Physics Course in English within a Digital Educational Environment.

The purpose of the research: To analyze the methodological aspects of teaching the school physics course in English in a digital educational environment and to develop interactive online courses, using UK educational platforms as an example to enhance teaching effectiveness.

Research objectives:

- 1) to analyze the challenges of using distance learning technologies and online courses for teaching physics in English and determine their role in the learning process;
- 2) to examine the methodological features of teaching the school physics course in English in the context of transitioning to a multilingual educational policy;
- 3) to integrate and identify advantages and disadvantages of the physics curriculum in the renewed content of school education and the UK educational program that served as its basis;
- 4) to carry out a pedagogical study on the effectiveness of developing methodological materials and creating interactive online and blended courses for teaching the physics course in English.

Methods of investigation.

A comprehensive approach combining both theoretical and empirical methods was employed to achieve the study's aim. Among the theoretical methods, various techniques—such as in-depth analysis, evaluation, synthesis, and comparison of philosophical, psychological-pedagogical, and scientific-methodological literature—served as a robust foundation for understanding existing knowledge and theoretical frameworks. Empirical methods were integral to the research process, including surveys, pedagogical observations, testing, diagnostics, and pedagogical experimentation. These empirical methods facilitated initial data collection and provided insights into the practical aspects of the research problem. Furthermore, mathematical and statistical procedures were used for data processing and analysis, ensuring the reliability and accuracy of the findings. This combination of diverse methodologies supports a thorough examination of research questions and yields well-founded conclusions.

Main Guidelines Recommended for Defense:

- 1) Digital Educational Environment is presented as an integrated system of digital technologies, tools, and resources that organize and support the educational process in an electronic format. It ensures interaction among all learning participants (students, teachers, administrators) and encompasses elements such as electronic

educational materials, online learning platforms, virtual classrooms, Learning Management Systems (LMS), and communication/collaboration tools. The digital educational environment facilitates various forms of learning (distance, blended, face-to-face with digital elements) and contributes to improving the efficiency and accessibility of education.

2) Analysis of the physics curriculum and the digital educational platforms adopted in the educational systems of Kazakhstan and the United Kingdom.

3) Conceptual Component of the structural-functional model for the methodological features of teaching the physics course in English in a digital educational environment (aim, methodological foundations of teaching physics in English, use of digital technologies), Content Component (course content, forms and methods of teaching, digital tools and resources, stages of the educational process), Evaluation Component (language aspects, criteria and indicators for assessing students' knowledge and skills, considering technological, cognitive, and communicative factors, level of content mastery), and Result Component (effectiveness assessment of the methodology, development of necessary skills, conducting a summarizing experiment; learning direction, knowledge level, qualification stages). This also involves creating a digital autonomous/collaborative/networked learning space; ensuring flexibility in independent interaction, collaboration, and joint knowledge construction in English; and organizing efficient professional interactions between student-content, student-student, and student-teacher in the digital educational environment.

4) Teaching Methodology of the physics course in English within a digital educational environment proves most effective when implementing the proposed content-based and procedural materials, using active digital, networked, virtual, and interactive instructional methods, formats, and resources.

The main findings of the study.

Based on a theoretical and methodological analysis, the content and functional features of the digital educational environment were clarified as an integrated system of digital technologies and resources (online platforms, LMS, communication tools, etc.). Its role in enhancing the effectiveness and accessibility of teaching physics in English was identified.

An analysis of physics curricula and digital educational platforms used in Kazakhstan and the UK was carried out. Commonalities and unique approaches to teaching were identified, demonstrating how digital resources influence the development of students' subject knowledge and language skills.

A structural-functional model of the methodological features of teaching physics in English within a digital environment was developed, comprising conceptual (objectives, methodological foundations, digital technologies), content (learning material, teaching forms and methods, resources), evaluation (criteria and indicators), and result (efficiency assessment, skill formation) components.

A teaching methodology for delivering the physics course in English, utilizing active digital, networked, virtual, and interactive instructional methods, was designed and experimentally tested. A summarizing experiment confirmed the methodology's effectiveness, showing improved language preparation and deeper comprehension of the learning material among school students.

Novelty and importance of the results obtained:

A comparison of the physics course curricula in the educational systems of Kazakhstan and the UK was conducted, identifying their components and providing a content-focused characterization.

A structural-functional model for teaching the physics course in English within a digital educational environment was developed, establishing relevant indicators, criteria, and levels.

The necessity of creating interactive online courses for effectively teaching physics in English was substantiated.

Methodological features of designing interactive online courses for teaching physics in English were identified, and their effectiveness was confirmed through experimental work.

Compliance with the directions of science development or state programs:

The dissertation work complies with the State Program for the Implementation of Language Policy in the Republic of Kazakhstan for 2020-2025 and complies with Resolution No. 1045 of December 31, 2019, approved by the Decree of the Government of the Republic of Kazakhstan, and the educational project "Digital Pedagogy", approved by the Decree of the Government of the Republic of Kazakhstan in March 2023 ; Law of the Republic of Kazakhstan "On the status of a teacher". December 27, 2019 No. 293-VI RK, Order of the Minister of Education and Science of the Republic of Kazakhstan dated May 5, 2020 No. 182 on amendments and additions to state compulsory educational standards. all levels of education, National Project for Quality Education "Educated Nation" of the Republic of Kazakhstan Government Decree No. 726 dated October 12, 2021 on approval of the Concept for the Development of Higher Education and Science in the Republic of Kazakhstan for 2023-2029. Based on the Decree of the Government of the Republic of Kazakhstan dated March 28, 2023 year No. 248.

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

According to the content of the research work, 10 scientific papers have been published. One of them was included in the SCOPUS scientific information database:

1. Development of a multilingual online course with the language support for teaching physics in English. International Journal of Evaluation and Research in Education (IJERE) T. 2252. – №. 8822. 2024. B. 752-758. p-ISSN: 2252-8822, e-

ISSN: 2620-5440 (SCOPUS). DOI: 10.11591/ijere.v13i2.26803. (co-authors: Seitkhanova A. K., Dakhin A. N.; 85%)

Three articles were published in journals recommended by the Committee for Quality Assurance in Science and Higher Education of the Ministry of Education and Science:

1. Қазақстандағы және Ұлыбританиядағы жоғары сыныптарға арналған физика пәнінің оқу жоспарларының мазмұнын салыстыру// Торайғыров университетінің Хабаршысы: Педагогикалық сериясы, № 4. С. 180-190. 2022, ISSN 2710-2661. <https://doi.org/10.48081/YeZf3234> (co-authors: Seitkhanova A. K.; 75%)

2. Ұлыбританиядағы білім беру мекемелерінің мысалында орта мектеп оқушылары үшін ағылшын тіліндегі физика бойынша интерактивті онлайн курстарын құрастыру// Известия. Серия: Педагогические науки. – 2024. – Т. 72. – №. 1. С. 588-604. ISSN 2412-2149 (Print)ISSN 2710-3269 (Online). <https://doi.org/10.48371/PEDS.2024.72.1.040> (co-authors: Seitkhanova A. K., Dakhin A. N.; 80%)

3. Student preferences for content in online learning environments: an analysis of engagement factors// Pedagogy and Psychology. – 2024. – № 1(58). – P.12–19: ISSN 2077-6861 (online 2960-1649). <https://doi.org/10.51889/2960-1649.2024.58.1.002> (co-authors: Seitkhanova A. K. H.; 70%)

Two articles were published in scientific journals of the near abroad:

1. Преподавание на английском языке: онлайн-курс для учителей физики на основе их потребностей// Kant. – 2021. – №. 3 (40). – С. 211-214. ISSN 2222-243X (co-authors: Anayeva E.Sh., 90%)

2. Development of students' academic writing skills using by clil approach// Научные вести. – 2020. – №. 10. – С. 15-18. ISSN: 2619-1245 (co-authors: Bilyalova A. B., Karataeva N.K.: 70%)

In the materials of international practical conferences held in foreign countries, 3 articles were published:

1. Аралас оқыту технологиясы арқылы физика мен ағылшын тілін кіріктіру// The XIII International Science Conference «Development of modern science: theory, methodology, practice», March 18–19, 2021, Madrid, Spain. 221 p. – 2021. – p. 130. ISBN - 978-1-63732-134-8 (100%)

2. Using web 2.0 resources in physics lessons for development high-grade students'academic writing skills. The XIV International Science Conference «Theoretical foundations in practice and science», December 21–24, 2021, Bilbao, Spain. 612 p. ISBN-978-1-68564-523-6. – 2021. – б. 311. (co-authors: Bilyalova A. B., Karataeva N.K., Khamitova A.K.; 75%)

3. Development of interactive online physics courses for secondary school students on the example of UK educational institutions // The 13th International scientific and practical conference “Information activity as a component of science development”(April 04–07, 2023) Edmonton, Canada.

International Science Group. 2023. 580 p. – 2023. – 6. 285. ISBN – 979-8-88955-324-3 (co-authors: Seitkhanova A. K., 80%)

One tutorial published:

1. Мектептегі физика курсын ағылшын тілінде оқыту әдістемесі // Ә. Марғұлан атындағы Павлодар педагогикалық университеті, 2023 - «Expert Group». ISBN 978-601-267-775-1 (co-authors: Seitkhanova A.K.; 85%)

In addition, the practical resources developed as part of the dissertation research received 1st place in the “Panorama of Pedagogical Ideas” (broadcast of experience), conducted among teachers of the AEO “Nazarbayev Intellectual Schools”.