**PROPOSAL FORM FOR AN ACADEMIC PROGRAMME**

**Physics**

Approved for 2023-2027

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# 1. General information

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| **1.1. Curriculum title** | **Physics** |
| **1.2. Curriculum developing team:** | |  |  | | --- | --- | | **Leader university** | **Member universities** | | Abai Kazakh National Pedagogical University | Kh. Dosmukhamedov Atyrau University | |  | South Kazakhstan State Pedagogical University | |  | M.Utemisov West Kazakhstan University | |  | E.A. Buketov Karaganda University | |
| **1.3. Type of curriculum**  (in accordance with the National Qualifications Framework | BACHELOR'S DEGREE  Level 6 |
| **1.4. Total academic credits** | 240 academic credits |
| **1.5. Study mode** | full-time |
| **1.6. Expected program duration** | 4 years |
| **1.7. Short curriculum description**  Curriculum goals and objectives | This Educational Programme (EP) "*Physics*" is a national teacher education curriculum, which has been designed in collaboration by various Kazakh universities and with international consulting. Due to the nature of a national curriculum, the descriptive texts within the curriculum do not provide specific information but highlight general pedagogical principles and cross-cutting themes (see also Annex 1.). The more detailed descriptions of e.g. methodologies and assessment will be identified in the implementation plans of the universities, considering also institutional and regional specific conditions.  Educational programme (EP) "*Physics*" is a teacher education programme for pre-service teachers who wish to specialize as a physics teacher (in schools, colleges, high schools) who are in demand in modern society, who can quickly navigate the constantly changing conditions in the field of education and meet the requirements for a competitive teacher. EP consists of a pedagogical component 60 academic credits (incl. pedagogical practice), a compulsory component 56 academic credits, and a subject component 124 academic credits (incl. a final attestation of 8 academic credits).  Subject component consists of 5 modules: “General Physics: Physical laws in the surrounding world”, “Fundamental physics”, “Research in physics: observation, experiment, hypotheses”, “Theory and technologies of teaching physics”, “Intersubject interactions”.  The EP aims to develop pre-service teachers' personal qualities, as well as the formation of universal, general, and professional competences in accordance with the requirements of the SES of Higher Education of the Republic of Kazakhstan. The characteristic of the EP is that it pays special attention to the subject training of future physics teachers, interdisciplinarity and research competences corresponding to the updated content of secondary education. The EP defines new areas of competence that meet modern challenges in the field of education and form the competences necessary for teachers of the 21st century that live and work in the world of VUCA.  EP provides an equal opportunity for learning without compromising pre-service teachers' rights and interests, preserving the principles of equality, respect, tolerance. It is interdisciplinary, student-oriented, scientifically integrated and problem-oriented by nature, and the selection of courses is guided by the topical issues of history and society and corresponds also to the international course descriptors.  EP is based on the principles of constructive alignment, where teaching and assessment methods, as well as subject-specific courses are selected to ensure the achievement and measurement of the competences outlined in the EP. The EP also follows an inclusive approach considering the multi-ethnic and multi-confessional composition of per-service teachers and their versatile needs for support of learning. |
| **1.8 Main principles of the curriculum** | |
| **Competence-based teacher education**  A teacher’s expertise combines competence in pedagogy and their own subject-specific field with theoretical and practical teaching competence in different kinds of operating environments. A teacher has mastery of the knowledge and skill requirements of their subject-specific field and thus is able to teach and supervise young people and adults studying for the same subject.  The competence of a teacher is focused on planning, guidance, teaching and assessment. For this reason, teacher must have sufficient theoretical knowledge of learning and competence development. In addition, modern working life emphasises cooperation and networking, development skills, and the support and maintenance of the well-being of oneself and one’s community.  A teacher’s competence is influenced by changes in the labour market, the structures of education and society as a whole, and all these elements are emphasised in the dynamic nature of a teacher's work. Work characterized by continual change in the variety of working environments places an emphasis on the teacher’s ability to assess and adjust their own activities. Self-assessment skills are an essential part of developing one’s professional identity. A teacher is making value decisions all the time, which means that the consideration of questions of professional ethics is one of the professional skills needed. Change requires the development of expertise, the ability to learn, as well as the ability to reform and renew the way things are done as part of a community.  **Competence-based teacher education curriculum**  The competence-based teacher education curriculum is formed of three entities: 1) Pedagogical studies, 2) Subject-specific studies 3) Compulsory studies. Each of the entities includes modules and related courses. The courses’ learning outcomes describe the competences required in teaching work and are placed in the NQF system’s (National Qualifications Framework) reference level six.  **The curriculum is guided by the following main principles:**   * Competence-based learning * Constructive alignment * Student-centred learning and active learning methodologies * Research-based teaching * Interdisciplinary learning * Inclusion * Teacher professional development and change management   (see Appendix for more details) | |

# 2. Programme rationale

In the context of the Education Modernization Project funded by the World Bank, several universities providing pre-service teacher education have designed and revised in international collaboration thirty (30) pre-service teacher education curricula according to the principles of competence-based education that ensure a holistic development of pre-service teachers’ competences. Moreover, the student-centered approach better prepares pre-service teachers to teaching profession by providing practical examples, experiments and experiences, which pre-service teachers can transfer to their classroom practices considering better the versatile needs and wellbeing of their students.

In order to match the requirements of the renewed primary and secondary education, teachers’ professional competences need to be re-evaluated and completed. The new approaches in secondary education need to be reflected in pre-service teacher education and the pre-service teachers’ profiles. Furthermore, these thirty (30) revised or new pre-service teacher education curricula have been designed to better improve pre-service teachers’ various generic competences that are essential in teacher’s profession. Several important and cross- cutting pedagogical principles that Kazakhstan education system aims to develop, such as inclusiveness and interdisciplinarity, have been taken into consideration in the design and implementation of the curricula. In addition, these curricula emphasize the development of pre-service teachers’ research skills in a way that they become practitioners who are constantly reflecting and evaluating their own practices and the practices of their schools to develop their own work and their work community, and the whole sector of education.

# 3. Teacher’s professional competences

Teachers’ professional competences are defined as consisting of **pedagogical competences** and **subject-specific competences** as well as **generic competences**. The competence-based teacher education curriculum is thus formed of three entities: 1) Pedagogical studies, 2) Subject-specific studies 3) Compulsory studies. Competence areas and competencies have been defined separately for each entity.

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| **3.1. Pedagogical and Generic Competence Areas/Learning Outcomes** |
| * **Competence area for pedagogy and didactics**  1. Pre-service teachers have basic knowledge and understanding of learning and students and are able consider the diversity of students in learning/teaching process and support their well-being in psychologically and ethically sound manner considering their life and learning contexts. 2. Pre-service teachers are capable to design, implement, assess, and develop learning and guidance processes in different kinds of learning environments in a pedagogically meaningful way including ability to utilize different digital resources in a manner that supports learning.  * **Competence area for interaction**  1. Pre-service teachers are able to communicate in different interactive relationships and partner networks in a meaningful manner both in face-to-face and online settings with regard to the goals set for the activity in question. 2. Pre-service teachers are capable of working in different collaboration networks and have the ability to create new relationships that are appropriate for the development of one's own and one's community activities. 3. Pre-service teachers are able to teach in accordance with the tri-lingual approach in secondary education and participate in the global professional community.  * **Competence area for teachers´ work environment**  1. Pre-service teachers are familiar with the international and national agreements and documents as well as legislation that affects his/her institution´s and his/her work. 2. Pre-service teachers are able to (a) to perceive his / her own activities in relation to the activities of his/her organization, and (b) work in a meaningful way to create positive relationships between the partners outside the school (families, regional actors, working life).  * **Competence area for professional development**  1. Pre-service teachers are able to reflect and critically assess their values, attitudes, ethical principles and work methods as a teacher and are able to set new goals to his/her own and his/her organization´s pedagogical development. 2. Pre-service teachers are able to develop his / her own and his / her organization's pedagogical activities in relation to the anticipated changes at regional, national and international level. 3. Pre-service teachers are able to produce, seek and critically select theoretical knowledge that, combined with experiential knowledge, serves the development of both him/her and his/her community's theory-in-use, and the ability and willingness to use knowledge to promote learning and own professional growth. |
| **3.2 Subject-specific and Generic Competence Areas/ Learning Outcomes** |
| * **Competence area of cognitive skills development**  1. Pre-service teachers demonstrate strong academic and practical knowledge in the field of physics (natural sciences); 2. Pre-service teachers possess forms and methods of scientific cognition, various ways of mastering the surrounding world, understands the role of science in the development of society 3. Pre-service teachers understand the scientific principles and logic of the development of the school physics course  * **Competence area for the development of practical and research skills**  1. Pre-service teachers have the theoretical knowledge necessary to analyze the problem situation, the structure of the problem, algorithms for solving physical problems 2. Pre-service teachers are able to conduct scientific research in the chosen field of experimental and (or) theoretical physical research with the help of modern instrumentation and information technology, taking into account domestic and foreign experience 3. Pre-service teachers are able to apply modern methods of processing, analysis and synthesis of physical information in their chosen field of physical research 4. Pre-service teachers are able to use the theoretical foundations of planning physical research in practice  * **Competence area for the interdisciplinary interactions development**  1. Pre-service teachers are proficient and able to apply basic mathematical concepts and operations in solving physical problems 2. Pre-service teachers are able to implement analytical and technological solutions in the field of experimental and theoretical physics 3. Pre-service teachers are able to conduct integrated lessons with elements of STEM learning 4. Pre-service teachers are able to work in interdisciplinary teams, have the skills to apply scientific knowledge in solving social problems. 5. Pre-service teachers own different learning technologies and apply them in their diversity and to the place |
| **3.3 Compulsory component: Competence Areas/Learning Outcomes** |
| * **Competence area for worldview, historical, and moral development**    1. Pre-service teachers are able to assess the surrounding reality on the basis of ideological positions, formed by a knowledge of the fundamentals of philosophy, which provide scientific understanding and study of the natural and social world by methods of scientific and philosophical knowledge.   2. Pre-service teachers are capable to interpret the content and specific features of the mythological, religious and scientific worldview   3. Pre-service teachers have deep understanding and scientific analysis of the main stages, patterns and characteristics of the historical development of Kazakhstan.   4. Pre-service teachers are able to analyse the causes and consequences of the events in the history of Kazakhstan. * **Competence area for social, cultural, and civic development**    1. Pre-service teachers are able to develop their own moral and civic position and able to operate with the social, business, cultural, legal and ethical norms of society.   2. Pre-service teachers have knowledge and understanding of the basics of socio-political, economic and legal studies and are able to demonstrate personal and professional competitiveness.   3. Pre-service teachers are able to assess situations and provide arguments for their own assessments of developments in the social and work environment. * **Competence area for interpersonal social and professional communication**   1. Pre-service teachers are able to assess situations in various spheres of interpersonal, social and professional communication and enter into communication in oral and written forms in Kazakh, Russian and foreign languages.   2. Pre-service teachers are able to use in their personal activities various types of information and communication technologies: Internet resources, cloud and mobile services for searching, storing, processing, protecting and distributing information.   3. Pre-service teachers are able to maintain a healthy lifestyle to achieve productive social and professional activities through the methods and means of physical education.   4. Pre-service teachers are able to select methodology and analysis, use scientific research methods and techniques, and synthesise new knowledge. |

# 4. Program structure and learning outcomes

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| 4.1. Structure of the pedagogical component |
| The extent of the Pedagogical Component shall be 60 academic credits, including teaching practice. This component is common for all curricula in initial teacher education. The Pedagogical Component has been jointly created by all the involved universities in a collaborative design process. The component is flexible and leaves space for individual universities to implement it according to their specific situation and needs.  The overall structure of the pedagogical studies component:   |  |  | | --- | --- | | **Module name and main disciplines** | **Academic credits** | | **SUPPORTING LEARNERS AS INDIVIDUALS** | **17** | | Psychology in Education and Concepts of Interaction and Communication | 4 | | Educational Science and Key Theories of Learning | 3 | | Age and Physiological Features of the Development of Children | 3 | | Inclusive Educational Environment | 3 | | Teaching Planning and Individualization of Learning | 4 | | **TEACHING AND ASSESSMENT FOR LEARNING** | **9** | | Teaching Methods and Technologies | 5 | | Assessment and Development | 4 | | **TEACHER AS A REFLECTIVE PRACTITIONER** | **9** | | Pedagogical Research | 4 | | Research, Development and Innovation | 5 | | **TEACHER AS A FACILITATOR OF LEARNING (PEDAGOGICAL PRACTICE)** | **25** | | Introduction to the teaching profession (1st year pedagogical practice) | 2 | | Psychological and pedagogical assessment (2nd year pedagogical practice) | 2 | | Pedagogical approaches (3rd year pedagogical practice) | 6 | | Research and innovation in education (4th year pedagogical practice) | 15 | | **Total academic credits** | **60** |   The modules, courses, their learning outcomes, and relation to competence areas in more detail:   |  | | --- | | **Supporting learners as individuals 17 Academic credits** | | This module provides an overview of psychological theories, concepts, and models which help to understand the pupils’ individual needs and individual differences in learning. The module provides the pre-service teachers with competences to acknowledge individualization of learning and the diversity of learners in teaching. The module highlights the importance of enhancing learner well-being through creating and maintaining a psychologically safe educational environment. |  |  |  | | --- | --- | | Course title | **Psychology in Education and Concepts of Interaction and Communication** | | Component | Pedagogical component | | Cycle | Core disciplines | | Module | Supporting learners as individuals 17 Academic credits | | Academic credits | 4 | | Course / competence description | The purpose of this course is to improve the following areas of pedagogical competence:   * Competence area for pedagogy and didactics (1) * Competence area for interaction (3, 4)   Pre-service teachers are familiar with the modern psychological theories and models, as well as personality functioning and individual properties. They can apply the knowledge in their teaching in diverse educational contexts. Pre-service teachers support positive development of learners by fostering dialogue, interaction, and communication in the educational process. They are able to communicate, interact, and collaborate with pupils’ families as well as in various other partnership networks and create new relationships suitable for the development of their own pedagogical activity. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * understand the basic concepts and terms of educational psychology, and the main practical applications of psychological knowledge; * understand the patterns, facts, and phenomena of cognitive and personal development of a person in the processes of education and upbringing; * apply an integrated approach to design, implementation, evaluation, and development of educational environments; * understand the concept of continuous learning as a part of the process of cognitive and personal development of a person. * apply basic communication and interaction concepts and theories at the individual, community, and network levels; * select the methods of communication and interaction that are most appropriate to facilitate learning in various forms (offline, online, blended, hybrid); * recognize the patterns of group dynamics and act in ways that promote community development and well-being. |  |  |  | | --- | --- | | Course title | **Educational Science and Key Theories of Learning** | | Component | Pedagogical component | | Cycle | Core disciplines | | Module | Supporting learners as individuals 17 Academic credits | | Academic credits | 3 | | Course / competence description | The purpose of this course is to improve the following areas of pedagogical competence:   * Competence area for pedagogy and didactics (1, 2)   Pre-service teachers explore the basics of educational science such as the conceptions of man leading to various learning theories and pedagogical models. Based on their understanding of the theoretical concepts, pre-service teachers are able to make appropriate pedagogical choices for various learning situations. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * distinguish between concepts of human and their importance for understanding learning and the design of an educational process; * differentiate between learning theories and their importance for understanding learning and the design of an educational process; * apply learning theories and pedagogical models suitable for versatile learning processes. |  |  |  | | --- | --- | | Course title | **Age and Physiological Features of the Development of Children** | | Component | Pedagogical component | | Cycle | Core disciplines | | Module | Supporting learners as individuals 17 Academic credits | | Academic credits | 3 | | Course/ competence description | The purpose of this course is to improve the following areas of pedagogical competence:   * Competence area for pedagogy and didactics (2)   Pre-service teachers are familiar with the formation of psyche, its functioning, and the patterns of development. Pre-service teachers can observe the development of their students, and accordingly, plan and implement age-appropriate learning processes considering individual needs of students. Pre-service teachers act creatively and appropriately in different situations and support learning and well-being of the learners. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * recognize the individual starting points of different students, their learning potential and specific support needs; * consider the individual needs of their students for specific support, guidance, teaching and assessment; * introduce various methodological solutions for inclusion and for providing specific support. |  |  |  | | --- | --- | | Course title | **Inclusive Educational Environment** | | Component | Pedagogical component | | Cycle | Core disciplines | | Module | Supporting learners as individuals 17 Academic credits | | Academic credits | 3 | | Course / competence description | The purpose of this course is to improve the following areas of pedagogical competence:   * Competence area for pedagogy and didactics (2) * Competence area for teachers´ work environment (6, 7)   Pre-service teachers have the ability to consider the diversity of learners and identify their individual needs in the learning / teaching process. Pre-service teachers support students’ learning and inclusion in the educational process by using suitable ICT, teaching and assistive technologies. Pre-service teachers maintain students’ well-being from psychological and ethical perspective in collaboration with the community (teachers, students, parents/guardians) considering the context of students’ life and learning. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * identify the individual educational needs that affect participation and learning in a diverse group of students; * use ICT and assistive technologies to support students’ learning and inclusion in the educational process. * teach values and attitudes beneficial to collaboration and inclusivity; * support collaboration in the community (teachers, students, parents/guardians). |  |  |  | | --- | --- | | Course title | **Teaching Planning and Individualization of Learning** | | Component | Pedagogical component | | Cycle | Core disciplines | | Module | Supporting learners as individuals 17 Academic credits | | Academic credits | 4 | | Course / competence description | The purpose of this course is to improve the following areas of pedagogical competence:   * Competence area for pedagogy and didactics (1, 2)   Pre-service teachers are familiar with the curriculum in their area of teaching and the guiding pedagogical principles and cross-cutting development themes of a specific level of education, such as entrepreneurship and sustainable development. Pre-service teachers possess the necessary skills of individualization of teaching, considering the diversity of students and their inclusion to the learning process, as well as the use of teaching technologies, based on pedagogical and independent research. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * understand the main principles and requirements of the curriculum in their area of teaching and apply them in planning and conducting educational activities; * identify factors and conditions that affect students’ learning; * apply in practice the principles of inclusion as well as individualized teaching and guidance (adapting curricula, developing differentiated lessons) by considering the needs of the students and support the development of their personality and self-esteem, including career guidance. |  |  | | --- | | **Teaching and assessment for learning 9 Academic credits** | | This module provides the teacher students with competencies to carry out interactive and student-centered teaching and assessment aligned with learning objectives. The module highlights the use of digital tools and technologies and the ability to update and apply teaching technologies in the context of ongoing changes in the society and the educational environment. This module supports the pre-service teachers’ competence to communicate and collaborate in various partnership networks to enhance own pedagogical activity. |  |  |  | | --- | --- | | Course title | **Teaching Methods and Technologies** | | Component | Pedagogical component | | Cycle | Core disciplines | | Module | Teaching and assessment for learning 9 Academic credits | | Academic credits | 5 | | Course / competence description | The purpose of this course is to improve the following areas of pedagogical competence:   * Competence area for pedagogy and didactics (1, 2)   Pre-service teachers have a comprehensive understanding of teaching strategies and methodologies, and can apply them in planning, teaching, and assessment in innovative ways matching the specific pedagogical situations, conditions of a specific school and the capabilities of students. Pre-service teachers are able to design suitable inclusive physical and online learning environments at different stages of the educational process. Pre-service teachers understand and can apply the regulations of copyright and data protection in their learning material planning. Pre-service teachers possess necessary knowledge of didactics, learning technologies and methods of motivating students being able to provide necessary pedagogical assistance to students. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * select pedagogical models suitable for teaching; * apply teaching methods in a creative and varied manner, considering the opportunities offered by learning technologies; * use a suitable inclusive learning environment in their teaching; * acknowledge and apply the norms and principles of copyright and data protection; * apply guidance methods to motivate students and to support their learning achievements. |  |  |  | | --- | --- | | Course title | **Assessment and Development** | | Component | Pedagogical component | | Cycle | Core disciplines | | Module | Teaching and assessment for learning 9 Academic credits | | Academic credits | 4 | | Course / competence description | The purpose of this course is to improve the following areas of pedagogical competence:   * Competence area for pedagogy and didactics (2)   Pre-service teachers have a thorough understanding of the meaning of assessment in learning process and are able to provide constructive assessment in ethical manner in different phases of learning processes and engage learners in assessment. Pre-service teachers identify, differentiate, and use different assessment technologies, principles, stages, and assessment tools in their own field of expertise (including formative and summative assessment and self-and peer- assessment, etc). They can critically evaluate and analyze their understanding and practices concerning assessment and develop them further. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * use and apply a variety of methods and tools of assessment and feedback (formative and summative assessment); * apply pedagogical principles in defining and recognizing competence levels of learners; * understand the importance and support the development of students’ self- and peer-assessment skills. |  |  |  | | --- | --- | | **Teacher as a reflective practitioner 9 Academic credits** | | | This module focuses on the methodological foundations of pedagogy, and it provides understanding of how pedagogical research informs teaching practices. The module helps the pre-service teachers to develop their reflection skills to become aware of themselves as teachers and to develop their own teaching as well as the ability to set new goals for pedagogical development to ensure lifelong learning. The module also addresses the ethical aspects of the teachers’ work and its development. |  |  |  | | --- | --- | | Course title | **Pedagogical Research** | | Component | Pedagogical component | | Cycle | Core disciplines | | Module | Teacher as a reflective practitioner 9 Academic credits | | Academic credits | 4 | | Course / competence description | The purpose of this course is to improve the following areas of pedagogical competence:   * Competence area for professional development (10)   This course provides pre-service teachers with a theoretical foundation on pedagogical research. Pre-service teachers possess skills to seek and critically select theoretical knowledge from various reliable sources, utilize research findings in the development their pedagogical thinking and practice, and adopt willingness to promote research-based learning and education as well as their own continuing development and professional growth. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * recognize the nature of pedagogy and its basic terminology; * identify the central areas of research in pedagogy and understand the difference between everyday thinking and scientific knowledge; * follow the changes in the field of education and consider how they influence own work as a teacher. |  |  |  | | --- | --- | | Course title | **Research, Development, and Innovation** | | Component | Pedagogical component | | Cycle | Core disciplines | | Module | Teacher as a reflective practitioner 9 Academic credits | | Academic credits | 5 | | Course / competence description | The purpose of this course is to improve the following areas of pedagogical competence:   * Competence area for professional development (8, 9) * Competence area for interaction (5)   To stay up-to-date and be able to continuously develop themselves and their work, pre-service teachers acquire new research-based knowledge and conduct practice-based research in an ethical manner in various networks concerning the development of education and teacher profession, innovative approaches to learning, as well as learning and guidance of students. Pre-service teachers adopt development-oriented mindset and are able to develop, update and apply innovative teaching approaches and technologies in the context of ongoing changes in society and the educational environment.  Pre-service teachers design a small-scale research project to familiarize themselves with research-based development of their work as teachers. They identify their research topic/questions, conduct the literature review and design the methodology for the data collection and analysis, including ethical aspects of research. After the course, pre-service teachers are able to develop and update their pedagogical activities based on ethically conducted research and development and carry out or participate in research projects. They are also able to present their research and development results using various professional forms and channels. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * evaluate their own professional activities and work environment to find areas for improvement; * apply a research-based approach to their professional activities and carry out independent research work; * consider and apply ethical aspects of research procedures; * apply critical thinking in data collection and utilization for the development of initial teacher education; * participate in scientific design research and / or develop cooperation between universities and stakeholders; * document their own research activities and present the results using various forms of communication. |  |  |  | | --- | --- | | **Teacher as a facilitator of learning (Pedagogical practice) 25 Academic credits** | | | This module focuses on the transformation of theoretical knowledge into practical skills through two pedagogical practice periods/courses, as well as the formation of a teacher’s professional identity that meets the requirements of teaching profession today and in the future. During the module, pre-service teachers also establish practice-based research skills promoting the continuous process of professional growth.  Pedagogical practice is organized in four periods/courses, one per study year, and each having their specific learning outcomes where the competences of pre-service teachers are progressively deepened from orientation and observation to designing educational processes and conducting own lessons, and developing own work environment through practice-based research activities.  All practice periods have some prerequisites and pre-service teachers must have completed a certain amount of subject and/or pedagogical studies before they can conduct their pedagogical practice, the number of credits may vary between the faculties and/or educational programmes. |  |  |  | | --- | --- | | Course title | **Introduction to the teaching profession (1st year pedagogical practice)** | | Component | Pedagogical component | | Cycle | Core disciplines | | Module | Teacher as a facilitator of learning 25 Academic credits | | Academic credits | 2 | | Course / competence description | The purpose of this course is to improve the following areas of pedagogical competence:   * competence area for pedagogy and didactics​ (1, 2) * competence area for interaction (3, 4, 5) * competence area for teachers´ work environment (6, 7) * competence area for professional development (8, 9, 10)   Pre-service teachers familiarize themselves with the educational process and the context of the educational institution and its adaptation to the conditions of future professional activity.  The prerequisite for the course is that the Pre-service teachers have completed the courses "*Psychology in Education and Concepts of Interaction and Communication*" and "*Age and physiological features of the development of children*" of the pedagogical component before entering their first pedagogical practice. | | Learning outcomes | **Pre-service teachers** **who demonstrate competence can:**   * understand the regulatory and legislative framework of the education system of the Republic of Kazakhstan, and the documents regulating educational institutions; * distinguish the main documents for maintaining school records (work plans of the educational institution, Kundelik electronic diary, short-term, medium-term and long-term lesson planning, etc.); * comprehend the theoretical and applied aspects of pedagogy and educational psychology in the educational process at school considering social, age, psychophysical and individual characteristics of students, as well as their special educational needs. |  |  |  | | --- | --- | | Course title | **Psychological and pedagogical assessment (2nd year pedagogical practice)** | | Component | Pedagogical component | | Cycle | Core disciplines | | Module | Teacher as a facilitator of learning 25 Academic credits | | Academic credits | 2 | | Course / competence description | The purpose of this course is to improve the following areas of pedagogical competence:   * competence area for pedagogy and didactics​ (1, 2) * competence area for interaction (3, 4, 5) * competence area for teachers´ work environment (6, 7) * competence area for professional development (8, 9, 10)   Pre-service teachers familiarize themselves with the features of the integral pedagogical process of an educational institution and the formation of analytical-reflexive, research, design, and other skills in the field of psychological and pedagogical support of the educational process.  The prerequisite for the course is that the Pre-service teachers have completed the course "*Pedagogical Research*" of the pedagogical component before entering their second pedagogical practice. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * + comprehend the psychological and pedagogical foundations of teaching strategies (critical thinking, functional literacy, collaborative learning, self-education, self-improvement, criteria-based learning);   + apply psychological and pedagogical diagnostic methods to evaluate the needs of a group of students, and understand how the support processes of the student welfare services function in schools;   + understand teacher’s work from the socio-pedagogical aspect and reflect own professional identity as a future teacher;   + establish effective dialogue to reinforce students’ positive and responsible learning behaviours;   + collaborate with all stakeholders of the educational process;   + analyze and develop a holistic pedagogical process in its various forms (lesson, seminar, round table, debate, etc.), and conduct various forms of subject-related extracurricular activities. |  |  |  | | --- | --- | | Course title | **Pedagogical approaches** **(3rd year pedagogical practice)** | | Component | Pedagogical component | | Cycle | Core disciplines | | Module | Teacher as a facilitator of learning 25 Academic credits | | Academic credits | 6 | | Course / competence description | The purpose of this course is to improve the following areas of pedagogical competence:   * competence area for pedagogy and didactics​ (1, 2) * competence area for interaction (3, 4, 5) * competence area for teachers´ work environment (6, 7) * competence area for professional development (8, 9, 10)   During this course, pre-service teachers go through a comprehensive professional development where they improve in practice their professional practices and develop their pedagogical and subject-specific competences necessary for a teacher (preschool teacher, primary school teacher, subject teacher, assistant class teacher / curator).  The prerequisite for the course is that the Pre-service teachers have completed the courses "*Methods and Technologies of Teaching*", "*Assessment and Development*", and "*Inclusive Educational Environment*" of the pedagogical component before entering their third pedagogical practice. | | Learning outcomes | **Pre-service teachers** **who demonstrate competence can:**   * + design and organize independently a constructive and inclusive educational process;   + choose purposeful and suitable learning materials, innovative pedagogical approaches, and active teaching considering also the use of educational technologies and digital environments;   + apply subject-specific knowledge and didactics;   + apply formative and summative assessment methods and techniques, and support the development of students’ reflection, self- and peer-assessment skills;   + establish dialogical atmosphere with all stakeholders of the educational process to solve problems and conflict situations and to promote safe learning environment. |  |  |  | | --- | --- | | Course title | **Research and innovation in education (4th year pedagogical practice)** | | Component | Pedagogical component | | Cycle | Core disciplines | | Module | Teacher as a facilitator of learning 25 Academic credits | | Academic credits | 15 | | Course / competence description | The purpose of this course is to improve the following areas of pedagogical competence:   * competence area for pedagogy and didactics​ (1, 2) * competence area for interaction (3, 4, 5) * competence area for teachers´ work environment (6, 7) * competence area for professional development (8, 9, 10)   The course focuses on establishing pre-service teachers’ developmental approach towards their own professional activities and work environment. The course also emphasizes the development of pre-service teachers’ collaborative, problem-solving and leadership skills. They deepen their pedagogical skills and develop research skills as well as practical skills (didactics) in accordance with their area of specialization.  During this practice period pre-service teachers also collect and analyze data,test the hypothesis, or make experimentationsaccording to the research plan created in the course *“Research, Development, and Innovation”.* They make conclusions and explorevarious forms and channels of communicating the research results in a professional manner.  The prerequisite for the course is that the Pre-service teachers have completed the courses "*Teaching planning and individualization of learning*" and "*Research, development and innovation*" of the pedagogical component. | | Learning outcomes | **Pre-service teachers** **who demonstrate competence can:**   * + design and organize independently a constructive and inclusive educational process to test hypothesis, make pedagogical experimentations and/or collect data according to their research plan;   + apply innovative teaching and learning strategies, and methods and tools for designing, conducting and assessing an educational process and/or extracurricular activities based on long-term, medium-term, short-term lesson / lesson plans, and educational and out-of-class activities in the subject;   + analyze the results of their experimentations and/or data collected and draw conclusions;   + document their research activities and present the results in a professional manner using various forms of communication;   + evaluate their professional activities in relation to the activities of the organization and through experimentations and practice-based research create ideas for improvement of their work and their work environment. | |
| 4.2 Structure of the subject component |
| |  |  | | --- | --- | | **Module name and main disciplines** | **Academic credits** | | **GENERAL PHYSICS: PHYSICAL LAWS IN THE SURROUNDING WORLD** | **30** | | **University Component** | **30** | | Mechanics | 6 | | Molecular physics and thermodynamics | 6 | | Electricity and magnetism | 6 | | Optics | 6 | | Physics of the atom and atomic nucleus | 6 | | **FUNDAMENTAL PHYSICS** | **15** | | **University Component** | **15** | | Methods of mathematical physics | 3 | | Theoretical Physics 1 | 6 | | Theoretical Physics 2 | 6 | | **RESEARCH IN PHYSICS: OBSERVATION, EXPERIMENT, HYPOTHESES** | **15** | | **University Component** | **15** | | Laboratory Workshop on Mechanics | 3 | | Laboratory Workshop on Molecular Physics and Thermodynamics | 3 | | Laboratory Workshop on Electricity and Magnetism | 3 | | Laboratory Workshop on Optics | 3 | | Laboratory Workshop on Physics of the atom and atomic nucleus | 3 | | **THEORY AND TECHNOLOGIES OF TEACHING PHYSICS** | **24** | | **University Component** | **24** | | Methods of teaching Physics | 6 | | Workshop on Solving physical problems 1 | 5 | | Workshop on Solving physical problems 2 | 5 | | School physics experiment | 5 | | Digital technologies in education | 3 | | **INTERSUBJECT INTERACTIONS** | **32** | | **University Component** | **23** | | Linear algebra and analytic geometry | 5 | | Mathematical analysis | 5 | | Astronomy | 4 | | Programming | 5 | | Electronics | 4 | | **Optional Component** | **9** | | Educational Robotics | 5 | | Physics and Education of Sustainable Development | | Project Based Approach in Science Education | 4 | | Physics in STEM | | **FINAL ATTESTATION** | **8** | | **Total ECTS** | **124** |  |  | | --- | | **General Physics: Physical laws in the surrounding world 30 academic credits** | | Physics studies the simplest forms of matter motion. Knowledge of its laws makes it possible for pre-service teachers to form a worldview to understand the connection between the development of physical science and the scientific and technological progress of mankind. They examine the physical forms of matter and motion which are the basis of the more complex chemical and biological forms of physics. The module prepares pre-service teachers for the investigation of deeper foundations of fundamental physics, which is more widely included in the content of the secondary school curriculum. |  |  |  | | --- | --- | | Course title | **Mechanics** | | Component | Subject Component, University Component | | Cycle | Major disciplines | | Module | General Physics: Physical laws in the surrounding world 30 academic credits | | Academic credits | 6 | | Course/ Competence description | The purpose of this course is to improve the following areas of subject competence:   * + Competence area of cognitive skills development (1,2,3)   + Competence area for the development of practical and research skills (4,7)   + Competence area for the interdisciplinary interactions development (8,12)   During the course, pre-service teachers develop their competences related to the use of modern theoretical concepts in mechanics. They also develop their skills based on the theoretical knowledge acquired, enabling the creative creation and application of physical models to solve research on the properties of mechanical objects. Pre-service teachers develop their independent work skills including the study of algorithms, tools and means necessary to solve mechanics problems. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * use the methods of physical research to study mechanical motion; * solve problems using SRT, Newton's laws, the law of Universal gravitation, the laws of conservation of momentum and energy to determine and calculate the trajectory of an absolutely rigid body; * calculate the motion of a body in arbitrary reference systems; * analyze traffic graphs; * evaluate the results of experiments on mechanics; * apply the laws of mechanics in solving practical problems. |  |  |  | | --- | --- | | Course title | **Molecular physics and thermodynamics** | | Component | Subject Component, University Component | | Cycle | Major disciplines | | Module | General Physics: Physical laws in the surrounding world 30 academic credits | | Academic credits | 6 | | Course/ Competence description | The purpose of this course is to improve the following areas of subject competence:   * + Competence area of cognitive skills development (1,2,3)   + Competence area for the development of practical and research skills (4,7)   + Competence area for the interdisciplinary interactions development (8,12)   During the course, pre-service teachers are introduced to the basics of molecular-kinetic theory and thermodynamics. They examine the basic models of molecular physics, models and regularities of ideal and real gases, and the classical distribution of molecules. They also explore the methods of thermodynamics, basic thermodynamic relations, and modern concepts in thermodynamics and molecular physics. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * understand the main classical and modern experimental results in the field of thermal phenomena, transport phenomena, and phase transitions; * apply statistical and thermodynamic methods to the description of physical phenomena associated with the atomic-corpuscular structure of matter; * establish the relationship of molecular phenomena with other sections of physics, as well as the relationship with physical chemistry; * solve and analyze physical problems of molecular physics and thermodynamics. |  |  |  | | --- | --- | | Course title | **Electricity and magnetism** | | Component | Subject Component, University Component | | Cycle | Major disciplines | | Module | General Physics: Physical laws in the surrounding world 30 academic credits | | Academic credits | 6 | | Course/ Competence description | The purpose of this course is to improve the following areas of subject competence:   * + Competence area of cognitive skills development (1,2,3)   + Competence area for the development of practical and research skills (4,7)   + Competence area for the interdisciplinary interactions development (8,12)   During the course, pre-service teachers are introduced to the electrical, magnetic and electromagnetic phenomena. They develop a modern scientific outlook on the nature of electric and magnetic fields, the electromagnetic field and the basic laws of electromagnetism. They also develop their independent work skills including the study of algorithms, tools and instruments necessary to solve problems of electricity and magnetism. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * analyze physical knowledge in the field of basic laws relating to the interaction of stationary electric charges, the movement of charges in conductors and magnetic fields of currents, understanding the electromagnetic properties of materials and the relationship of electrical and magnetic phenomena within the framework of Maxwell's classical theory of the electromagnetic field; * understand the manifestation of physical laws in the surrounding world and their application in practical problems and role in scientific and technological progress; * apply the laws of electrodynamics in solving physical problems; * calculate the main electromagnetic parameters, electrostatic and magnetic fields generated by static and moving charges in various simple configurations; * use the educational laboratory instruments to demonstrate physical phenomena. |  |  |  | | --- | --- | | Course title | **Optics** | | Component | Subject Component, University Component | | Cycle | Major disciplines | | Module | General Physics: Physical laws in the surrounding world 30 academic credits | | Academic credits | 6 | | Course/ Competence description | The purpose of this course is to improve the following areas of subject competence:   * + Competence area of cognitive skills development (1,2,3)   + Competence area for the development of practical and research skills (4,7)   + Competence area for the interdisciplinary interactions development (8,12)   During the course, pre-service teachers are introduced to the physical phenomena associated with the laws of light propagation and its interaction with matter. They form their understanding of the basic concepts and laws of optics, as well as optical research methods. They also learn skills in simple practical calculations. Pre-service teachers also develop their skills in independent and experimental work involving the solution of problems in optics. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * apply in professional activities the knowledge of the features of light as a physical object, development of ideas about the nature of light, the dualism of its properties, manifestations of wave, electromagnetic and quantum nature; * use the principles of operation and design of modern experimental equipment for the study of optical phenomena and matter using optical methods; * apply mathematical models of the simplest optical phenomena and use the mathematical apparatus available to study these models; * apply the general laws of physics to solve specific problems in optics and interdisciplinary boundaries of optics with other fields of knowledge; * calculate and evaluate the main parameters in the interaction of light with matter; * use the simplest measuring instruments to demonstrate physical phenomena in optics. |  |  |  | | --- | --- | | Course title | **Physics of the atom and atomic nucleus** | | Component | Subject Component, University Component | | Cycle | Major disciplines | | Module | General Physics: Physical laws in the surrounding world 30 academic credits | | Academic credits | 6 | | Course/ Competence description | The purpose of this course is to improve the following areas of subject competence:   * + Competence area of cognitive skills development (1,2,3)   + Competence area for the development of practical and research skills (4,7)   + Competence area for the interdisciplinary interactions development (8,12)   During the course, pre-service teachers investigate the basics of the theoretical description of the properties of atomic nuclei. They explore the methods of describing the properties of elementary particles and interactions. Pre-service teachers become familiar with modern models of the formation of the universe and the evolution of stars. They acquire practical skills in calculating the properties of atomic nuclei and particles. They also practice simplest practical calculations on atomic and atomic nucleus physics. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * develop students’ understanding of the principles of classifications of elementary particles; * use methods and techniques to solve specific problems in the field of nuclear physics and elementary particle physics; * apply the basic principles of the quantum theory of the atom to solve the basic problems of atomic physics. |  |  | | --- | | **Fundamental physics 15 academic credits** | | During the module, pre-service teachers theoretically summarize their knowledge from the module "General Physics: Physical laws in the surrounding world" to give students a unified physical picture of the world. Pre-service teachers practice mathematical research methods and mathematical concepts used to solve specific problems related to the main theoretical content areas. Pre-service teachers develop a solid theoretical basis for teaching physics in secondary school. |  |  |  | | --- | --- | | Course title | **Methods of mathematical physics** | | Component | Subject Component, University Component | | Cycle | Major disciplines | | Module | Fundamental physics 15 academic credits | | Academic credits | 3 | | Course/ Competence description | The purpose of this course is to improve the following areas of subject competence:   * + Competence area of cognitive skills development (1,2,3)   + Competence area for the development of practical and research skills (4,6,7)   + Competence area for the interdisciplinary interactions development (8,9)   During the course, pre-service teachers explore the basics of field theory and the necessary mathematical methods. They examine the main types of partial differential equations used in physical problems, including nonlinear equations, and types of special functions of mathematical physics and their properties, as well as the basics of the finite difference method. Pre-service teachers also develop their abilities in building mathematical models of physical phenomena and analytical and numerical problem solving. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * bring linear equations with two independent variables to canonical form; * apply analytical methods for solving partial differential equations to describe the processes of wave propagation, and the phenomena of heat conduction and diffusion; * apply methods of complex analysis, such as contour integrals and analytic continuation, to the study of special functions of mathematical physics; * analyze information in the required format from various sources and databases using the methods of mathematical physics. |  |  |  | | --- | --- | | Course title | **Theoretical Physics 1** | | Component | Subject Component, University Component | | Cycle | Major disciplines | | Module | Fundamental physics 15 academic credits | | Academic credits | 6 | | Course/ Competence description | The purpose of this course is to improve the following areas of subject competence:   * + Competence area of cognitive skills development (1,2,3)   + Competence area for the development of practical and research skills (4,6,7)   + Competence area for the interdisciplinary interactions development (8,9)   During the course, pre-service teachers [create](https://ru.wikipedia.org/wiki/%D0%9F%D1%80%D0%B8%D1%80%D0%BE%D0%B4%D0%B0) theoretical (primarily mathematical) models of phenomena in classical [mechanics](https://ru.wikipedia.org/wiki/%D0%9C%D0%B0%D1%82%D0%B5%D0%BC%D0%B0%D1%82%D0%B8%D1%87%D0%B5%D1%81%D0%BA%D0%B0%D1%8F_%D0%BC%D0%BE%D0%B4%D0%B5%D0%BB%D1%8C) and electrodynamics comparing them with reality as the main way of understanding nature. Pre-service teachers explore the historical aspect: the development of fundamental physics as a generalization of experimental laws, their transformation from integral to differential form, the expression of physical content in the language of modern mathematics, and the development of physical science as stages of formation of fundamental theories: classical mechanics, thermodynamics, and Maxwell's electrodynamics. They also analyze the role of fundamental interactions (strong, electromagnetic, weak and gravitational) in the physical view of the world. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * classify fundamental concepts of analytic mechanics such as generalized coordinates and generalized momenta, phase space, Lagrange and Hamilton functions, relation between symmetries and conservative quantities (Noether's theorem), integrals of motion, and Poisson brackets; * use the Lagrange and Hamilton equations to analytically solve simple mechanical problems, such as the motion of a body in a central force field, and apply the calculus of variations to more complex problems; * understand the basic concepts, principles and laws of classical electrodynamics, the electronic theory of Lorentz, the interaction of an electromagnetic wave with matter, the dipole field; * apply Maxwell's equations in differential and integral forms when solving problems of electrodynamics, with the necessary calculations and mathematical transformations. |  |  |  | | --- | --- | | Course title | **Theoretical Physics 2** | | Component | Subject Component, University Component | | Cycle | Major disciplines | | Module | Fundamental physics 15 academic credits | | Academic credits | 6 | | Course/ Competence description | The purpose of this course is to improve the following areas of subject competence:   * + Competence area of cognitive skills development (1,2,3)   + Competence area for the development of practical and research skills (4,6,7)   + Competence area for the interdisciplinary interactions development (8,9)   During the course, pre-service teachers investigate the mathematical formulation of the laws of quantum and statistical phenomena observed experimentally. They also explore theoretical physics as a unified science, the internal connections which are established by analytical calculations or numerical calculations and comparison with experimental data. Pre-service teachers analyze the description of fundamental physical laws through the following six research areas:   1. Condensed matter theory of quantum, macroscopic and microscopic systems. The study of various states of matter and physical phenomena in them. Statistical physics and kinetic theory of equilibrium and nonequilibrium systems. 2. General relativity and relativistic astrophysics. Physical properties of matter and space-time in the Universe. Quantum cosmology and gravity. 3. Theory of fundamental interactions and quantum field theory. The study of phenomena at small scales and at high energies. Development of mathematical methods of field theory. 4. General questions of quantum mechanics: fundamentals, measurement theory, general scattering theory. Quantum theory of physical phenomena in nuclei, atoms and molecules. 5. Development of the theory of mesoscopic systems. Quantum information theory and quantum computing. 6. Development of theory and research of general properties and laws of nonlinear dynamics of strongly nonequilibrium systems. Development of the chaos and turbulence theory. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * formulate the basic concepts and postulates of quantum mechanics; * apply the Schrödinger equation and the Heisenberg relations to solve problems related to the simplest cases of microparticle motion; * define the relationship between classical and quantum mechanics; * distinguish what the canonical, microcanonical and grand canonical Gibbs distributions are, as well as Fermi-Dirac statistics and Bose-Einstein statistics, and the Fermi level; * analyze the relationship between the laws of motion of an individual particle and a system of particles. |  |  | | --- | | **Research in physics: observation, experiment, hypotheses 15 academic credits** | | The module is designed to help pre-service teachers better understand the basic physical patterns and acquire experimentation skills. Through the physical laboratory workshop pre-service teachers explore the main trends in the development of modern university physical experiment. During the module, pre-service teachers develop their professional competence in teaching students to apply physical knowledge in solving educational and olympiad problems in secondary school (basic, complete, variative) and additional education in physics. |  |  |  | | --- | --- | | Course title | **Laboratory workshop on Mechanics** | | Component | Subject Component, University Component | | Cycle | Major disciplines | | Module | Research in physics: observation, experiment, hypotheses 15 academic credits | | Academic credits | 3 | | Course/ Competence description | The purpose of this course is to improve the following areas of subject and pedagogical competence:   * + Competence area of cognitive skills development (1,2)   + Competence area for the development of practical and research skills (4,5,6,7)   + Competence area for the interdisciplinary interactions development (8,9,10,11)   + Competence area for pedagogy and didactics (1,2)   + Competence area for interaction (4)   + Competence area for professional development (8)   During the course, pre-service teachers explore the theory and practice of modern laboratory practice using modern laboratory equipment and mathematical software. They develop their skills in creatively performing and applying physical models for laboratory work. They also develop skills in independent work necessary to solve mechanics problems. After completing the course, pre-service teachers are able to creatively apply physical models in laboratory work and independently solve problems in mechanics. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * use basic theoretical knowledge in the field of mechanics to solve professional problems to demonstrate knowledge and understanding in the interpretation of phenomena and processes in nature and technology; * plan and carry out an experiment and process the results; * apply the laws of mechanics in solving practical and experimental problems; * analyze the results of experimental studies. |  |  |  | | --- | --- | | Course title | **Laboratory workshop on Molecular Physics and Thermodynamics** | | Component | Subject Component, University Component | | Cycle | Major disciplines | | Module | Research in physics: observation, experiment, hypotheses 15 academic credits | | Academic credits | 3 | | Course/ Competence description | The purpose of this course is to improve the following areas of subject and pedagogical competence:   * + Competence area of cognitive skills development (1,2)   + Competence area for the development of practical and research skills (4,5,6,7)   + Competence area for the interdisciplinary interactions development (8,9,10,11)   + Competence area for pedagogy and didactics (1,2)   + Competence area for interaction (4)   + Competence area for professional development (8)   During the course, pre-service teachers acquire modern knowledge and practical skills and research work in the field of molecular physics and thermodynamics. They master the methods of scientific research in the field of molecular physics and thermodynamics . After completing this course, pre-service teachers are able to competently and critically select a theoretical model for the observed phenomena. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * use the basic models of molecular physics, the laws of ideal and real gases, methods of thermodynamics to solve problems, to demonstrate knowledge and understanding in the interpretation of phenomena and processes in nature and technology; * apply the laws of molecular physics and thermodynamics in solving practical and experimental problems; * choose the appropriate methods for the analysis of the experiment; * collect, process and analyze scientific data. |  |  |  | | --- | --- | | Course title | **Laboratory workshop on Electricity and Magnetism** | | Component | Subject Component, University Component | | Cycle | Major disciplines | | Module | Research in physics: observation, experiment, hypotheses 15 academic credits | | Academic credits | 3 | | Course/ Competence description | The purpose of this course is to improve the following areas of subject and pedagogical competence:   * + Competence area of cognitive skills development (1,2)   + Competence area for the development of practical and research skills (4,5,6,7)   + Competence area for the interdisciplinary interactions development (8,9,10,11)   + Competence area for pedagogy and didactics (1,2)   + Competence area for interaction (4)   + Competence area for professional development (8)   During the course, pre-service teachers get acquainted with the physical phenomena and laws of electromagnetism in practice. They form professional competencies and skills in formulating, creating and applying physical models of electromagnetic phenomena for solving practical problems. Pre-service teachers develop a deep understanding of the concepts and laws of electromagnetism. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * use the basic laws of electromagnetism, demonstrate knowledge and understanding when interpreting phenomena and processes in nature and technology; * apply the laws of electricity and magnetism in solving practical and experimental problems; * design experimental systems using available instruments and equipment; * demonstrate critical thinking skills in applying knowledge of physics to an experimental process related to electricity and magnetism; * use electrical circuit simulation software. |  |  |  | | --- | --- | | Course title | **Laboratory workshop on Optics** | | Component | Subject Component, University Component | | Cycle | Major disciplines | | Module | Research in physics: observation, experiment, hypotheses 15 academic credits | | Academic credits | 3 | | Course/ Competence description | The purpose of this course is to improve the following areas of subject and pedagogical competence:   * + Competence area of cognitive skills development (1,2)   + Competence area for the development of practical and research skills (4,5,6,7)   + Competence area for the interdisciplinary interactions development (8,9,10,11)   + Competence area for pedagogy and didactics (1,2)   + Competence area for interaction (4)   + Competence area for professional development (8)   During the course, pre-service teachers observe the properties of light, find experimental confirmation of the laws of optics. They master the applied significance of the studied laws and the practical application of the laws of optics. By performing laboratory work, pre-service teachers obtain a deeper assimilation of optical knowledge and are provided with an opportunity to get acquainted with modern scientific equipment and to develop their skills in conducting a physical experiment. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * use the basic laws of optics, optical research methods, demonstrate knowledge and understanding in the interpretation of optical phenomena and processes in nature and technology; * apply the laws of optics in solving practical and experimental problems; * analyze the results of experimental studies and computational problems on mathematical models of optical phenomena, on the parameters of the interaction of light with matter; * understand the concepts of the optical field of physics; * conduct a systematic scientific analysis of problems (both natural and professional) of various levels of complexity. |  |  |  | | --- | --- | | Course title | **Laboratory workshop on Physics of the atom and atomic nucleus** | | Component | Subject Component, University Component | | Cycle | Major disciplines | | Module | Research in physics: observation, experiment, hypotheses 15 academic credits | | Academic credits | 3 | | Course/ Competence description | The purpose of this course is to improve the following areas of subject and pedagogical competence:   * + Competence area of cognitive skills development (1,2)   + Competence area for the development of practical and research skills (4,5,6,7)   + Competence area for the interdisciplinary interactions development (8,9,10,11)   + Competence area for pedagogy and didactics (1,2)   + Competence area for interaction (4)   + Competence area for professional development (8)   During the course, pre-service teachers acquire the skills of experimental research on the main issues of atomic and nuclear physics using modern multifunctional laboratory complexes. They apply computer simulation to implement Rutherford 's experiment on the scattering of α-particles by atoms and to study Compton scattering as well as a number of other related phenomena. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * use the basic laws of atomic and nuclear physics, practical skills in calculating the properties of atomic nuclei and particles, demonstrate knowledge and understanding when interpreting physical phenomena and processes in nature and technology; * apply laws and phenomena, methods and techniques for solving specific problems from the field of physics of the atom and the atomic nucleus in solving practical and experimental problems; * define the problem and formulate the hypothesis; * develop a basic experimental procedure to test the hypothesis. |  |  | | --- | | **Theory and technology of teaching physics 24 academic credits** | | Teaching physics requires systematic reflection of the features of physical science, its content and research methods combined with the main trends of modern pedagogical research and approaches. In particular, pre-service teachers need to pay attention to a shift from merely subject-related scientific knowledge towards a more holistic system of different interrelated types of knowledge (informational, procedural, evaluative, reflective) that characterize social and personal experience. During the module, pre-service teachers experiment with practical applications of teaching physics considering also the use of modern technologies in the learning process. |  |  |  | | --- | --- | | Course title | **Methods of Teaching Physics** | | Component | Subject Component, University Component | | Cycle | Major disciplines | | Module | Theory and technology of teaching physics 24 academic credits | | Academic credits | 6 | | Course/ Competence description | The purpose of this course is to improve the following areas of subject and pedagogical competence:   * + Competence area of cognitive skills development (1,2,3)   + Competence area for the development of practical and research skills (7)   + Competence area for the interdisciplinary interactions development (10,11,12)   + Competence area for pedagogy and didactics (1)   + Competence area for interaction (3,5)   + Competence area for teachers´ work environment (6,7)   + Competence area for professional development (8)   During the course, pre-service teachers combine knowledge about the content of physics in the secondary school curriculum and knowledge about the forms, methods and technologies of teaching to develop physics lessons, and teaching and assessment methods. They also conduct a scientific and methodological analysis of topics and sections of the school physics course. | | Learning outcomes | **Pre-service teachers demonstrating competence can:**   * choose the main content of physics from the secondary school educational program; * determine the place of the topic in the school physics course and analyze the structure and content of the topic under study ; * assess the readiness of students to study the topic; * identify the main difficulties in studying the topic and find ways to overcome them; * determine the range of methodological possibilities that contribute to the formation of physical knowledge among students. |  |  |  | | --- | --- | | Course title | **Workshop on solving physical problems 1** | | Component | Subject Component, University Component | | Cycle | Major disciplines | | Module | Theory and technology of teaching physics 24 academic credits | | Academic credits | 5 | | Course/ Competence description | The purpose of this course is to improve the following areas of subject and pedagogical competence:   * + Competence area of cognitive skills development (1,2,3)   + Competence area for the development of practical and research skills (4,6,7)   + Competence area for the interdisciplinary interactions development (8,9)   + Competence area for pedagogy and didactics (1,2)   + Competence area for professional development (8)   During the course, pre-service teachers develop their competences in the formation of students’ skills in solving physical problems, including general approaches to solving any physical problem. | | Learning outcomes | **Pre-service teachers demonstrating competence can:**   * determine the structure of the educational physical task (selection of elementary conditions, object and task requirements); * distinguish between classification features that underlie the typical structure of the problem being aware of the features of solving problems of various types; * solve problems and test tasks in various sections of the course of physics; * apply methods for solving problems in a particular situation and a method for constructing a physical model of the situation described in the problem; * carry out control actions to solve educational physical problems (control over the preparation of a plan for solving the problem and checking the result and its analysis). |  |  |  | | --- | --- | | Course title | **Workshop on solving physical problems 2** | | Component | Subject Component, University Component | | Cycle | Major disciplines | | Module | Theory and technology of teaching physics 24 academic credits | | Academic credits | 5 | | Course/ Competence description | The purpose of this course is to improve the following areas of subject and pedagogical competence:   * + Competence area of cognitive skills development (1,2,3)   + Competence area for the development of practical and research skills (4,6,7)   + Competence area for the interdisciplinary interactions development (8,9)   + Competence area for pedagogy and didactics (1,2)   + Competence area for professional development (8)   During the course, pre-service teachers deepen their knowledge of the subject through solving problems, consolidating knowledge about methods of solving problems and their application in practice. They master the methods of studying various natural phenomena and get acquainted with new progressive ideas and views with the discoveries of domestic scientists, and with the achievements of domestic science and technology, and new professions. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * use analytical, graphical and mathematical tools to solve problems; * solve problems and perform practical tasks from the school course, and justify the choice of completing the task; * understand the basic techniques for solving problems, exercise, self-control and self- assessment; * use practice-oriented tasks in teaching physics; * teach students to plan their actions in everyday life using the acquired knowledge of the laws of physics to preserve their health. |  |  |  | | --- | --- | | Course title | **School physics experiment** | | Component | Subject Component, University Component | | Cycle | Major disciplines | | Module | Theory and technology of teaching physics 24 academic credits | | Academic credits | 5 | | Course/ Competence description | The purpose of this course is to improve the following areas of subject and pedagogical competence:   * + Competence area of cognitive skills development (1,2,3)   + Competence area for the development of practical and research skills (4,5,6,7)   + Competence area for the interdisciplinary interactions development (9,10,11,12)   + Competence area for pedagogy and didactics (2)   + Competence area for interaction (5)   + Competence area for professional development (8)   During the course, pre-service teachers get acquainted with the methodology and techniques of conducting a school physical experiment. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * prepare and set out the experiment (select and place devices on the demonstration table in a certain logical order , combine installation elements); * analyze feasibility of the requirements for the experiments considering the possibilities of different means; * apply the methods and techniques of a physical experiment covering different aspects of the educational process, including the optimal and efficient technical implementation with the minimum expenditure of time and reliance on didactic principles. |  |  |  | | --- | --- | | Course title | **Digital technologies in education** | | Component | Subject Component, University Component | | Cycle | Major disciplines | | Module | Theory and technology of teaching physics 24 academic credits | | Academic credits | 3 | | Course/ Competence description | The purpose of this course is to improve the following areas of subject competence:   * + Competence area for the development of practical and research skills (7)   + Competence area for the interdisciplinary interactions development (10,11,12)   During the course, pre-service teachers develop their professional competences through the formation of a holistic view of the role of digital technologies in teaching physics. They build their skills in computer modeling of physical phenomena and processes, performing a virtual physical experiment, and creating digital educational resources for teaching physics. | | Learning outcomes | **Pre-service teachers demonstrating competence can:**   * use computer models of physical phenomena and processes in physics lessons; * conduct a virtual physical experiment; * use computer testing to check educational achievements; * create digital educational resources for the study of physics. |  |  | | --- | | **Interdisciplinary interactions 32 academic credits** | | This module develops the interdisciplinary connections, which are the basis of methodological development and effective assimilation of science. Pre-service teachers build their understanding that scientific areas such as mathematics, the language of physics, and physics itself cannot exist in isolation from each other, they need to be developed in interconnection at all times. For example, mathematics gives physics techniques and means of general and precise expression of physical dependencies between quantities that appear as a result of theoretical research or experiments. During the module, pre-service teachers develop a holistic view of information, information systems and technologies, and their role in the development of society, and build interdisciplinary classes themselves through e.g. project-based or STEM approach. |  |  |  | | --- | --- | | Course title | **Linear algebra and analytic geometry** | | Component | Subject Component, University Component | | Cycle | Major disciplines | | Module | Interdisciplinary interactions 32 academic credits | | Academic credits | 5 | | Course/ Competence description | The purpose of this course is to improve the following areas of subject competence:   * + Competence area of cognitive skills development (2)   + Competence area for the development of practical and research skills (4)   + Competence area for the interdisciplinary interactions development (8,9,10)   During the course, pre-service teachers develop their theoretical knowledge of the study of elements of vector algebra and analytical geometry. They also apply methods of solving problems applied to physics, mechanics, etc. | | Learning outcomes | **Pre-service teachers demonstrating competence can:**   * understand the basics of the theory of vector algebra and analytical geometry: the study of the method of coordinates, equations of lines on a plane, surfaces, surfaces in space; * solve problems related to the calculation of matrices, determinants and systems of linear equations; * solve problems of analytical geometry on the plane and in space; * operate with the mathematical apparatus of the theory of matrices, determinants and systems of linear equations, vector algebra, and problem solving methods. |  |  |  | | --- | --- | | Course title | **Mathematical analysis** | | Component | Subject Component, University Component | | Cycle | Major disciplines | | Module | Interdisciplinary interactions 32 academic credits | | Academic credits | 5 | | Course/ Competence description | The purpose of this course is to improve the following areas of subject competence:   * + Competence area of cognitive skills development (2)   + Competence area for the development of practical and research skills (4)   + Competence area for the interdisciplinary interactions development (8,9,10)   During the course, pre-service teachers acquire knowledge and skills of systemic thinking and fundamendal worldview. They explore the basic concepts and methods of the theory of limits, as well as differential and integral calculus of functions of one and several real variables. The course provides pre-service teachers a foundation for studying all mathematical and special disciplines and the knowledge and practical skills acquired in the course are used by pre-service teachers in the study of general professional disciplines, as well as in the performance of term papers and theses. | | Learning outcomes | **Pre-service teachers demonstrating competence can:**   * apply the basic provisions of the theory of limits and continuous functions, the basic theorems of differential and integral calculus of functions of one and several variables, the theory of numerical and functional series, the theory of integrals that depend on a parameter, the theory of implicit functions and its application to problems of conditional extremum, as well as field theory; * solve the main problems of calculating the limits of functions, and their differentiation and integration, as well as calculating integrals and expanding functions into series; * find the limit of a numerical sequence and the limit of a function, as well as the differentiation of a function of one variable, and the extremes necessary in professional activities. |  |  |  | | --- | --- | | Course title | **Astronomy** | | Component | Subject Component, University Component | | Cycle | Major disciplines | | Module | Interdisciplinary interactions 32 academic credits | | Academic credits | 4 | | Course/ Competence description | The purpose of this course is to improve the following areas of subject competence:   * + Competence area of cognitive skills development (1,2,3)   + Competence area for the development of practical and research skills (4,5,6,7)   + Competence area for the interdisciplinary interactions development (8,11)   During the course, pre-service teachers investigate the basic information about the celestial sphere and coordinate systems, the structure of the Solar System and the phenomena occurring in it, the structure of our Galaxy, the structure of the Universe - initial information about astrophysics and the methods of astronomical research. Pre-service teachers also become familiarized with the history of the development of ideas about the Universe. They build their modern scientific understanding of the structure of the Universe and the history of the development of astronomy. | | Learning outcomes | **Pre-service teachers demonstrating competence can:**   * understand the structure of the universe, including its basic and astronomical objects; * determine the location of the main constellations in the celestial sphere; * distinguish the relationship between physics, astronomy and geodesy; * understand the visible movements of celestial objects (stars, planets, moon, sun), astronomical phenomena based on the knowledge gained; * navigate the terrain by celestial objects using the simplest astronomical and geodetic methods; * apply methods for determining the positions of celestial bodies. |  |  |  | | --- | --- | | Course title | **Programming** | | Component | Subject Component, University Component | | Cycle | Major disciplines | | Module | Interdisciplinary interactions 32 academic credits | | Academic credits | 5 | | Course/ Competence description | The purpose of this course is to improve the following areas of subject competence:   * + Competence area for the development of practical and research skills (6)   + Competence area for the interdisciplinary interactions development (10,11)   During the course, pre-service teachers practice methods of using software tools to solve practical problems. They acquire knowledge and skills in the field of programming (on the example of one programming language). They also independently use new knowledge and skills in information technologies in practice. | | Learning outcomes | **Pre-service teachers demonstrating competence can:**   * understand the technologies and methods of developing algorithms and programs; * use the syntax and rules of a programming language; * set a task and develop an algorithm for solving it; * apply packages of existing application programs; * operate with basic methods and technologies of programming. |  |  |  | | --- | --- | | Course title | **Electronics** | | Component | Subject Component, University Component | | Cycle | Major disciplines | | Module | Interdisciplinary interactions 32 academic credits | | Academic credits | 4 | | Course/ Competence description | The purpose of this course is to improve the following areas of subject competence:   * + Competence area of cognitive skills development (1,2)   + Competence area for the development of practical and research skills (4,5,7)   + Competence area for the interdisciplinary interactions development (8,10)   During the course, pre-service teachers develop their theoretical knowledge of the physical foundations of the functioning of electronic elements, the principles of operation of electronic devices, circuits and functional units of analog and digital electronics and microelectronics. They learn practical skills in the field of physical experiment to calculate and study the characteristics of electronic devices. | | Learning outcomes | **Pre-service teachers demonstrating competence can:**   * use the acquired knowledge in solving practical problems of calculating electronic circuits; * calculate the parameters of electrical and magnetic circuits; * use electrical measuring instruments and devices; * choose electronic devices, electrical appliances and equipment with certain parameters and characteristics for solving physical problems; * analyze the results of laboratory work and calculation tasks. |  |  |  | | --- | --- | | Course title | **Educational Robotics** | | Component | Subject Component, Optional Component | | Cycle | Major disciplines | | Module | Interdisciplinary interactions 32 academic credits | | Academic credits | 5 | | Course/ Competence description | The purpose of this course is to improve the following areas of subject competence:   * + Competence area for the development of practical and research skills (7)   + Competence area for the interdisciplinary interactions development (9,10,11)   During the course, pre-service teachers are provided with the basic tools needed to integrate science and technology (through robotics) into their teaching methods, and they develop an interest in the application of educational robotics in the learning process. They are introduced with the basics of robot programming and the world of technology and artificial intelligence. Pre-service teachers also get familiarized with the possibilities and methodological features of the use of educational robotics in the project activities of students. | | Learning outcomes | **Pre-service teachers demonstrating competence can:**   * apply educational robotics and advanced pedagogical technologies in the process of implementing the educational process; * apply the techniques of developing models of educational robotics; * develop regulations for robotic competitions; * organize students’ extracurricular activities on the basis of modern developments in robotics. |  |  |  | | --- | --- | | Course title | **Physics and Education of Sustainable Development** | | Component | Subject Component, Optional Component | | Cycle | Major disciplines | | Module | Interdisciplinary interactions 32 academic credits | | Academic credits | 5 | | Course/ Competence description | The purpose of this course is to improve the following areas of subject and pedagogical competence:   * + Competence area for the development of practical and research skills (4,5,6)   + Competence area for the interdisciplinary interactions development (8,11,12)   During the course, pre-service teachers are introduced to the 2030 Agenda for Sustainable Development by the United Nations. They apply their knowledge and skills in physics to creative design and problem solving promoting the achievement of the Sustainable Development Goals (SDGs). | | Learning outcomes | **Pre-service teachers demonstrating competence can:**   * understand the relevance of physics in sustainable development; * apply it in systems thinking, critical thinking and integrated problem solving. |  |  |  | | --- | --- | | Course title | **Project Based Approach in Science Education** | | Component | Subject Component, Optional Component | | Cycle | Major disciplines | | Module | Interdisciplinary interactions 32 academic credits | | Academic credits | 4 | | Course/ Competence description | The purpose of this course is to improve the following areas of subject and pedagogical competence:   * + Competence area for pedagogy and didactics (1,2)   + Competence area for the development of practical and research skills (4,5,6,7)   + Competence area for the interdisciplinary interactions development (8,10,11)   During the course, pre-service teachers work in groups to jointly solve educational problems. Working as a team on a project, they gain experience close to their future profession by implementing a project to solve and identify a genuine scientific problem. Pre-service teachers learn to design similar projects for their students. | | Learning outcomes | **Pre-service teachers demonstrating competence can:**   * develop a research project to study authentic issues relevant to students; * create diverse out of classroom learning environments and communities of learners using active learning methods; * understand, value, and encourage using ICT and a variety of artefacts as outcomes of the projects. |  |  |  | | --- | --- | | Course title | **Physics in STEM** | | Component | Subject Component, Optional Component | | Cycle | Major disciplines | | Module | Interdisciplinary interactions 32 academic credits | | Academic credits | 4 | | Course/ Competence description | The purpose of this course is to improve the following areas of subject and pedagogical competence:   * + Competence area for pedagogy and didactics (1,2)   + Competence area for the development of practical and research skills (4,5,6,7)   + Competence area for the interdisciplinary interactions development (8,9,10,11,12)   During the course, pre-service teachers develop their competences in teaching integrated science, technology, mathematics, and engineering in secondary school. They practice active methods such as inquiry based science education for enhancing secondary graders understanding of the STEM as an interconnected structure of conceptual and procedural knowledge and skills. | | Learning outcomes | **Pre-service teachers demonstrating competence can:**   * discover real-life phenomena and applications, which are relevant to secondary students; * design problems and inquiries applying STEM integration to study them. |  |  | | --- | | **FINAL ATTESTATION 8 academic credits** | | Final attestation of the graduate is mandatory and is carried out after mastering the educational programme in full. The aim of the attestation is to evaluate the level of maturity of general cultural and professional competences of the graduate, as well as their readiness to perform basic professional activities.  **Final attestation work *(Oral Exam, Written Exam, Diploma work, Research project, Development project, Organisational project, Strategic project, Art project)*** | |
|  |
| 4.3 The structure of the compulsory component |
| The Compulsory Component (Cycle of General Education Studies) consists of 56 academic credits (51 academic credits mandatory studies and 5 academic credits optional studies) and includes the following modules and courses   |  |  | | --- | --- | | **Name of modules and courses** | **Academic credits** | | **COMPULSORY COMPONENT (CYCLE OF GENERAL**  **EDUCATION STUDIES)** | **56** | | **MANDATORY STUDIES** | **51** | | **Module of historical and philosophical competencies** | **10** | | *History of Kazakhstan*  Kazakhstan in Ancient and Medieval Times. Prehistoric society. Settlements, economy, and household (2.5 million - 12 thousand B.C. - 4th century). Ethnogenesis of Kazakh nation. Medieval Kazakhstan (IV-XV cc.). Kazakh Khanate. Geopolitical position of the Kazakh state. Kazakh Khanate: formation, rise, decline. Social history (mid- XV - beginning XVIII cc.). Kazakhstan in a colonial period (30-40s of XVIII - 60s XIX cc). Kazakhstan in the beginning of ХХ century. Formation of a poly-ethnic structure of the population. Kazakhstan in the Soviet period (February-October, 1917 - August, 1991) Kazakhstan - Independent State. The Modern period in the country's history (December 1991 - up to the present). | 5 | | *Philosophy*  Origins of a culture of thinking. The subject and method of philosophy. Foundations of philosophical understanding of the world.  Consciousness, spirit and language. Ontology and metaphysics. Ethics. Philosophy of values. Philosophy of freedom. Philosophy of art. Society and culture. Philosophy of history. Philosophy of religion. Philosophy of modern Kazakhstan. | 5 | | **Module of socio-political knowledge (sociology, political studies, cultural studies, psychology)** | **8** | | *Sociology*  Sociological studies in understanding the social world. Sociological research. Social structure and stratification of society. Socialization and identity. Family and modernity. Deviation, crime, social control. Religion, culture, society. Sociology of ethnicity and the nation. Education and social inequality. Mass media, technology and society. Economics, globalization, labor. Health and medicine. Population, urbanization, and social movements. Social change. | 2 | | *Political studies*  Main stages in the development of political science. Politics as part of social life. Political power. Political elites, leadership. Political system of society. State and civil society. Political regimes. Electoral systems, elections. Political parties, party systems and socio-political movements. Political culture, behavior. Political consciousness, ideology; development, modernization; conflicts and crises. World politics, modern international relations. | 2 | | *Cultural studies*  Morphology of culture. Language of culture. Semiotics of culture. Anatomy of culture. Nomadic culture. Cultural heritage of proto-Turks. Medieval culture.  Central Asia. Cultural heritage of Turks. Basis of the Kazakh culture. Kazakh culture in the XVIII - end of XIX century, XX century. Kazakh culture in the context of modern world processes, and in the context of globalization. Cultural policy of Kazakhstan. State program "Cultural heritage". | 2 | | *Psychology*  Personality in the context of national consciousness.  Me and my motivation. Emotions, emotional intelligence. Human will, psychology of self-regulation. Individual-typological features. Values, interests, norms. Psychology of the meaning of life, professional self-determination, health. Communication between individuals and groups. The perceptive side of communication.  The interactive side of communication. The communicative side of communication. Social and psychological conflict. Patterns of behavior in conflict. Effective communication techniques | 2 | | **Instrumental and communication module** | **25** | | *Russian /Kazakh language*  Proficiency in accurate use of vocabulary, scientific terms, syntactic constructions in oral and written communication; conversation skills. Business communication, letter-writing, report-writing, review, essay-writing skills; meaningful reading of texts, ability to express own idea. Fluent speaking in various conversations, mastering the ability to carry on a conversation, discussion. Functional styles of speech as a historically developed system of speech means, a variety of literature language. | 10 | | *Foreign language*  Social and domestic sphere of communication. Me and my family. Social and cultural sphere of communication. World map. Customs and Traditions. Educational and professional sphere of communication: Future profession. A modern home. Family in modern society.  Cultural and historical background. Education. Profession. Human and nature, environmental problems. News, media, advertising. | 10 | | *Information and communication technologies*  ICT role in society development. Standards in ICT. Introduction to computer systems. Software. Operating systems. Human-computer interaction. Database systems. Data analysis. Data management. Networks and telecommunications. Cybersecurity. Internet technologies. Cloud and mobile technologies. Multimedia technologies. Smart technology. E-technologies. E-business. E-learning. E-government. ICT in industries. Prospects of ICT development. | 5 | | **Health Promotion module** | **8** | | *Physical education*  Principles of physical education. Scientific basis of physical education. Modern recreational systems, basics of body physical state monitoring. Main methods of practicing sports and physical education independently. Professional physical training. General physical training. Speed. Running. Relay races. Execution of exercises for: endurance, flexibility, agility, coordination, balance, gymnastic and acrobatic exercises. Strength. General training exercises. Special physical training. | 8 | | **OPTIONAL COMPONENT** | **5** | | *Basics of Economics and Law*  Social production. The essence, forms and structure of capital. Costs and income of production in a market economy. Business. Financial system. Resource saving. Cyclical economic development. Kazakhstan in the system of global economic relations. Market emergence. Role of the government in business development. The main provisions of the Constitution and current legislation of the Republic of Kazakhstan. System of public administration institutions and the sphere of their authority. Aims, methods of state regulation of economy. Role of public sector in economy. Financial law and finance. Mechanism of interaction between substantive and procedural law. | 5 | | *Basics of an anti-corruption culture*  Anti-corruption culture: a concept, structure, tasks and functions. Anti-corruption awareness and anti-corruption culture: content, role and functions. Formation of anti-corruption culture in foreign countries. Anticorruption culture: mechanisms and institutions for development. Role of a family in fostering an anti-corruption culture. National bases of an anti-corruption culture. Social control as a mechanism of counteracting corruption. Political parties and the mass media as tools for building an anti-corruption culture. Anti-corruption education and upbringing. Anti-corruption legislation and legal liability for corruption. The constitutional basis of anti-corruption. Legal liability for crimes of corruption. Building an anti-corruption culture in civil service and business. | 5 | | *Entrepreneurial skills*  Types of entrepreneurship. Business. Financial system. Time management and project management. Stress management. Negotiation skills. Public speaking skills. Business management skills. Teamwork and leadership skills. Customer service skills. Financial skills. Analytical and problem solving skills. Critical thinking skills. Strategic thinking and planning skills. Technical skills. Time management and organisational skills. Branding, marketing and networking skills. Business management skills. | 5 | | *Ecology and life safety*  Basic laws of functioning of living organisms, ecosystems of different organisational levels, biosphere as a whole, their sustainability. Interaction of biosphere components and ecological consequences of human economic activity, in particular under conditions of nature management intensification. Modern understanding of the concepts, strategies and practical goals of sustainable development in different countries and in the Republic of Kazakhstan. Life safety, its main provisions. Risks, emergencies. Risk analysis, risk management. Human security systems. Modern destabilizing factors. Social, religious, political, economic threats, threats in everyday life. System of security institutions and legal regulation of their activities. | 5 | | *Research methods*  Research approaches. Inductive and deductive reasonings. Qualitative, quantitative, mixed methods research. Primary and Secondary research. Action research. Research designs – descriptive, correlational, experimental, quasi-experimental, cross-sectional, longitudinal, case study, ethnographic, exploratory, explanatory. Variables and hypotheses. Reliability and validity of research. Reproducibility and replicability. Random and systematic error. Triangulation. Sampling. Inclusion and exclusion criteria in sampling. Sampling methods. Collecting data – surveys, interviews, experiments, observational studies, systematic review. Data cleansing. Transcribing interviews. Analysing data – statistical analysis, content analysis, discourse analysis, thematic analysis, textual analysis. Research ethics. Peer review. | 5 | | **Total academic credits** | **56** | |
| 4.4 Progression of the studies |
| |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Modules and courses | **BA degree, 4 academic years** | | | | | | | | | 1. year | | 2. year | | 3. year | | 4. year | | | 1 sem | 2 sem | 3 sem | 4 sem | 5 sem | 6 sem | 7 sem | 8 sem | | **PEDAGOGICAL COMPONENT** | | | | | | | | | | **SUPPORTING LEARNERS AS INDIVIDUALS – 17 Academic credits** | | | | | | | | | | Psychology in Education and Concepts of Interaction and Communication 4 academic credits |  |  | 4 |  |  |  |  |  | | Educational Science and Key Theories of Learning 3 academic credits |  |  | 3 |  |  |  |  |  | | Inclusive Educational Environment 3 academic credits |  |  |  |  | 3 |  |  |  | | Age and Physiological Features of the Development of Children 3 academic credits |  | 3 |  |  |  |  |  |  | | Teaching Planning and Individualization of Learning 4 academic credits |  |  |  |  |  | 4 |  |  | | **TEACHING AND ASSESSMENT FOR LEARNING – 9 Academic credits** | | | | | | | | | | Teaching Methods and Technologies 5 academic credits |  |  |  | 5 |  |  |  |  | | Assessment and Development 4 academic credits |  |  |  |  | 4 |  |  |  | | **TEACHER AS A REFLECTIVE PRACTITIONER – 9 Academic credits** | | | | | | | | | | Pedagogical Research 4 academic credits |  |  | 4 |  |  |  |  |  | | Research, Development and Innovation 5 academic credits |  |  |  |  |  |  | 5 |  | | **TEACHER AS A FACILITATOR OF LEARNING (PEDAGOGICAL PRACTICE) – 25 academic credits** | | | | | | | | | | Introduction to the teaching profession (1st year pedagogical practice) 2 academic credits |  | 2 |  |  |  |  |  |  | | Psychological and pedagogical assessment (2nd year pedagogical practice) 2 academic credits |  |  |  | 2 |  |  |  |  | | Pedagogical approaches (3rd year pedagogical practice) 6 academic credits |  |  |  |  |  | 6 |  |  | | Research and innovation in education (4th year pedagogical practice) 15 academic credits |  |  |  |  |  |  |  | 15 | | **COMPULSORY COMPONENT** | | | | | | | | | | **HISTORICAL AND PHILOSOPHICAL COMPETENCIES – 10 Academic credits** | | | | | | | | | | History of Kazakhstan 5 academic credits |  |  | 5 |  |  |  |  |  | | Philosophy 5 academic credits |  |  | 5 |  |  |  |  |  | | **SOCIO-POLITICAL KNOWLEDGE – 8 Academic credits** | | | | | | | | | | Sociology 2 academic credits |  |  | 2 |  |  |  |  |  | | Political studies 2 academic credits |  |  |  | 2 |  |  |  |  | | Cultural studies 2 academic credits |  |  |  | 2 |  |  |  |  | | Psychology 2 academic credits |  |  | 2 |  |  |  |  |  | | **INSTRUMENTAL AND COMMUNICATION – 25 Academic credits** | | | | | | | | | | Russian /Kazakh language 10 academic credits | 5 | 5 |  |  |  |  |  |  | | Foreign language 10 academic credits | 5 | 5 |  |  |  |  |  |  | | Information and communication technologies 5 academic credits | 5 |  |  |  |  |  |  |  | | **HEALTH PROMOTION – 8 Academic credits** | | | | | | | | | | Physical education 8 academic credits | 2 | 2 | 2 | 2 |  |  |  |  | | **Optional Component – 5 Academic credits** | | | | | | | | | | Basics of Economics and Law 5 academic credits |  |  |  |  | 5 |  |  |  | | Basics of an anti-corruption culture5 academic credits |  |  |  |  |  |  |  | | Entrepreneurial skills 5 academic credits |  |  |  |  |  |  |  | | Ecology and life safety 5 academic credits |  |  |  |  |  |  |  | | Research methods 5 academic credits |  |  |  |  |  |  |  | | **SUBJECT COMPONENT** | | | | | | | | | | Mechanics 6 academic credits | 6 |  |  |  |  |  |  |  | | Molecular physics and thermodynamics 6 academic credits |  | 6 |  |  |  |  |  |  | | Electricity and magnetism 6 academic credits |  |  | 6 |  |  |  |  |  | | Optics 6 academic credits |  |  |  | 6 |  |  |  |  | | Physics of the atom and atomic nucleus 6 academic credits |  |  |  |  | 6 |  |  |  | | Methods of mathematical physics 3 academic credits |  |  |  |  | 3 |  |  |  | | Theoretical Physics-1 6 academic credits |  |  |  |  |  | 6 |  |  | | Theoretical Physics-2 6 academic credits |  |  |  |  |  |  | 6 |  | | Laboratory workshop on Mechanics 3 academic credits |  | 3 |  |  |  |  |  |  | | Laboratory workshop on Molecular Physics and Thermodynamics 3 academic credits |  |  | 3 |  |  |  |  |  | | Laboratory workshop on Electricity and Magnetism 3 academic credits |  |  |  | 3 |  |  |  |  | | Laboratory workshop on Optics 3 academic credits |  |  |  |  | 3 |  |  |  | | Laboratory workshop on Physics of the atom and atomic nucleus 3 academic credits |  |  |  |  |  | 3 |  |  | | Methods of Teaching Physics 6 academic credits |  |  |  |  | 6 |  |  |  | | Workshop on solving physical problems 1 5 academic credits |  |  |  |  |  | 5 |  |  | | Workshop on solving physical problems 2 5 academic credits |  |  |  |  |  |  | 5 |  | | School physics experiment 5 academic credits |  |  |  |  |  |  | 5 |  | | Digital technologies in education 3 academic credits |  |  |  |  |  | 3 |  |  | | Linear algebra and analytic geometry 5 academic credits | 5 |  |  |  |  |  |  |  | | Mathematical analysis 5 academic credits |  | 5 |  |  |  |  |  |  | | Astronomy 4 academic credits |  |  |  |  |  |  | 4 |  | | Programming 5 academic credits |  |  |  | 5 |  |  |  |  | | Electronics 4 academic credits |  |  |  |  |  |  |  | 4 | | Educational Robotics 5 academic credits |  |  |  |  |  |  |  | 5 | | Physics and Education of Sustainable Development 5 academic credits |  |  |  |  |  |  |  | | Project Based Approach in Science Education 4 academic credits |  |  |  |  |  |  | 4 |  | | Physics in STEM 4 academic credits |  |  |  |  |  |  |  | | **FINAL ATTESTATION – 8 Academic credits** | | | | | | | | | | **Final attestation** |  |  |  |  |  |  |  | 8 | | **Academic credits in total** | **30** | **30** | **30** | **30** | **30** | **30** | **28** | **32** | |
| 4.5 Requirements for the successful completion of curriculum |
| For successful completion of the educational program, students shall have:   * minimum credits for core and major subjects; * achievement of all learning outcomes; * successful completion of compulsory and optional courses; * successful fulfillment and defense of Final attestation work *(Oral Exam, Written Exam, Diploma work, Research project, Development project, Organisational project, Strategic project, Art project);* * the minimum average achievement score. |

# 5. Description of students’ work

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| Students’ work includes contact teaching, individual, pair and group work, assignments, exams, etc. 1 ECTS = 30 hours of student work.  Students’ individual and/or pair and group work is divided into two parts: individual and/or pair and group work supervised by a teacher and the work that is performed entirely independently.  Students’ individual and/or pair and group work is carried out on a specific list of topics allocated for independent/group study, provided with educational and methodical literature and recommendations for each course. Students’ individual and/or pair and group work supervised by a teacher is carried out according to the schedule, which determines the university or the teacher themselves.    The entire scope of work performed entirely independently is supported by assignments that require the student to work independently on a daily basis.    The ratio of time between classroom contact work, students’ individual and/or pair and group work supervised by a teacher, and the work that is performed entirely independently for all types of educational activities is determined by the educational institution independently. At the same time, the amount of classroom work and students’ individual and/or pair and group work supervised by a teacher is 1440 hours per year, the scope of work that is performed entirely independently - 360 hours per year. |

# 6. Evaluation methods/Assessment

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| 6.1 Assessment |
| The Assessment of learning outcomes is based on the competence objectives of the modules and the resulting evaluation criteria of the courses. Assessment criteria are used as a basis for various tasks. Learning tasks include independent tasks, group tasks, plans, reports, group discussions, group tests, development tasks, laboratory tasks, various tasks for reflection and evaluation, or activating tasks. The assessment generates information for the pre-service teacher about his or her achievement of the competence goals of the pedagogical education modules.  Assessment is at the heart of all competence-based education. Competence-based assessment should measure not only what a pre-service teacher knows, but also take into account skills and whether pre-service teachers can apply what they know to real life problems or situations. Pre-service teachers should be given assignments and non-standard problems in situations that students are likely to encounter in the workplace. Assessment plays a very important role in competence-based training. Based on the recognition of prior competence and personal situation, competence can be demonstrated on a per-course basis. The demonstration of competence can cover the entire training module. Specific guidelines regarding the practice of recognizing and accrediting prior training or training received elsewhere.  Studies are evaluated on a scale basis. Learning achievements (knowledge, abilities, skills and competencies) of pre-service teachers are evaluated in points on a 100-point scale, corresponding to the internationally accepted letter system with a numeric equivalent (positive grades, in descending order, from "A" to "D", and "unsatisfactory" - "FX", "F")  Alphabetic system of evaluation of pre-service teachers' learning achievements, corresponding to the digital equivalent of the four-point system.   |  |  |  |  | | --- | --- | --- | --- | | **Assessment by letter system** | **Digital equivalent of points** | **% content** | **Assessment according to the traditional system** | | А | 4.0 | 95-100 | Excellent | | А- | 3.67 | 90-94 | | В+ | 3.33 | 85-89 | Good | | В | 3.0 | 80-84 | | В- | 2.67 | 75-79 | | С+ | 2.33 | 70-74 | | С | 2.0 | 65-69 | Satisfactory | | С- | 1.67 | 60-64 | | D+ | 1.33 | 55-59 | | D | 1.0 | 50-54 | | FХ | 0.5 | 25-49 | Unsatisfactory | | F | 0 | 0-49 |   The purpose of assessment is to provide guidance and encouragement to pre-service teachers, develop their self-assessment abilities, provide information about pre-service teachers' competences, and ensure that the competences and intended learning outcomes defined in the educational programme are achieved. Self-assessment skills and peer assessment are considered as the main skills of the world of work, and assessment is a central tool to support the development of these skills during study. |
| 6.2 External evaluation |
| **1) Design of new educational programmes Internal quality assurance system**  The new curriculum needs to be designed through engagement with all stakeholders, including students, faculty and employers. The aim throughout the process is to retain and further develop the strengths and high quality of the existing programme while addressing some of the challenges of the current programme, such as the workload demand on students and the need for a course on education management. A survey of all students and alumni, together with focus group discussions and interviews with alumni and employers, also inform the design of the programme. All faculty are involved in discussions of programme aims and learning outcomes, and programme teams worked collaboratively to design the courses for their area of specialization.  On the basis of the faculty (school) of the university, a council on academic quality is formed, which makes decisions on the content and conditions of implementation of curricula, on the policy of evaluation and other academic issues of the faculty (school), organizing a survey of students on the quality of curricula and (or) disciplines/modules.  **2) Procedures for external evaluation of the educational programmes. Continuous Improvement**  All faculty are actively engaged in continuous improvement of their courses as an integral part of the culture of university and their own professionalism as experts in education. In addition to formal student feedback mechanisms such as course evaluations and Student Committee meetings, faculty and students are to communicate closely regarding specific courses and the programme as a whole. The process of continuous reflection and improvement informs the Annual Programme Monitoring process, in which individual faculty reflect on courses they have taught, this feeds into specialization-level reflection and suggestions for improvements, and this in turn goes to programme and School level reflection and plans for further improvement.  Universities have regular, formal mechanisms for obtaining feedback from employers and the professional community. These interactions also inform the continuous improvement of the programme.  For the improvement of the quality assurance of the educational programmes, the universities need to:   * develop an internal quality system that has a delicate balance between quality assurance and quality enhancement. While quality assurance is more of a preventive measure, quality enhancement has higher-order aims and implies transformational change (Jones, 2003). * raise institutional awareness and develop deep understanding of the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG) (2015) and implement ESG 2015 standards. * regularly revisit the existing institutional quality processes for ongoing improvement.   **3) Accreditation**  There are institutional and specialised accreditation in Kazakhstan, they remain voluntary for higher educational institutions. However, accreditation is one of the conditions for obtaining state grants for student education. |

# 7. Faculty requirements

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| 7.1 Faculty Requirements |
| Availability of teachers in accordance with the disciplines of the educational programme, the correspondence of teachers' education to the profile of the taught disciplines and/or their academic or research degree of "Doctor of Philosophy (PhD)" or "Doctor in Profile", and/or the academic title of "Associate Professor (Associate Professor)", or "Professor" (if any) and/or teachers with the degree of "Master" to the profile of disciplines and (or) senior teachers with at least three years of experience as a teacher or experience practical work on the profile for at least five years.  The advanced/academic degree of the teaching staff corresponds to the academic degree of the doctor/candidate of sciences or the advanced/academic PhD degree of the doctor or master. Basic education or postgraduate education or doctorate/candidate of science degree, advanced/academic PhD degree must correspond to the subjects taught. |
| 7.2 Additionally Required Faculty |
| Part-time teachers in the main place of work engaged in practical professional activities in the profile of the subjects taught, with at least 3 years of work experience in the field of training. Additionally, leading scientists, specialists from other higher education institutions and research organizations, teachers, and supervisors of schools in corresponding categories such as: expert teacher, research teacher, master teacher, can be involved in the work. |
| 7.3 Required professional development of faculty |
| On the basis of the Law of the Republic of Kazakhstan "On Education" (2007; with amendments dated 27.12.2019) and other regulatory legal acts regulating the activities of higher education organizations in the Republic of Kazakhstan, a teacher who carries out professional activity in a higher education organization has the right for professional development at least once every five years for a duration of no more than four months.  The development of professional competences is also one of the priorities adopted in the Republic of Kazakhstan "Concepts of lifelong learning (continuing education)" (2021). |
| 7.4 Required additional administrative staff |
| Vice-rector for academic affairs is responsible for planning and monitoring the implementation of educational services.  Responsibility for arranging and coordinating the implementation of the specific steps of the procedure and the quality of the outputs rests with the heads of divisions. |

# 8. Resources

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| 8.1. Library Resources |
| The library collection is an integral part of the information resources and includes educational, teaching, scientific and other literature.  Availability of a library fund of educational and scientific literature: in the format of printed and electronic publications for the last ten years, providing 100% of the disciplines of the curricula, including those published in the languages of instruction. Updating of the library fund should be carried out in accordance with the regulations of the Republic of Kazakhstan. |
| 8.2. IT Resources |
| University provides pre-service teachers with educational and teaching literature and (or) electronic resources necessary for successful implementation of curricula, provides the functioning of the information system of education management (high-tech information and educational environment, including the website, information and educational portal, automated system of credit technology training, a set of information and educational resources). |
| 8.3 Infrastructure |
| University provides equipment with educational, methodological, scientific and other literature, classrooms with multimedia complexes, computer rooms, access to broadband Internet, sports, material and technical, educational and laboratory facilities and equipment necessary for the implementation of curriculum. |

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9. Additional information

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| **9.1 Additional materials** |
| Inclusion is one of the most important cross-cutting principles of the curriculum (see more in Annex 1.). Inclusion in education means that all students, regardless of their possible impairments or disability, should have the opportunity to participate in the regular school systems and study with their peers. The teacher education emphasizes on pre-service teachers’ perceptions of themselves as experts in implementing curriculum for diverse learners based on the principles of pedagogy of difference or universal design for all. It is important to renew inclusive pedagogies such as co-teaching and differentiating. It is important that not only the specialized teachers (special education teachers) but all teachers can work in an inclusive educational environment. Thus, competences of all pre-service teachers need to be developed in areas such as:  ***Knowledge of the concepts and principles of inclusive education***:   * Evaluation of one's own activity in terms of the values of inclusion. * Understanding of the implementation of the principle of inclusiveness in education implemented by a flexible model of the educational process: adaptive programmes, changing the ways of assessing educational achievements. * Understanding of children's different abilities and application of different trajectories to support versatile learners.   ***Practical applications in teaching:***   * Designing of an adapted/individual programme for a child with special education needs in specific subject. * Using of multimodal universal teaching methods, simple structured speech, use alternative communication. |
| **9.2 E-learning** |
| The rapid development of digital technologies requires the study of not only specific software tools, but the development of pre-service teachers’ competences on using virtual learning environments and tools in teaching and choosing pedagogical methods suitable for learning processes in digital learning environments (psychological and didactic justification). For this the universities need:   * to create provisions for the professional development of pre-service teachers with the effective use of digital technology; * to develop competences of pre-service teachers on understanding how individual educational needs of their students can be considered when using digital tools or in virtual learning environments; * to develop digital competences of pre-service teachers on using digital learning environments and tools in assessment, such as gamification, digital tests and quizzes, and other formats of digital evaluation; * to promote pre-service teachers’ capabilities in assessing their digital competences and the use of digital tools in pedagogical processes in relation to the requirements of the employers (schools) daily operations; * to put into practice the integration of education, science, and industry, and involve professional communities in teaching school students the basics of applying and using digital technology, and perform an independent assessment of the practical skills acquired; * to include digitalization into the educational process for in-service teachers to increase efficiency and practical application of digitalization in education; * to promote the implementation of global standards in digitalization in initial teacher education (i.e. International Society for Technology in Education (ISTE) and the establishment of an expert community of educators in digitalization. |

# 10. Approval

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| - Ensure a review of the developed curricula, its coordination and approval by the Republican Educational and Methodological Council of Higher and Postgraduate Education.  - Scale up all developed curricula in pedagogical universities |

# **APPENDIX 1**: Main principles of the curriculum

**Competence-based approach**

Competence-based approach is a learning-oriented way to organise and implement teaching. It is an alternative to more traditional educational approaches mainly focusing on what learners are expected to learn about in terms of traditionally-defined subject content. In designing the curriculum following the principles of competence-based approach, the focus is on what we want our students to learn. Thus, it is essential to define the competences that the students are supposed to learn during their degree programs. The articulation of competences should include both discipline specific skills as well as the generic competences or soft skills that the teacher students should develop during the curricula. Soft skills include, for example, leadership, communication and collaboration skills, reflection skills, social and emotional intelligence etc. The development of these soft skills should be included in all the curricula, the competences and learning outcomes as well as the implementation of the curricula.

After defining the degree level competences, the learning outcomes of study units and study modules should compiled by comparing them to the objectives of the entire degree. Learning outcomes represent the desired state, which is expressed as knowledge, skills and attitudes. The written learning outcomes of all the interconnected study units should also make visible the accumulated competence. Planning competence-based learning thus starts at degree programme level and is then realised at study unit level through the learning outcomes, the execution of the study unit and its assessment.

The reason for using competence-based approach to designing curricula is that it makes it possible to design courses and study programs in a more student-centred way. Student-centred approach means that the key knowledge and skills that the students need to achieve during their studies determine the content of the course or study programme. The aim of the competence-based approach to designing curricula is that the students acquire the knowledge, skills and attitudes/values that are essential. Further, the competence-based approach supports students to identify the knowledge and skills specific to their discipline or field of education as well as the generic competences that accumulate during their studies and are common to all degrees.

To sum up the key elements in designing competence-based curricula, it is essential to focus on describing explicitly a) what competences (including subject-specific and general competencies) should a student have after graduation/after study unit/after an individual course, b) how do different study modules, courses and study modes support the development of the competencies, c) how is it ensured that the degree program and the learning objectives of the courses form a coherent entity supporting the development of the competencies, and d) how is it possible for students to make their competence visible (assessment related decision)

The implementation of all curricula should introduce methodologies that promote student-centeredness and active learning, such as gamification, PBL, etc. In a student-centred learning approach, students are active participants, placed at the core of the learning process. The learner is not seen as a passive receiver of knowledge but, rather, an active participant. The teacher's role becomes that of a guide who assists the learner in the difficult process of constructing his/her knowledge. Student-centred approach to teaching broadly means the shift of focus from the teacher to the student and their learning processes (Tran et al., 2010). The emphasis in student-centred approach to teaching is on what the student does and the ways to improve students’ active engagement and deep approach to learning (Biggs and Tang, 2011; Prosser and Trigwell, 2014). In student-centred approach the student is seen as an active constructor of knowledge. Thus, the focus of the student-centred teaching practices is to develop autonomy and active learning that eventually enable lifelong learning.

**Student-centred approach & Active Learning Methodologies**

Student-centredness differs from traditional teaching approach, also known as teacher-centredness, in that the focus is on designing the teaching-learning process in a way that it promotes students’ active participation and deep approach. Teaching that requires active engagement from students is likely to increase quality learning (Biggs and Tang, 2011). However, student-centered learning does not sideline or diminish the role of teachers. Instead, it seeks to use teachers’ expertise in different ways to increase student engagement.

Student-centeredness requires a change in the mindset of the teachers and has many implications for the teaching practices. For example, teaching and learning activities should be designed in a way that they support and promote active learning. Active learning methods place greater responsibility on the learner rather than passive approaches such as lectures. Active learning activities promote higher order thinking skills such as application of knowledge and analysis and engage students in deep learning processes rather than surface learning. Furthermore, they enable students to transfer and apply knowledge better. There is a variety of active learning methods, such as case studies, problem-solving, group projects, debates, peer teaching, games etc. to mention a few. However, it should be kept in mind that the methods should always be chosen purposefully to support the attainment of the intended learning outcomes. Thus, when choosing the active learning methods, it should always be considered from the perspective of which methods support the attainment of the intended learning outcomes in a best possible way.

**Constructive alignment**

The principle of constructive alignment has long been promoted as a powerful way to enhance the quality of teaching and learning (Biggs and Tang, 2011). Constructive alignment is an integrative design for teaching and curriculum design in which the alignment between intended learning outcomes/competences, teaching-learning activities and assessment tasks is emphasised to optimise the conditions for quality learning. The fundamental principle is that curriculum should be designed in such a way that the learning activities and assessment tasks are aligned with the intended learning outcomes (ILOs), and what the students should be able to do or demonstrate after completing the degree, module or a course. High quality learning may be supported by integrating these components together.

Constructive alignment reflects the more general paradigm shift from teacher-centred teaching to student-centred teaching described above. The central step in designing teaching is to define the intended learning outcomes or the competences that the students are supposed to learn during the learning process and how they will demonstrate that learning has taken place (Biggs and Tang, 2011). The role of the instructor is to engage the student in relevant activities that support the attainment of the intended learning outcomes (Biggs, 1996). By choosing appropriate teaching and assessment methods and tasks and aligning them with the intended learning outcomes/competences it is possible to effectively guide students’ study practices and enhance deep, meaning-oriented learning (Biggs and Tang, 2011; Boud and Falchikov, 2006). Constructively aligned teaching is essentially a criterion-referenced system where the central elements, that is, intended learning outcomes, teaching-learning activities and assessment, are aligned and there is consistency throughout these elements.

Constructive alignment should be applied at all levels of the educational system, including institutional, departmental and classroom levels as teaching and learning take place in the whole system. In a good system, all aspects of teaching and assessment are tuned to support high level learning, so that all students are encouraged to use higher-order learning processes.

Figure 1. Illustration of constructive alignment



**Research-based Initial Teacher Education**

The recognition of the importance of research-based teacher education is growing worldwide (Flores, 2018). The research-teaching integration in the teacher educators’ work has been suggested to be an effective solution to develop the profession in many aspects. They should be able to make explicit links between the educational theory, research and teaching practices. There is an increasing recognition that research is an important component of teacher education practices and is beneficial for preparing reflective practitioners (Flores, 2018). Research-based teacher education can take place in different forms. In its simplest form, it can mean that the teaching content is based on research, or that the teaching methods and pedagogical designs are based on research. It can also mean that teachers use inquiry-oriented methods in their teaching to enhance their students’ own knowledge construction and research skills. Moreover, research-based teacher education can mean that the teacher educators themselves conduct research of their own work or more generally about topics related to teacher educators’ work. The different forms of research-based teacher education identified in a recent research are presented in Table 1.

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| Teaching content is based on research | Teacher educators use their own or others’ research as their teaching content to transfer academic knowledge to student teachers and develop the student teachers’ independent thinking (Visser-Wijnveen et al. 2010). |
| Teaching methods and course design are based on research | Teacher educators benefit from their research work in teacher education and develop their teaching methods accordingly (Cochran-Smith 2005; Krokfors et al. 2011). |
| Applying inquiry-oriented methods in teaching | Teacher educators organise the course based on inquiry-oriented activities to guide student teachers to learn in an analytical and inquiring way to develop their pedagogical thinking (Krokfors et al. 2011). |
| Acting as researchers in teacher education | Teacher educators work as researchers and conduct research on what and how they teach, and on topics in teacher education (Cochran-Smith 2005). |
| Encouraging student teachers’ involvement in research work | Teacher educators involve student teachers in research process to provide them with the experience of conducting research (Visser-Wijnveen et al. 2010). |
| A supportive relationship between research and teaching | Teacher educators consider the research-teaching nexus is complementary and fairly evident. Teaching and research support each other in a general and broad sense. |

Table 1. Forms of research-based teacher education (Cao, Postareff, Lindblom-Ylänne & Toom, 2021

Teacher education can adopt the research-based approach in diverse ways, and it is important to consider what kind of forms fit the cultural context and practices. The ultimate goal of research-based teacher education is to support student teachers to become pedagogically-thinking, reflective and inquiry-oriented teachers with an inquiring attitude towards teaching. Teachers’ pedagogical thinking means the ability to analyse and conceptualise educational occasions and phenomena, to evaluate them as part of larger instructional processes and to make rational and theory-based decisions and justify their decisions and actions as teachers. Their readiness to consume as possibly also conduct research enhances their ability to meet the challenges of the future (Toom et al., 2010).

Research-based teacher education not only enhances the teacher educators’ own professional development, but also enhances teacher students’ reflective and deep learning. By engaging in research-based activities, the students can acquire a set of highly valued competences, such as critical thinking, problem solving and reflective skills (Lunenberg, 2010). Thus, it is important, that teacher educators support the student teachers’ to become reflective practitioners with an inquiring attitude (see Toom et al., 2010), which they can learn not only from what their teachers say about how to teach, but most importantly, from how their teachers engage their students in collaborative and interactive teaching-learning activities (Berry, 2004).

To make research-based teacher education occur in practice, it should be made visible in the teacher education curricula. Secondly, the teacher education programmes should develop their students’ inquiry-oriented and research-oriented approach to their work and enhance their research skills. Becoming an inquiry-oriented reflective practitioner requires time and space to deeply reflect on theory, practice, and the link between them. Therefore, the curriculum of teacher education should provide possibilities for reflection and practicing new skills.

**Interdisciplinary learning**

*Content and Language Integrated Learning (CLIL)*

CLIL (Content and Language Integrated Learning) is a dual-focused educational approach in which an additional language is used for learning and teaching of both content and language (Coyle, Hood & Marsh, 2010:1). The umbrella term of CLIL also includes a range of other language programs, such as bilingual education, English- medium of education or immersion programs (Coyle, 2007; Mehisto, Marsh, and Frigols, 2008). But CLIL differs from those language programs by its equal focus on both content and language (Coyle, 2008; Dalton-Puffer, 2008; De Zarobe, 2008; Marsh, 2012). Thus, this approach is neither language learning nor subject learning but a combination of both; hence, attention is given both to the language and the content. Contrary to the common belief, the CLIL instruction takes place with and through a foreign language and it is not the approach when non-language subjects are taught in the foreign language (Eurydice, 2006).

The reasons for introducing CLIL include provision of a more holistic educational experience for the student as well as content-and language-learning outcomes realized in class. Furthermore, benefits of CLIL are also linked with insights from interdisciplinary research within neurosciences and education (Coyle, Hood & Marsh, 2010). Due to these advantages CLIL is increasingly attracting stakeholders’ attention across continents.

In terms of the curriculum implementation, the CLIL approach is inclusive and flexible; it includes a range of models that can be adapted according to the age, ability and needs of the students (Coyle, 2007). Thus, implementing CLIL varies based on the context. In primary stage, language learning can be embedded across the curriculum and link with one or more subjects of the curriculum. For example, through specific themes or projects (e.g. lifestyle, sports, and holidays).

Secondary CLIL can make specific links between a language and a subject (e.g. history through Kazakh, science through English) or it can take a broader approach integrating language with parts of curriculum. More recently, CLIL is less aligned to a single subject and is evolving through links with a variety of subjects or themes. The content for lessons can include particular aspects of the curriculum for individual subjects. In practical terms, lesson planning involves joint effort across a number of subjects focusing on the cross-curriculum feature for the secondary curriculum. But there is a need for research to explore whether such an approach is compatible with the local context.

The existing curriculum models integrating CLIL vary in length from a single unit which comprise a sequence of 2-3 lessons to a more sustained approach through modules lasting half a term or more. Some successful cases include schools with bilingual sections where subjects are taught through the medium of another language for extensive periods (Coyle et al., 2010).

*STEM (Science, Technology, Engineering, Mathematics) education*

Interdisciplinarity in natural sciences and mathematics, so called STEM -education can be defined as “an effort to combine some or all of the four disciplines of science, technology, engineering, and mathematics into one class, unit, or lesson that is based on connections between the subjects and real-world problems” (Moore et al. (2014). Implementation and integration of engineering in K-12 STEM education. In S. Purzer, J. Strobel, & M. Cardella (Eds.), Engineering in Pre-College Settings: Synthesizing Research, Policy, and Practices (pp. 35–60). West Lafayette: Purdue University Press.). STEM -pedagogy in teacher education aims to prepare students to design, teach and develop research-based active learning STEM -lesson plans to educate competent citizens, who can access and make sense of science relevant to their lives and global perspectives (Feinstein, N. W., Allen, S., & Jenkins, E. (2013). Outside the pipeline: Reimagining science education for nonscientists. Science, 340(6130), 314-317.).

Active learning includes student centered active methods, such that project based education, and benefitting from diverse out of classroom learning environments and communities of learners and ICT. On the hand, Science education should also focus on competences with an emphasis on learning through science and shifting from STEM to STEAM (A = All) by linking science with other subjects and disciplines (Hazelkorn, Ellen & Ryan, Charly & Beernaert, Yves & Constantinou, Costas & Deca, Ligia & Grangeat, Michel & Karikorpi, Mervi & Lazoudis, Angelos & Pintó, Roser & Welzel-Breuer, Manuela (2015). Science Education for Responsible Citizenship. 10.2777/12626). In the ITE curricula in Kazakhstan, the A should include at least developing the English linguistic skills of teacher students (KAZ ITE D-3 Framework Report).

**Digitalisation in Education and Teachers’ Digital competence development**

New information and communication technologies (ICTs) provide teachers and learners with an innovative learning environment to stimulate and enhance the teaching and learning process. In this context, novel educational concepts such as online learning, or blended and hybrid learning are being developed (López-Pérez, Pérez-López & Rodríguez-Ariza, 2011). Hybrid or blended learning can be defined as the integration of face-to-face classroom instruction learning with web-based tools and materials (e.g. Garrison & Kanuka, 2004), as contrast to fully online learning. Blended or hybrid learning is becoming increasingly significant to complement traditional forms of learning. Often these two terms are defined similarly, but can also be differentiated. Blended learning can be defined as a mix of various event-based activities, including conventional face-to-face classrooms instruction, e-learning, and self-paced learning, while in hybrid learning a part of the learning activities and assignments are transferred from the face-to-face environment to the distance learning environment (see Valiathan, 2002, in Koohang, Britz & Seymor, 2006).

Blended forms of learning has the potential to enhance both the effectiveness and efficiency of meaningful learning experiences, and some researchers have suggested that blended learning has the potential to be even more effective and efficient when compared to a traditional classroom model (see Garrison & Kanuka, 2004). Other benefits of blended forms of learning include convenience, student satisfaction, flexibility and higher retention (Koohang, Britz & Seymor, 2006).

Especially in situations where student numbers are high, online, blended or hybrid forms of learning have the potential to provide greater opportunities for improved learning (Osguthorpe & Graham, 2003). In teacher education, student teachers can also learn from their teachers the use of various digital tools and platforms. Thus, not only teacher educators should have the skills to adopt digital tools in their teaching, but also student teachers should develop their digital skills during teacher education. Times faced with uncertainty and sudden changes, such as pandemics, require flexible and advanced use of digital tools and instructional practices functional in online contexts.

**Inclusion in education and recognition of different learners**

Inclusion in education is a principle which means that all students, regardless of their possible impairments or disability, should have the opportunity to participate in the regular school systems and study with their peers. Inclusion is based on several international United Nations declarations, such as the Salamanca Statement (1994) and The Universal Declaration of Human Rights (1948). Inclusive pedagogy is a pedagogical approach that is impacted by the sociocultural context of learning (Florian & Black-Hawkins, 2011) and it aims to respond to the diverse learning needs of students in as varied ways as possible.

The concepts of ‘inclusion’ and ‘diversity’ are reviewed in the teaching and education practices with the activities and arrangements that promote inclusion as the centre. The key words in education are educational equality, accessibility, individuality, lifelong learning and co-operation. The teacher training emphasizes on teachers’ perceptions of themselves as experts in implementing curriculum for diverse learners based on the principles of pedagogy of difference or universal design for all. It is important to renew inclusive pedagogies such as co-teaching and differentiating. The teacher’s task is to teach and guide students to become lifelong learners while taking each student’s individual learning style into account. Four core values related to teaching and learning have been identified as the basis for the work of all teachers in inclusive education (European Agency). These core values are associated with areas of teacher competence. The areas of competence are made up of three elements: attitudes, knowledge and skills. All teachers must commit to the idea of equality for all students. (Saloviita, 2018.)

**Teachers’ professional development and change management**

Considering the dynamic and constantly changing nature of teachers’ work, teachers at all levels must be continuous learners throughout their professional careers. Teachers’ professional development needs to address simultaneously the teachers’ beliefs and conceptions and the improvement in their practices (Timperley & Phillips, 2003), as well as integration of theoretical and practical knowledge (Tynjälä, Häkkinen & Hämäläinen, 2004). Often an experience of a successful implementation in teaching changes teachers’ attitudes and beliefs, and therefore, positive experiences are central for teachers’ professional development (Guskey, 1989).

Development and growing as a teacher can be understood in different ways: 1) growing understanding of one’s content area, in order to become more familiar with what to teach; 2) getting more practical experience as a teacher, in order to become more familiar with how to teach; 3) building up a repertoire of teaching strategies, in order to become more skilful as a teacher; 4) finding out which teaching strategies work best for the teacher, in order to become more effective as a teacher, and 5) continually increasing understanding of what works for students, in order to become more effective in facilitating student learning (Åkerlind, 2007).

It is important to notice, that professional development of teachers is often a slow process. Furthermore, the development is not a linear continuum, but instead, the development may be interrupted by various reasons (Beijaard, Meijer & Verloop, 2004). Some teachers may experience change and development as threatening and change processes often include feelings of anxiety or uncertainty (Postareff et al., 2008). Such negative emotions towards the change may narrow the teacher’s attention (Fredrickson, 2001). Therefore, it is important to ensure that teachers receive enough support from diverse sources (e.g. peers, supervisors, work environment) and encouraging feedback. It is also important for teachers to understand, that failures are part of the teachers’ professional development, and mistakes should be seen as learning opportunities. When teachers have the possibility to share experiences and engage in collaboration with their peers, it has been shown to have positive influences of their learning and development (Voogt, et al., 2011). When teachers feel well and are engaged in their work, they are more likely to engage in pedagogical practices that promote their development (Fredrickson, 2001) The development of teaching is, at best, a continuous process, and thus, teachers should be encouraged to reflect on their own teaching on a continuous basis to increase their pedagogical awareness (Parpala & Postareff, 2021).

Teachers should also be provided with agency, which refers to the teacher’s possibilities to influence, make decisions and take actions. The aim of exercising agency is to create new work practices and transforming the course of activities (Hökkä et al., 2012). When teachers have a possibility engage in development and changes, and when they experience that their opinions truly matter, they are likely to become highly engaged in their work (e.g. Day, Elliot & Kington, 2005; Pyhältö et al. 2012).

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