**PROPOSAL FORM FOR AN ACADEMIC PROGRAMME**

**Biology**

Approved for 2023-2027

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# 1. General information

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| **1.1. Curriculum title** | **Biology** |
| **1.2. Curriculum developing team** | |  |  | | --- | --- | | **Leader university** | **Member universities** | | M.Utemisov West Kazakhstan University | M.Kozybayev North Kazakhstan University | |  | Pavlodar Pedagogical University | |  | Altynsarin Arkalyk Pedagogical Institute | |  | Kh. Dosmukhamedov Atyrau University | |  | E.A.Buketov Karaganda University | |  | A.Baitursynov Kostanay Regional University | |  | Shakarim University of Semey | |  | Shoqan Ualikhanov Kokshetau 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) "*Biology*" 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) "*Biology*" is a teacher education programme for Pre-service teachers who wish to specialize in teaching biology in educational establishments (schools, colleges, high schools). EP consists of a pedagogical component 60 credits (incl. pedagogical practice), a compulsory component 56 credits, and a subject component 124 academic credits (incl. a final attestation of 8 academic credits).  Subject component consists of 5 modules: "Biology of living organisms", "Genetics and evolution", "Biogeocenology and environment", "Applied and integrated sciences", "Research in biology".  Educational program "Biology" was developed based on competence-based approach in the training of teachers for school education of the Republic of Kazakhstan. The curriculum reflects the ideas of modernization in the field of education and upbringing of the Republic of Kazakhstan in accordance with the State Educational Standard of Higher Education (Order № 2 of the Minister of Science and Higher Education of the Republic of Kazakhstan dated July 20, 2022, as amended on 19.01.2023).  EP provides equal opportunities for learning without infringing on the rights and interests of pre-service teachers, preserving the principles of equality, respect, tolerance.  The programme is interdisciplinary, oriented towards future teachers, scientifically integrated and problem-oriented, and the choice of courses is determined by current issues in history and society and conforms to 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.  The EP is aimed at educating a qualified biology teacher who is able to use innovative technologies, including STEM-, CLIL-, IT-technologies in professional activities. Pre-service teachers possess pedagogical and subject competences in the field of conceptual and theoretical knowledge, and in conducting scientific research and applying it in science. |
| **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 component 3) Subject component, University component. 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 competences 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 can work 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 can 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 can (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 can 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 can 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 for conceptual and theoretical knowledge**  1. Pre-service teachers know and understand the theoretical foundations of biology and science disciplines, current trends in the development of biology, use knowledge of the diversity and functioning of biological systems, their diversity and evolution. 2. Pre-service teachers form a holistic view of the natural science picture of the world, using forms and methods of scientific knowledge. 3. Pre-service teachers understand the biological nature and social essence of human beings, the level organization of living nature, demonstrate a scientific understanding of the world, a healthy lifestyle, environmental and genetic literacy.  * **Competence area for conducting scientific research**  1. Pre-service teachers analyze and cite scientific and methodological literature in the fields of biology and pedagogy; 2. Pre-service have the skills to conduct scientific research, understand the research process, use scientific knowledge to analyze the results; 3. Pre-service teachers can plan and implement research activities using various digital and other resources; 4. Pre-service teachers can plan and implement research activities using various digital and other resources.  * **Competence area for application in science**  1. Pre-service teachers put into practice the results of biological and pedagogical experiments; 2. Pre-service teachers are able to use theoretical and practical knowledge in pedagogical activities; 3. Pre-service teachers have modelling skills and are able to create and propose solutions to non-standard problems; 4. Pre-service teachers are able to apply modern methods for processing and synthesizing information in scientific and pedagogical research; 5. Pre-service teachers are able to teach integrated lessons using knowledge from other areas of science. 6. Pre-service teachers are able to use analytical and critical thinking and intercultural knowledge to develop linguistic competences in implementing academic and pedagogical activities. |
| **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** | | **BIOLOGY OF LIVING ORGANISMS** | **35** | | **University Component** | **30** | | Structure and functions of plant organisms | 6 | | Diversity of plant organisms | 5 | | Plant Physiology | 5 | | Human and Animal Physiology | 5 | | Structure and functions of animals 1 | 4 | | Structure and functions of animals 2 | 5 | | **Optional Component** | **5** | | Human Biology | 5 | | Human Anatomy | | **GENETICS AND EVOLUTION** | **22** | | **University Component** | **6** | | Molecular Biology | 6 | | **Optional Component** | **16** | | Individual development of living organisms | 6 | | Cytology, histology and embryology | | Patterns of inheritance and variability | 5 | | Genetics and the basis of breeding | | Comparative anatomy and evolution of living organisms | 5 | | Evolutionary teaching | | **BIOGEOCENOLOGY AND ENVIRONMENT** | **10** | | **Optional Component** | **10** | | Biogeocenology | 5 | | Ecology of plants, animals and humans | | Bioresources of Kazakhstan | 5 | | Flora and fauna of the world | | **APPLIED AND INTEGRATED SCIENCES** | **25** | | **Optional Component** | **25** | | Environmental Chemistry | 5 | | Theoretical foundations of inorganic chemistry | | Biochemistry | 5 | | Bioorganic Chemistry | | Biophysics and Bioinformatics | 5 | | Scientific foundations of natural science | | Biometrics | 5 | | Experimental Biology | | Microbiology with the basics of biotechnology | 5 | | Applied Biology with the basics of soil Science | | **RESEARCH IN BIOLOGY** | **24** | | **University Component** | **9** | | Conceptual Biology Training | 5 | | Educational practice and methods of its implementation at school (Botany) | 2 | | Educational practice and methods of its implementation at school (Zoology) | 2 | | **Optional Component** | **15** | | STEM Education in Biology | 5 | | Digital Technologies in Biology | | Design of STEM Education | | Modern approaches to the organization of biological experiment | 5 | | Methodology of biological research | | Research and project activities in biological education | | Academic Letter | 5 | | Content-language integrated learning (CLIL) in biology | | **FINAL ATTESTATION** | **8** | | **Total academic credits** | **124** | |
| |  | | --- | | **Biology of living organisms 35 academic credits** | | * The module provides pre-service teachers with advanced knowledge, skills and competencies in plant, animal and human sciences. The module includes fundamental disciplines and has a relationship with the updated secondary education program. The module also supports the professional development of pre-service teachers in various types of learning environments, forming their strong scientific knowledge in the subject area. |  |  |  | | --- | --- | | Course title | * **Structure and functions of plant organisms** | | Component | * Subject component, University component | | Cycle | * Major disciplines | | Module | * Biology of living organisms 35 academic credits | | Academic credits | * 6 | | Course Description/ competencies | The purpose of this course is to improve the following areas of subject competence:   * Competence area for Cognitive skills development (1) * Competence area for Development of practical and research skills (6) * Competence area for Interdisciplinary interactions development (9)   Pre-service teachers build fundamental knowledge in the field of botany, anatomy, and morphology of plants, and are able to use correct terminology. They develop their skills in working with optical devices, herbarium and fixed material, and understand the technique of preparing micro-preparations. | | Learning outcomes | * **Pre-service teachers who demonstrate competence can:** * recognize the structural features of plant cells and tissues; * compare and describe anatomical and morphological features of vegetative and generative organs of plants; * show the complex nature of the interaction between plants and other representatives of the organic world in the biogeocenosis when creating a whole and stable structure; * understand the methods of reproduction and cycles of reproduction of plants; * reveal the role of plants in nature and human life; * generalize the acquired knowledge and skills about the structure of plants, their variability in the process of adaptation to external conditions; * discuss the plant world as the most important component of the biosphere; * conduct research in the organization and planning of educational activities of students. |  |  |  | | --- | --- | | Course title | **Diversity of plant organisms** | | Component | Subject component, University component | | Cycle | Major disciplines | | Module | Biology of living organisms 35 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of subject competence:   * Competence area for Cognitive skills development (1) * Competence area for Development of practical and research skills (6) * Competence area for Interdisciplinary interactions development (9)   Pre-service teachers classify plants using knowledge about the main features, characteristics, spatial distribution, ecology, and diversity. They are able to describe their life forms, introduction, and phylogeny of life, as well as investigate the centers of origin and the practical significance of plant organisms. While studying the course, pre-service teachers acquire skills in working with plant determinants, herbarium, and collection materials. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * carry out a complete morphological description of plants, considering the specifics of the structural organization of representatives of different departments; * determine the taxonomic position of higher plants based on the analysis of their anatomical and morphological features; * explain the role of plant biological diversity in ecosystems; * make a characteristic of the main departments of higher plants, * present modern views on the evolution and phylogeny of the main systematic groups; * conduct biological excursions to nature with pre-service teachers in different biotopes and at different times of the year; * select literature on a specific topic, document information sources using the selected citation style; * work with plant determinants; * distinguish by the characteristics of families, genera, plant species, name them in accordance with the international nomenclature; * plan the scientific and research activities of schoolchildren; * produce visual aids (herbariums, wet preparations, collections); * apply knowledge of plant biology in the formation of stable plant groupings created in artificial conditions; * plan, organize and conduct experiments in the educational activities of students; * process and formalize the results of experiments and observations; * analyze and evaluate the results of laboratory and field studies. |  |  |  | | --- | --- | | Course title | **Plant Physiology** | | Component | Subject component, University component | | Cycle | Major disciplines | | Module | Biology of living organisms 35 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of subject competence:   * Competence area for Cognitive skills development (1) * Competence area for Development of practical and research skills (5, 6) * Competence area for Interdisciplinary interactions development (9,10)   Pre-service teachers explore the structure, functions, physiology, and biochemistry of the plant cell. They also examine the features of the processes of photosynthesis, respiration, water metabolism, mineral nutrition, metabolism and transport of organic substances in plants, as well as plant growth and development. Pre-service teachers investigate the changes of physiological processes in various environmental conditions caused by abiotic, biotic, and anthropogenic influences. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * understand the chemistry and organization of photosynthesis, mineral nutrition of plants, water metabolism, mechanisms of transport of metabolites in the plant; * distinguish various natural phenomena from the point of view of plant physiology; * determine the main stages of plant ontogenesis; * evaluate the resistance of plants and cells to abiotic and biotic stressors; * conduct observations and experimental studies; * simulate physiological processes in laboratory and field conditions, analyze and explain the results obtained; * apply theoretical knowledge of physiological processes in practice. |  |  |  | | --- | --- | | Course title | **Human and Animal Physiology** | | Component | Subject component, University component | | Cycle | Major disciplines | | Module | Biology of living organisms 35 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of subject competence:   * Competence area for Cognitive skills development (1) * Competence area for Development of practical and research skills (5, 6) * Competence area for Interdisciplinary interactions development (9, 10)   Pre-service teachers build their understanding of the laws of functioning of the human body and animals in interaction with the environment. They are able to analyze information about the relationship of regulatory systems and the mechanisms that support homeostasis of the internal environment. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * compare the main physiological processes occurring in humans and animals; * understand the regulatory mechanisms of homeostasis in humans and animals; * analyze theoretical knowledge about the functions of body systems; * apply basic methods of experimental physiological research; * determine the causes of physiological shifts in the main parameters of body's activity under various environmental factors; * evaluate the functional state of various body systems; * apply physiological knowledge in life, including as a prevention of various diseases; * organize educational research activities of students. |  |  |  | | --- | --- | | Course title | **Structure and functions of animals 1** | | Component | Subject component, University component | | Cycle | Major disciplines | | Module | Biology of living organisms 35 academic credits | | Academic credits | 4 | | Course Description/ competencies | The purpose of this course is to improve the following areas of subject competence:   * Competence area for Cognitive skills development (1) * Competence area for Development of practical and research skills (6) * Competence area for Interdisciplinary interactions development (9)   Pre-service teachers investigate the laws of the animal world development from the simplest unicellular forms to highly organized taxa (arthropods, mollusks, chordates). They examine the features of morphophysiological organizations, phylogeny, embryogenesis, physiology, and reproduction. They also research their geographical distribution, the role in ecosystems and the practical significance of the main types and classes of invertebrates, as well as the importance of biodiversity conservation as a leading factor in ecosystem sustainability. During the course, pre-service teachers build their understanding of the importance of zoology in the formation of a scientific worldview. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * describe anatomical, morphological, physiological, ecological features of invertebrates using special terminology; * identify primitive and progressive features of invertebrate structure based on comparative analysis; * determine the taxonomic affiliation and classify invertebrates; * conduct surveillance of biological objects; * carry out cameral processing of zoological material, to produce micro- and macro-preparations of invertebrates; * mount systematic and biological [collections](https://pandia.ru/text/category/koll/); * apply the acquired knowledge and skills during the experiment, organization and planning of educational activities of students; * participate in discussions and negotiations about the scientific problems of the evolution of the animal kingdom; * describe the structure and role of invertebrates in ecosystems in written and oral form; * analyze, generalize and systematize scientific information in the field of invertebrate zoology; * sketch and design the results of their work; * Substantiate phylogenetic relationships between organisms. |  |  |  | | --- | --- | | Course title | **Structure and functions of animals 2** | | Component | Subject component, University component | | Cycle | Major disciplines | | Module | Biology of living organisms 35 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of subject competence:   * Competence area for Cognitive skills development (1) * Competence area for Development of practical and research skills (6) * Competence area for Interdisciplinary interactions development (9)   Pre-service teachers investigate modern information about the systematics of vertebrates – their diversity, characteristics of organization, lifestyle, biology, ecology, phylogeny and fauna of vertebrates of Kazakhstan, as well as the role in ecosystems, theoretical and practical significance of the main taxonomic groups of vertebrates in nature and human life. They understand the principles of conservation of biological diversity and nature conservation. Pre-service teachers plan and conduct monitoring studies to identify the causes of changes in the number of vertebrates and the influence of various factors (food supply, reproduction, competition, migration, etc.). | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * describe anatomical, morphological, physiological, ecological features of vertebrates using special terminology; * identify primitive and progressive features of vertebrate structure based on comparative analysis; * determine the taxonomic affiliation and classify vertebrates; * carry out cameral processing of zoological material, work with collectible materials; * apply the acquired knowledge and skills during the experiment, organization and planning of educational activities of schoolchildren; * use modern educational technologies in various areas of their professional activities * work with light microscopes, sketching and formatting the results of work; * design the conduct of theoretical and experimental research, recommendations for the design of the results of scientific work; * collect field materials (collections, fixation of biomaterial, etc.), statistical processing and interpretation of research data; * analyze scientific materials on zoology and mathematical processing of the results of field and experimental studies; * synthesize information, summarizing the results of all types of its analysis; * formulate a reasoned and detailed conclusion on the research issue; * Evaluate the strengths and weaknesses of the study, prove the truth or falsity of working hypotheses; * document reliable sources of the information used with links to sources, following the established (selected) citation system (Arastil or others.); * prepare a report on the results of the study, an appendix to the report and an analytical report containing information, conclusions and recommendations; * use scientific vocabulary and scientific constructions of the natural-technical profile, professional and electronic dictionary of basic biological terms, writing and presentation of articles, messages and reports related to the scientific interests of students (scientific report, message, theses, poster report, abstract, abstract). |  |  |  | | --- | --- | | Course title | **Human biology** | | Component | Subject component, Optional component | | Cycle | Major disciplines | | Module | Biology of living organisms 35 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of subject competence:   * Competence area for Cognitive skills development (1) * Competence area for Development of practical and research skills (6) * Competence area for Interdisciplinary interactions development (9)   During the course, pre-service teachers form a comprehensive understanding of the functioning of the human being as a biological object. They examine the features of the structure and functioning of organ systems, considering ontogenetic and phylogenetic features. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * describe the features of topography and patterns of the structure of the human body at the micro- and macroscopic levels; * understand the relationship of the structure of organs with the functions performed; * systematize knowledge about the structure and function of organs and systems of the human body, their interrelation and mechanisms of regulation; * navigate the structure of the human body, find and determine the location and projection of organs and their parts on the surface of the body; * evaluate the structural and functional parameters of human body development; * design and conduct experiments to study the work of organs and organ systems; * apply anatomical and physiological knowledge in life, including as a prevention of various diseases. |  |  |  | | --- | --- | | Course title | **Human anatomy** | | Component | Subject component, Optional component | | Cycle | Major disciplines | | Module | Biology of living organisms 35 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of subject competence:   * Competence area for Cognitive skills development (1, 3) * Competence area for Development of practical and research skills (6) * Competence area for Interdisciplinary interactions development (9, 10)   Pre-service teachers build their understanding of the basic laws of the structure and function of the body, as well as individual organs and systems of a person. They are able to use correct terminology and develop their skills in working with laboratory devices. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * understand the general laws of the structure of the human body, the structural and functional relationships of parts of the body; * use conceptual apparatus and specialized terminology; * determine the location and relative position of organs in the body; * analyze information about the topography, structure of the human body, its systems, organs and tissues and their main functions; * describe morphological changes in the studied macroscopic preparations; * design and conduct simple experiments to study the work of individual organs and organ systems at school; * observe ethical standards when performing experiments. |  |  | | --- | | **Genetics and Evolution 22 academic credits** | | The module provides pre-service teachers with knowledge, practical skills and competencies about cells and tissues, molecular processes, laws of heredity, variability, and development of organisms. The module also provides knowledge about the main problems of modern evolutionary teaching and ontogenesis. As a result of studying the module, pre-service teachers acquire skills in using methods of hybridological, cytological and population analysis, solving genetic problems and practical implementations of breeding tasks. |  |  |  | | --- | --- | | Course title | **Molecular Biology** | | Component | Subject component, University component | | Cycle | Major disciplines | | Module | Genetics and Evolution 22 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of subject competence:   * Competence area for Cognitive skills development (2, 3) * Competence area for Development of practical and research skills (5) * Competence area for Interdisciplinary interactions development (10, 11)   Pre-service teacher analyze the molecular organization of viruses, the structure, properties and functions of biopolymers, the molecular organization of the genome of prokaryotes and eukaryotes, the structure of pro- and eukaryotic genes, and the mechanisms of their implementation using modern and classical research methods. Pre-service teachers form an understanding of the mechanisms of storage, reproduction, transmission, and realization of genetic information at the level of biomolecules. Pre-service teachers investigate the molecular basis of genetic recombination, the structure, processing and functions of various types of RNA, and protein-nucleic interactions. They also examine the molecular mechanisms of cell cycle regulation, carcinogenesis and programmed cell death, as well as basic principles of application of modern molecular genetic methods and technologies in science and medicine. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * distinguish the features of the structures, properties and functions of biopolymers; * put into practice modern molecular genetic methods and technologies of laboratory research at the molecular level; * identify the mechanisms of gene expression, ways of regulating their action, replication, recombination and DNA repair; * solve problems on the molecular mechanisms of inheritance and variability and simulate the processes of matrix synthesis; * use special reference material, and electronic genetic databases; * understand the structural and functional organization of hereditary material at the gene, chromosomal and genomic levels; * analyze the relationship between the structure of genes and the mechanisms of their implementation; * determine the relationship of life-defining processes occurring in the cell at the molecular level; * evaluate the application of molecular genetic methods and technologies in science and medicine; * use modern and classical methods for conducting scientific research. |  |  |  | | --- | --- | | Course title | **Individual development of living organisms** | | Component | Subject component, Optional component | | Cycle | Major disciplines | | Module | Genetics and Evolution 22 academic credits | | Academic credits | 6 | | Course Description/ competencies | The purpose of this course is to improve the following areas of subject competence:   * Competence area for Cognitive skills development (1) * Competence area for Development of practical and research skills (6) * Competence area for Interdisciplinary interactions development (9)   Pre-service teachers have a fundamental knowledge of the regularity ontogenetic development of organisms. They also build their understanding of macro- and micromorphological, physiological and biochemical processes, processes occurring in developing organisms, as well as about the factors and mechanisms governing the processes of development at all stages of the ontogenesis of animals and plant organisms. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * describe the patterns of reproduction and individual development of organisms; * understand the basic laws of the biology of animal reproduction, the main stages of ontogenesis, phases of embryonic development, mechanisms of growth, morphogenesis, and causes of developmental anomalies; * describe the morphology of gametes; spermatogenesis, fertilization; crushing, blastulation, gastrulation, neurulation; * compare features stages of ontogenesis and phylogeny; * use specialized terminology; * evaluate the features of the development of biological systems embryonic development of the digestive system, respiratory organs, skeleton, muscles, circulatory and genitourinary systems; * describe electrical processes in living organisms, photobiological processes, problems of stability and evolution of biological systems; * use in practice the acquired knowledge about the mechanisms of morphophysiological differentiation of the organism in ontogenesis; * apply the acquired knowledge to solve scientific and practical problems, and to work with embryonic objects. |  |  |  | | --- | --- | | Course title | **Cytology, histology and embryology** | | Component | Subject component, Optional component | | Cycle | Major disciplines | | Module | Genetics and Evolution 22 academic credits | | Academic credits | 6 | | Course Description/ competencies | The purpose of this course is to improve the following areas of subject competence:   * Competence area for Cognitive skills development (1) * Competence area for Development of practical and research skills (6) * Competence area for Interdisciplinary interactions development (9)   Pre-service teachers have fundamental knowledge about the structure and principles of cell life, subcellular components, their structure, and functions, as well as the features of embryonic development. They develop their skills in working with optical devices, histopreparations, and fixed material. They also practice the technique of preparing micropreparations. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * compare the structure of cells of living organisms, the functions of organoids; * describe morphological features of organoids, subcellular structures, types and morphology of tissues; * compare methods of reproduction of living organisms and embryology; * put into practice the methods of cytological and histological studies; * explain the types and mechanisms of cell division. |  |  |  | | --- | --- | | Course title | **Patterns of inheritance and variability** | | Component | Subject component, Optional component | | Cycle | Major disciplines | | Module | Genetics and Evolution 22 academic credits | | ECTS | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of subject competence:   * Competence area for Cognitive skills development (3) * Competence area for Development of practical and research skills (5, 6) * Competence area for Interdisciplinary interactions development (10, 11)   Pre-service teachers investigate the patterns of inheritance of traits, chromosomal theory of heredity, non-nuclear inheritance, natural and induced mutation process, fundamentals of genetic engineering, developmental genetics, population and evolutionary genetics, genetic foundations of breeding, and features of human genetics. Pre-service teachers determine the relationship between the influence of genotype and environmental factors on the development of organisms. Pre-service teachers also consider heritability in the population, and the influence of various factors on the genetic structure of the population. | | Competence outcomes | **Pre-service teachers who demonstrate competence can:**   * distinguish inheritance patterns in intraspecific and distant hybridization; * solve genetic problems of inheritance of traits and interpret the results obtained; * explain the role of environmental and hereditary factors in variability; * use modern research methods and information and communication technologies to model crosses; * analyze the types of inheritance of breeding traits, types of genetic variability arising under the influence of mutagenic factors; * explain the role of heredity and variability in the evolution of life on the planet, the main provisions of the chromosomal theory of heredity and the mechanism of inheritance of human diseases; * solve genetic problems of inheritance of traits and interpret the results obtained. |  |  |  | | --- | --- | | Course title | **Genetics and the basis of breeding** | | Component | Subject component, Optional component | | Cycle | Major disciplines | | Module | Genetics and Evolution 22 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of subject competence:   * Competence area for Cognitive skills development (3) * Competence area for Development of practical and research skills (5, 6) * Competence area for Interdisciplinary interactions development (10, 11)   Genetics includes ideas and methods that play an important role in medicine, agriculture, microbiological industry, as well as in genetic engineering. Pre-service teachers investigate the cytological foundations of heredity, the laws of heredity, and variability of traits at all levels of the organization of living matter. They also analyze the types of inheritance of breeding traits, the role of heredity, and the environment in the formation of the phenotype. Pre-service teachers consider the issues of modification and mutational variability, polyploidy, and distant hybridization. Pre-service teachers also analyze the patterns of transmission and realization of genetic information. Pre-service teachers examine the basics of breeding, genetic engineering, and methods of molecular genetic analysis. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * analyze the types of inheritance of traits; * use genetic terms and conventions appropriately, contributing to an understanding of the nature, process, and results of the study; * apply in practice methods of hybridological, cytological and population analysis to solve genetic problems for all types of inheritance; * design and conduct genetic experiments; * process and analyze the measurement results of quantitative features; * distinguish the role of heredity and variability in the evolution of life on the planet, the main provisions of the chromosomal theory of heredity and the mechanism of inheritance of human diseases; * distinguish the causes and consequences of mutations for the vital activity of living organisms and the evolution of life on the planet; * combine the concepts of genetic processes in plants and animals; * perform calculations to determine the percentage of crossing between genes and design genetic maps for genes; * determine the genotypic structure of populations and the frequency of alleles and genotypes by phenotypic frequencies in populations; * distinguish the types of heredity (nuclear – chromosomal and extra–nuclear - cytoplasmic) and their causes; * determine the influence of factors on the type of variability; * make schemes of crosses according to the form accepted in genetics; * draw conclusions about the importance of induced mutations in the selection of microorganisms, plants and animals; * apply the knowledge and methods of genetics to solve the problems of breeding organisms; * model and design an intraspecific crossing experiment. |  |  |  | | --- | --- | | Course title | **Comparative anatomy and evolution of living organisms** | | Component | Subject component, Optional component | | Cycle | Major disciplines | | Module | Genetics and Evolution 22 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of subject competence:   * Competence area for Cognitive skills development (1, 2) * Competence area for Development of practical and research skills (6) * Competence area for Interdisciplinary interactions development (10)   Pre-service teachers explore the historical process of adaptive transformations of wildlife at different levels of organization – from the macromolecular to the biosphere as a whole. During the course, pre-service teachers analyze comparative anatomical evidence of the evolution of the main types of living organisms. They also pay special attention to the evolution of vertebrates as the most highly organized, studied and economically important group. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * classify organs by their origin in embryogenesis; * compare the features of the structure of organs in connection with their functions performed; * characterize the main stages of the evolution of organ systems; * distinguish aromorphoses, idioadaptation and degeneration in the stages of evolution; * understand the adaptive nature of the evolution of organ systems; * identify the main directions of the evolution of living organisms; * apply knowledge on the current state of evolutionary theory in the educational process; * understand the content of the main provisions of the evolutionary theory; * analyze scientific data to prove the provisions of the evolutionary doctrine; * integrate the acquired knowledge on comparative anatomy and evolution of living organisms; * use methods of comparative analysis of various groups of living organisms, considering their systematic position, phylogenetic relationships, ecology and biology; * analyze the anatomical and morphological structure of organs, considering their functions; * systematize research results, evaluate their reliability and significance; * plan and conduct experiments, and process and analyze research results. |  |  |  | | --- | --- | | Course title | **Evolutionary teaching** | | Component | Subject component, Optional component | | Cycle | Major disciplines | | Module | Genetics and Evolution 22 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of subject competence:   * Competence area for Cognitive skills development (1, 2) * Competence area for Interdisciplinary interactions development (9, 10, 11)   Pre-service teachers investigate the basic laws of the development of the organic world at the macro- and microevolutionary levels, the features of speciation, and the mechanisms of natural selection. During the course, pre-service teachers gain knowledge in explaining the processes occurring in nature, as well as develop their skills in analyzing various data at an interdisciplinary level. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * describe the process and significance of the evolutionary process in wildlife; * apply knowledge about the basic laws and mechanisms of evolutionary changes in the life of plants and animals in pedagogical activity and in solving practical problems; * substantiate the role of the evolutionary idea in the biological worldview; * use the skills of interpreting changes occurring in ecosystems; * document, correctly formalize links to the used sources of information using the selected citation style; * argue the modern evolutionary approach to the study of biological objects; * apply the skills of scientific explanation of natural processes in professional activity. |  |  | | --- | | **Biogeocenology and environment 10 academic credits** | | The purpose of the module is to form strong scientific knowledge of pre-service teachers about the biological diversity of plants, animals and microorganisms on the planet, and, in particular, in Kazakhstan, as well as to investigate the characteristics of adaptation of organisms to changing environmental conditions. During the module, pre-service teachers navigate the issues of environmental conservation and apply microbiological methods and methods of biodiversity conservation in their professional activities using the acquired knowledge in teaching their subject. |  |  |  | | --- | --- | | Course title | **Biogeocenology** | | Component | Subject component, Optional component | | Cycle | Major disciplines | | Module | Biogeocenology and environment 10 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of subject competence:   * Competence area for Cognitive skills development (1, 3) * Competence area for Development of practical and research skills (6) * Competence area for Interdisciplinary interactions development (10)   Biogeocenology combines a number of disciplines that are related to biology, ecosystem ecology and geography. Pre-service teachers build their understanding of the basic laws of the organization and functioning of biogeocenoses. They are able to prove the essence of the complex of living, inanimate components of nature that are in causal interactions, and justify the totality of complex ecological systems in the biogeosphere. They also conduct studies of the structural components of biogeocenosis considering the forms of species coadaptation in different natural and geographical conditions using the skills of collaboration. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * understand the structure and methodology of biogeocenosis processes; * characterize the basic principles of the organization and functioning of biogeocenoses; * analyze the structural and functional organizations of biogeocenotic systems of various types; * evaluate production processes and efficiency of energy flow in food chains of biogeocenoses; * analyze the role of components of biogeocenoses as elementary environment-forming structural and functional blocks of the biosphere; * teach conducting safety-based research with phyto- and zoocenosis objects to determine the types and forms of coadaptations in different natural conditions, geographical location, and the impact of environmental factors. |  |  |  | | --- | --- | | Course title | **Ecology of plants, animals and humans** | | Component | Subject component, Optional component | | Cycle | Major disciplines | | Module | Biogeocenology and environment 10 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of subejct competence:   * Competence area for Cognitive skills development (1, 3) * Competence area for Development of practical and research skills (6) * Competence area for Interdisciplinary interactions development (10)   The discipline of plant, animal and human ecology is associated with the disciplines of ecology, botany, zoology, and human anatomy. Pre-service teachers analyze the fundamental concepts of the organism and biological diversity in nature, as well as biogeocenosis as special levels of organization of life. Pre-service teachers evaluate the relationship of organisms and the environment considering the characteristics of the structure and vital activity of organisms in various environmental conditions of the Earth. They teach planning and monitoring of biological objects and the state of their own body under the influence of environmental factors. They also assess the consequences of anthropogenic activities in relation to the natural environment and the health of other people. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * determine the type of interaction of different species in the ecosystem and the features of the structure of cells, tissues, organs, organ systems in accordance with the effects of environmental factors and anthropogenic impact; * understand the importance of the activity of living organisms in the circulation of ecosystem substances in human life and economy; * identify essential features of biological objects and processes and compare them; * identify the variability of living organisms under anthropogenic influences and environmental factors; * teach safe research to study the adaptations of organisms to the environment and explain their meanings. |  |  |  | | --- | --- | | Course title | **Bioresources of Kazakhstan** | | Component | Subject component, Optional component | | Cycle | Major disciplines | | Module | Biogeocenology and environment 10 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of subject competence:   * Competence area for Cognitive skills development (1, 3) * Competence area for Development of practical and research skills (6) * Competence area for Interdisciplinary interactions development (8)   Bioresources of Kazakhstan are interconnected with biology, geography and ecology. Pre-service teachers understand the geographical distribution and placement of living organisms and their communities on the territory of Kazakhstan. They determine the most important patterns of the structure and dynamics of the flora and fauna in certain regions. They also compare the main stages of the history and economic development of certain groups and species of useful plants and animals in the Republic of Kazakhstan. Pre-service teachers distinguish the locations of specially protected natural areas of Kazakhstan and assess the role of the state and society in the conservation of landscape and biological diversity. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * systematize the position of the main types of biological resources; * list biological resources on the territory of the Republic of Kazakhstan; * specify categories and criteria of endangered species of biological resources; * determine the importance of the environment in increasing the productivity of Kazakhstan's bioresources; * present modern conceptual approaches to the problem of conservation of biological diversity of Kazakhstan; * name the main ways to increase the productivity of biological resources; * teach the assessment of the role of specially protected natural territories of the Republic of Kazakhstan in preserving and increasing the productivity of biodiversity. |  |  |  | | --- | --- | | Course title | **Flora and fauna of the world** | | Component | Subject component, Optional component | | Cycle | Major disciplines | | Module | Biogeocenology and environment 10 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of subject competence:   * Competence area for Cognitive skills development (1, 3) * Competence area for Development of practical and research skills (6) * Competence area for Interdisciplinary interactions development (8)   The flora and fauna of the world are integrated with botany, zoology, geography, and ecology. Pre-service teachers have knowledge of the biological diversity of flora and fauna in different habitats of the Earth, according to faunal and floral zoning. Pre-service teachers distinguish and evaluate faunal and floral kingdoms. Identify the processes of speciation and the state of species and subspecies of flora and fauna at the global level. Substantiate measures to preserve the natural habitat of plants and animals and propose measures to protect them from overexploitation by humans. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * describe the main faunal complexes: tundra, taiga, forest, steppe, semi-desert, desert, pantropical, paleotropical, and faunal zoning; * separate types of fauna: mainland, island, marine; * identify zoogeographic regions and kingdoms and floristic complexes; * characterize the endangered species of flora and fauna and to focus on the scale and importance of endangered flora and fauna. * train in planning and organizing activities aimed at protecting existing species, including endangered and endemic plant and animal species. |  |  | | --- | | **Applied and Integrated Sciences 25 academic credits** | | The module is aimed at the formation of pre-service teachers' interdisciplinary competencies and involves the study of disciplines at the intersection of biology, chemistry, physics, computer science and mathematics. The competencies obtained within the module will allow pre-service teachers to form an educational environment considering the diversity of students, and use interdisciplinary connections as means of strengthening the unity of teaching students various sections of biology. |  |  |  | | --- | --- | | Course title | **Environmental Chemistry** | | Component | Subject component, Optional component | | Cycle | Major disciplines | | Module | Applied and Integrated Sciences 25 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of subject competence:   * Competence area for Cognitive skills development (2) * Competence area for Development of practical and research skills (6) * Competence area for Interdisciplinary interactions development (11)   This course is aimed at acquiring knowledge about the basic principles of environmental chemistry and their actions on a local and global scale. During the course, pre-service teachers discuss and predict the effects of pollution on the environment, and use knowledge in physics, chemistry, Earth sciences and biology to scientifically substantiate the processes occurring in the environment. Pre-service teachers analyze the main physical and chemical processes taking place with the participation of pollutants in the atmosphere, hydrosphere and soil. They form a civic position and are responsible for their decisions and actions in the context of Sustainable Development. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * describe the properties of simple and complex substances and the patterns of chemical processes; * apply basic physico-chemical and chemical methods of analysis in professional activity; * conduct chemical and biological experiments and use the results in teaching students; * argue the role of the development of natural science knowledge in solving the problems of modern society; * form students’ environmental literacy through the integration of basic knowledge in the field of physics, chemistry, Earth sciences and biology in search of solutions to global and local environmental problems; * document information sources using the accepted citation style; * predict possible ways of migration and transformation of chemical compounds in environmental objects and their impact on ecosystems; * evaluate anthropogenic changes in environmental objects. |  |  |  | | --- | --- | | Course title | **Theoretical foundations of inorganic chemistry** | | Component | Subject component, Optional component | | Cycle | Major disciplines | | Module | Applied and Integrated Sciences 25 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of subject competence:   * Competence area for Cognitive skills development (2) * Competence area for Development of practical and research skills (6) * Competence area for Interdisciplinary interactions development (11)   The course forms pre-service teachers' knowledge of the basic concepts and laws of chemistry, the basics of atomic and molecular theory, the structure of matter, the Periodic law, chemical bonding, laws of the chemical process, the doctrine of solutions, exchange reactions in electrolyte solutions, and redox reactions. Pre-service teachers investigate the basics of chemical thermodynamics, kinetic principles of describing chemical reactions, methods and mechanisms of their acceleration, the doctrine of chemical equilibrium and methods of its displacement, the basics of the theory of solutions, and elements of electrochemistry. The course is practice-oriented: all concepts, laws, and theories, as well as the most important processes, substances and materials are introduced in terms of their practical significance and use in everyday life as well as their role in living and inanimate nature. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * predict the possibilities of chemical processes and the factors affecting the equilibrium of chemical reactions and determine the direction of the process under these conditions; * classify reactions occurring in aqueous solutions and offer optimal conditions for conducting reversible reactions; * compare the thermodynamic, and redox activity of substances; * apply the academic language of chemical concepts and terms; * formulate the basic laws of chemistry with reasoned judgments; * understand the properties of substances and the mechanism of chemical processes and discuss chemical phenomena with a thermal effect occurring in nature, in a living organism; * apply the acquired theoretical knowledge and skills with general scientific and special disciplines in their teaching activities; * teach conducting experiments using elementary methods of chemical research of substances and compounds for the formation of research skills; * collect, process and interpret research data. |  |  |  | | --- | --- | | Course title | **Biochemistry** | | Component | Subject component, Optional component | | Cycle | Major disciplines | | Module | Applied and Integrated Sciences 25 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of subject competence:   * Competence area for Cognitive skills development (2) * Competence area for Development of practical and research skills (5, 6) * Competence area for Interdisciplinary interactions development (9)   Biochemistry is an integrated discipline and covers a number of natural science disciplines, including chemistry, genetics, microbiology, forensic science, crop production, and medicine. Pre-service teachers investigate chemical processes in living organisms occurring at the molecular level. They determine the causal relationships between the structure of the molecule and its function allowing them to predict the mechanisms of interaction of molecules by analyzing the structure and properties of proteins, nucleic acids, fats, carbohydrates, as well as cellular organelles. Pre-service teachers also consider the processes of cell interaction during growth or disease control and explore the achievements of science in the field of biochemistry. Pre-service teachers plan and conduct research to determine the influence of various factors (temperature, pH, substrate concentration on enzyme activity). | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * understand the structure and functions of bioorganic substances in living organisms; * establish causal relationships between the metabolism in a living organism and the biochemical functions of cellular organelles; * draw conclusions on the relationship between the structures of bioorganic molecules and their function in living organisms; * determine the ways of transformation of nutrients; * compare the features of the course of biochemical reactions in the human body, animals and plants, such as the biosynthesis of vital compounds; * apply chemical knowledge and methods in their teaching activities; * give a scientific justification of the proposed assumption (formulation of the hypothesis) and design an experiment to determine the influence of various factors (temperature, pH, substrate concentration on enzyme activity); * conduct a safe experiment to investigate the chemical structure, properties and function of carbohydrates, fats, proteins and nucleic acids; * collect, process and interpret research data; * document reliable sources of information used following the established (selected) citation system (ARA style or others.); * evaluate the strengths and weaknesses of the study, such as the limitations of data and the sources of errors and inaccuracies of the experiment; * formulate a reasoned and detailed conclusion on the research topic and make a structured and clear report on all stages of the study; * use scientific language, subject terminology and conventions appropriately and correctly. |  |  |  | | --- | --- | | Course title | **Bioorganic chemistry** | | Component | Subject component, Optional component | | Cycle | Major disciplines | | Module | Applied and Integrated Sciences 25 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of subject competence:   * Competence area for Cognitive skills development (2) * Competence area for Development of practical and research skills (5, 6, 7) * Competence area for Interdisciplinary interactions development (8, 9, 13)   During the course, pre-service teachers examine the issues and problems of bioorganic chemistry and develop their skills in obtaining and identifying organic substances in a living organism. During lectures and laboratory classes, pre-service teachers analyze the relationship between the structure of organic substances and their biological functions, and conduct laboratory studies of the structure, properties and functions of biologically important natural (biopolymers, vitamins, hormones, antibiotics) and synthetic compounds (drugs, pesticides, etc.). Pre-service teachers practice skills in working with devices and materials and choose ways and methods of conducting individual and group research. They solve creative tasks and offer new non-standard solutions to problems. They also demonstrate practical application of the results of a biological experiment for their professional development, and evaluate experimental and calculated data, as well as prepare research reports and pass an exam. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * classify organic compounds by nomenclature when composing names and writing formulas of biologically active substances; * conduct experiments to study the chemical structure and properties of biologically important substances; * demonstrate the skills of conducting a biological experiment using chemical, physical, [physico-chemical](https://ru.wikipedia.org/wiki/%D0%A4%D0%B8%D0%B7%D0%B8%D1%87%D0%B5%D1%81%D0%BA%D0%B0%D1%8F_%D1%85%D0%B8%D0%BC%D0%B8%D1%8F), mathematical and biological methods; * evaluate the importance of biopolymers, enzymes, hormones, vitamins, signaling substances, antibiotics, and others in the vital activity of living organisms; * conduct small projects: formulation of hypotheses and conclusions, planning, assessment of strengths and weaknesses, preparation of a report; * collect, process and interpret research data on design and laboratory work; * use scientific language, subject terminology and conventions appropriately; * offer creative non-standard solutions to problems in the field of bioorganic chemistry; * apply the results of biological research for their professional development; * organize project activities of students to develop their interdisciplinary and research competencies. |  |  |  | | --- | --- | | Course title | **Biophysics and bioinformatics** | | Component | Subject component, Optional component | | Cycle | Major disciplines | | Module | Applied and Integrated Sciences 25 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of subject competence:   * Competence area for Cognitive skills development (2) * Competence area for Development of practical and research skills (5, 7) * Competence area for Interdisciplinary interactions development (9, 10, 11)   The course focuses on the use of theoretical knowledge and practical skills in biology in integration with physics and computer science, applying basic knowledge in the field of molecular biology and genomics, as well as the basics of statistics and mathematics. During lectures, practical and laboratory classes, pre-service teachers analyze the impact of natural phenomena (photobiological, electrical, sound, etc.) on living organisms, the principles of structured bioinformatics to reveal the essence of biological phenomena, a database search algorithm (BLAST), and the basics of gene mapping. During the course, pre-service teachers develop their interdisciplinary competencies (BTEAM) to solve creative tasks as well as their practical skills in biological physics in solving problems of biomedicine, and biomechanics. The course promotes the development of pre-service teachers’ practical skills in working with databases of biological data (DNA, RNA, proteins), and modeling biological processes. Pre-service teachers can write a good scientific report and use biophysical and bioinformatic methods to solve research issues, working independently and in groups. At the end of the course, pre-service teachers defend the project and the scientific report, and pass the exam. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * describe the application of biomechanical processes in robotics and medicine; * analyze the physical foundations of the study of heart automatics using an electrocardiogram, the functioning of muscle tissue (electrophysiology); * evaluate the thermodynamic feature of biological systems and electrical processes in living organisms, problems of stability and evolution of biological systems; * investigate the effects of electromagnetic and sound waves on the organism of living beings; * simulate photobiological processes, ultrastructure of the cell and cell membrane, etc.; * explain how information is transferred from genes to proteins in living organisms; * describe the technology of the neurocomputer interface, the system of information exchange between the brain and the computer; * apply modern methods of obtaining, analyzing, storing, organizing and visualizing biological data; * evaluate the advantages and disadvantages of using computer systems and tools for solving biological problems; * use of the most important databases and software (for example, OMIM, PubMed, UniProt, Cosmic, BioMart) for the extraction, analysis and interpretation of data at the level of DNA, RNA and protein; * perform BLAST-search, alignment of DNA and protein sequences; * critically interpret the results, visualize the protein and evaluate the differences created by sequence variations; * create computer modeling of the genome (gene mapping), and phylogenetic trees on databases of biodata. |  |  |  | | --- | --- | | Course title | **Scientific foundations of natural science** | | Component | Subject component, Optional component | | Cycle | Major disciplines | | Module | Applied and Integrated Sciences 25 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of subject competence:   * Competence area for Cognitive skills development (2) * Competence area for Development of practical and research skills (5) * Competence area for Interdisciplinary interactions development (9)   The course forms pre-service teachers' knowledge about the modern natural-scientific world view and the methods of natural sciences. They also develop their skills in applying the acquired knowledge to explain the phenomena of the surrounding world, and the perception of natural-scientific information. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * understand the natural science method of cognition, the main ideas and achievements of natural science, determining influence on the development of technology; * navigate modern scientific concepts and information of natural science; * understand the applied significance of the most important achievements in the field of natural sciences; * critically analyze the phenomena, perception and interpretation of natural science; * apply natural science knowledge in their professional activities. |  |  |  | | --- | --- | | Course title | **Biometrics** | | Component | Subject component, Optional component | | Cycle | Major disciplines | | Module | Applied and Integrated Sciences 25 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of subject competence:   * Competence area for Cognitive skills development (2) * Competence area for Development of practical and research skills (7) * Competence area for Interdisciplinary interactions development (11)   Pre-service teachers have basic knowledge in the field of mathematics and natural sciences and apply methods of mathematical analysis and modeling, as well as theoretical and experimental research in the field of biology. During the course, pre-service teachers acquire the basics of practical knowledge and skills in the field of biometrics understanding its relationship with other sciences. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * use the knowledge of mathematical statistics, the principle and various methods of analysis in professional activity; * apply statistical processing methods in practice; * identify trends in the patterns of the studied objects; * perform correct statistical processing of experimental data; * organize experimental work and analyze the observations and the results of the experiments; * work with biological objects in natural and laboratory conditions; * make reports, reviews, analytical maps and explanatory notes; * present and critically analyze the information received to present the results of field and laboratory biological studies. |      |  |  | | --- | --- | | Course title | **Experimental biology** | | Component | Subject component, Optional component | | Cycle | Major disciplines | | Module | Applied and Integrated Sciences 25 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of subject competence:   * Competence area for Development of practical and research skills (7) * Competence area for Interdisciplinary interactions development (11)   Pre-service teachers analyze the principles and structure of the organization of a scientific activity, the methodology of scientific knowledge, and the methods of setting goals and objectives for the scientific research. The discipline is aimed at developing pre-service teachers’ skills in conducting experimental research, as well as processing and analyzing the results. | | Learning outcomes | **Pre-service teachers demonstrating competence can:**   * apply scientific methods in their professional activity; * understand and solve problems in new or unfamiliar situations in contexts and within broader (or interdisciplinary) fields related to the field being studied; * adapt modern scientific achievements to their educational process; * collect, process and interpret research data; * formalize the research results into various forms of scientific products; * conduct a scientific discussion using the evidence based on the results of theoretical and experimental research. |  |  |  | | --- | --- | | Course title | **Microbiology with the basics of biotechnology** | | Component | Subject component, Optional component | | Cycle | Major disciplines | | Module | Applied and Integrated Sciences 25 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of subject competence:   * Competence area for Cognitive skills development (2) * Competence area for Development of practical and research skills (5, 6, 7) * Competence area for Interdisciplinary interactions development (9, 11, 13)   During the course, pre-service teachers examine morphology, physiology, biochemistry, genetics and systematics of microorganisms. They also investigate the principles of using bacterial, yeast, animal and plant cell cultures, metabolism and biosynthetic capabilities in genetic engineering and biotechnological production by using knowledge of chemistry and physics. After the course, pre-service teachers have a good basic knowledge of the prospects for the development of biotechnology: the methods of obtaining recombinant DNA and DNA cloning, the use of plasmids, the stages of microclonal reproduction, and the use of enzymes in various fields. The knowledge gained serves as the basis not only for individual laboratory work and small group studies in microbiology and biotechnology, but also for all other research in biology. Completion of the course includes a report on laboratory work and an exam. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * compare morpho-physiology, biochemistry, genetics of microorganisms with the use of modern molecular genetic methods; * use disinfection and sterilization methods when working with biotechnological objects, and preparing nutrient media and coloring by using the Gram method to identify microorganisms; * check the parameters of growth and development of microbial cultures, and correctly identify microorganisms by cultural and morphological characteristics; * evaluate the use of living organisms in biotechnological production: production of microbial protein, enzyme preparation, biogas, bioethanol; * practice the skills of cultivation and cloning of living organisms, experimentation of microclonal reproduction, microscopy of preparations of cells of living organisms; * analyze the ethical issues of the use of GMOs, the principles of genetic engineering manipulations, and the importance of molecular genetic approaches in taxonomy, medicine and criminology; * investigate the influence of various factors (temperature, pH, nutrient content) on the growth and development of microorganisms, the use of enzymes (pectinase, protease, etc.), the influence of antiseptic and disinfectants; * design experiments for obtaining a cumulative and pure culture of microorganisms, obtaining callus tissues by microclonal reproduction; * conduct a safe experiment to study the microflora of water, air, and dairy products; * organize small projects: formulation of hypotheses and conclusions, planning, assessment of strengths and weaknesses, preparation of a report; * collect, process and interpret research data on design and laboratory work; * use scientific language, subject terminology and conventions appropriately. |  |  |  | | --- | --- | | Course title | **Applied biology with the basics of soil science** | | Component | Subject component, Optional component | | Cycle | Major disciplines | | Module | Applied and Integrated Sciences 25 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of subject competence:   * Competence area for Cognitive skills development (2) * Competence area for Development of practical and research skills (5, 6, 7) * Competence area for Interdisciplinary interactions development (9, 11, 13)   During the course, pre-service teachers examine the topics of soil science, agrochemistry, and crop production:  the process of soil formation, soil morphology, structure and properties of soil, tillage, chemistry of agriculture, and cultivated plants. The course consists of lectures and laboratory classes, during which pre-service teachers develo their skills in working with laboratory equipment, materials, tools in the organization of educational and research activities. They also develop their interdisciplinary competencies during laboratory work and small scientific projects. Pre-service teachers critically choose the methods and techniques of research, academically conduct and evaluate experimental and calculated data, prepare research reports and pass the exam. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * classify soil by mechanical composition; * analyze the relationship of soil science with biological, chemical and other sciences; * conduct safe experiments to study the influence of various factors on soil formation, the influence of living organisms on soil formation; * identify morphological, biological and economic features of cultivated plants; * assess the soil-ecological and bioecological condition of the territory of Kazakhstan; * practice the skills of cultivating soil microorganisms, microscoping preparations of cells of living organisms; * design experiments to determine the composition and properties of the soil (physical, physico-mechanical, rheological); * investigate the use of organic and mineral fertilizers in crop production; * plan and carry out projects: formulation of hypotheses and conclusions, assessment of strengths and weaknesses, preparation of a report; * collect, process and interpret research data on design and laboratory work; * use scientific language, subject terminology and conventions appropriately. |  |  | | --- | | **Research in Biology 24 academic credits** | | The module allows pre-service teachers to master the skills in defining a problem, setting experiments, solving research problems, selecting information, analyzing, and summarizing the results. Pre-service teachers improve their abilities to develop, implement, and evaluate learning processes, considering the diversity of students and their well-being. Pre-service teachers will gain knowledge on determining the purpose, relevance, and significance of research, as well as master the principles of writing scientific texts and public presentations of research results. The courses of the module contain a global and local context for ensuring the safety of life, the competent use of modern technologies, as well as methods of STEM learning and sustainable development. |  |  |  | | --- | --- | | Course title | **Conceptual Biology Training** | | Component | Subject component, University component | | Cycle | Major disciplines | | Module | Research in Biology 24 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of pedagogical and subject competence:   * Competence area in Pedagogy and Didactics (1,2) * Competence area for professional development (8,9) * Competence area for conceptual and theoretical knowledge (3) * Competence area for conducting scientific research (7,8) * Competence area for science application (10, 13)     During the course, pre-service teachers analyze the methodology of implementing new interdisciplinary approach in school’s biology education. Pre-service teachers systematize the basic learning material and adapt it to the biology course at school, considering the age and individual characteristics of students. Pre-service teachers plan, conduct, and analyze lessons, and use various learning technologies, and digital educational resources. They form a holistic perception of the world (not fragmented) integrating knowledge from various academic disciplines. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * analyze knowledge from specific scientific disciplines in biology; * identify patterns in natural phenomena and formulate meaningful relationships between them; * make connections between biology, humanities and other sciences; * use conceptual learning tools. |  |  |  | | --- | --- | | Course title | **Educational practice and methods of its implementation at school (Botany)** | | Component | Subject component, University component | | Cycle | Major disciplines | | Module | Research in Biology 24 academic credits | | Academic credits | 2 | | Course Description/ competencies | The purpose of this course is to improve the following areas of pedagogical and subject competence:   * Competence area in Pedagogy and Didactics (2) * Competence area for professional development (9,10) * Conceptual-theoretical knowledge competencies (2,3). * Competences in conducting scientific research (6) * Competences in the science application (12)     Pre-service teachers explore the main taxonomic groups of plants, biological, morphological, and anatomical features of plants in their natural habitat and apply the acquired theoretical knowledge and skills in botany in practice. Mastering the course contributes to the formation of pre-service teachers’ holistic natural-scientific world view. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * describe plant communities, life forms and ecological groups of plants; * apply methods of field research in botany; * identify plants in field and in laboratory conditions; * conduct phenological observations in nature; * apply methods of fixation and herbarization of plants; * plan and organize excursions, and conduct research at school, at the school site and in the laboratory. |  |  |  | | --- | --- | | Course title | **Educational practice and methods of its implementation at school (Zoology)** | | Component | Subject component, University component | | Cycle | Major disciplines | | Module | Research in Biology 24 academic credits | | Academic credits | 2 | | Course Description/ competencies | The purpose of this course is to improve the following areas of pedagogical and subject competence:   * Competence area in Pedagogy and Didactics (2) * Competence area for professional development (9,10) * Conceptual-theoretical knowledge competencies (2,3). * Competences in conducting scientific research (6) * Competences in the science application (12)     Pre-service teachers explore the main taxonomic groups of plants, biological, morphological. and anatomical features of plants in their natural habitat and apply the acquired theoretical knowledge and skills in zoology in practice. Mastering the course contributes to the formation of pre-service teachers’ holistic natural-scientific world view. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * describe the ecological characteristics, anatomical and morphological features of invertebrates and vertebrates from different habitats; * determine the systematic position of animals with the help of identifiers, * recognize the most typical animals of the local fauna in the field by their external appearance and typical marks of activity; * apply the methods of field research in zoology; * carry out observations of animals and record them in a field diary; * apply methods of collecting, recording and collecting animals; * write reports on the results of the observations; * use methods of identification, classification, cultivation of biological objects; * carry out research work at school, on the school grounds and in the laboratory; * organize extra-curricular activities for animal conservation; * plan an excursion route, lead an excursion on a given topic, and explain and critically analyze the received information; * present the results of field and laboratory biological investigations. |  |  |  | | --- | --- | | Course title | **STEM education in biology** | | Component | Subject component, Optional component | | Cycle | Major disciplines | | Module | Research in Biology 24 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of pedagogical and subject competence:   * Competence area in Pedagogy and Didactics (1,2) * Competence area for professional development (8,9) * Conceptual and theoretical knowledge competences (3) * Competences in conducting scientific research (7,8) * Competences in the science application (10, 13)   During the course, pre-service teachers practice pedagogical methods and technologies based on the activation and intensification of students' educational activities, diagnostics, and assessment in biology teaching using STEM approach. Pre-service teachers master the subject content through projects in which scientific knowledge and design, information technology and mathematical calculations are naturally integrated. Pre-service teachers explore the methodology of the organization of STEM learning, discuss the stages, apply various research methods in the practice of teaching STEM learning, and design STEM research. Pre-service teachers form their skills in integrating research into teaching practice in various types of learning environments. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * carry out the selection of pedagogical STEM–learning technologies and effectively implement them in the practice of teaching school academic disciplines in the classroom and in extracurricular activities; * design STEM learning, considering the diversity of students; * apply various methods and technologies of pedagogical diagnostics used in evaluation of the quality of results and content of the educational process; * perform consistent, planned actions to improve the practice of teaching and STEM learning; * develop their research skills, direct them to improve the quality of education and their functional literacy; * develop a plan for the implementation of research on the practice of teaching STEM learning; * conduct systematic evaluation of the results during STEM training; * evaluate the strengths and weaknesses of STEM education. |  |  |  | | --- | --- | | Course title | **Digital technologies in biology** | | Component | Subject component, Optional component | | Cycle | Major disciplines | | Module | Research in Biology 24 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of pedagogical and subject competence:   * Competence area in Pedagogy and Didactics (2) * Competence area for professional development (8,9) * Competences in conducting scientific research (7) * Competences in the science application (8,10, 12)   Pre-service teachers investigate the possibilities of using digital equipment and software in the educational process in biology, and plan effective ways of teaching using IT technologies, including in distance learning. They also create digital educational resources in biology. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * use various forms of interactive electronic educational content; * use IT technologies in the organization of project activities; * structure, integrate and present information in teaching activities, considering life and educational context of students; * plan effective teaching using IT technologies; * develop digital educational resources on biology. |  |  |  | | --- | --- | | Course title | **Design of STEM education** | | Component | Subject component, Optional component | | Cycle | Major disciplines | | Module | Research in Biology 24 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of pedagogical and subject competence:   * Competence area in Pedagogy and Didactics (2) * Competence area for professional development (8,9) * Competences in conducting scientific research (7) * Competences in the science application (8,10, 12)   Pre-service teachers analyze the design features of STEM learning based on the applied nature of the real world challenges, learning through problem solving and critical thinking, and the integration of different content into the educational process. The course builds pre-service teachers’ abilities to use new technological opportunities in biology, as well as to design and adapt STEM education considering the diversity of students. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * link science and STEM subjects with real life challenges or situations; * identify practice-oriented problem situations; * build project/phenomena-based learning processes in which students make observations, identify problems and find solutions independently and with their peers; * conduct experimental research with mathematical and IT modeling; * design STEM lessons for students' academic and extracurricular activities in an inclusive environment. |  |  |  | | --- | --- | | Course title | **Modern approaches to the organization of a biological experiment** | | Component | Subject component, Optional component | | Cycle | Major disciplines | | Module | Research in Biology 24 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of subject competence:   * Competences in conducting scientific research (4,6) * Competences in the science application (10, 12)   Pre-service teachers analyze modern approaches to the organization of experiments in the field of biological sciences, the stages of conducting and the aspects of organizing and planning of experiments, the methods of data processing, and the ways of presenting the results. Special emphasis is placed on molecular genetic approaches to the organization of experiments. The course is aimed at developing pre-service teachers’ skills in conducting biological experiments by using modern approaches and experiments in their professional and research activities. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * apply modern approaches to the organization of biological experiments and apply them in their professional and research activities; * work with scientific and laboratory equipment, use them during biological experiments; * determine and formulate a research hypothesis, draw up an experiment plan, select methods, and on the basis of this conduct theoretical and applied research in the field of biology; * organize and conduct experimental work with biological objects, processing and presenting the results of this work. |  |  |  | | --- | --- | | Course title | **Methodology of biological research** | | Component | Subject component, Optional component | | Cycle | Major disciplines | | Module | Research in Biology 24 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of pedagogical and subject competence:   * Competence area in Pedagogy and Didactics (2) * Competences in conducting scientific research (4,5,7) * Competences in the science application (8,11, 12)   Pre-service teachers analyze the methodology of organizing scientific research in the field of biology, the stages of research, the variety of research methods in biology, the methods of processing data, and the ways of presenting the results. The course is aimed at developing pre-service teachers’ skills in working with scientific equipment and conducting theoretical and applied research. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * use methods of conducting biological research in their professional and research activities; * work with scientific and laboratory equipment, use them during research; * determine and formulate a research hypothesis, draw up an experiment plan, select methods, and on the basis of this conduct theoretical and applied research in the field of biology; * organize and conduct experimental work with biological objects, processing and presenting the results of this work; * teach research methods in various types of learning environments. |  |  |  | | --- | --- | | Course title | **Research and project activities in biological education** | | Component | Subject component, Optional component | | Cycle | Major disciplines | | Module | Research in Biology 24 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of pedagogical and subject competence:   * Competence area in Pedagogy and Didactics (2) * Competence area for interaction (3,4) * Competence area for professional development (8,9) * Competences in conducting scientific research (4,7) * Competences in the science application (8,11, 12)     Pre-service teachers analyze the methodology of project activity in education, the method of projects in a modern school, the practice of educational design, the organization and stages of project activity of students, as well as the collaboration between a teacher and students. The discipline is aimed at developing pre-service teachers’ skills within the framework of research and project activities. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * set goals and define tasks in the organization of scientific and project research; * carry out information-analytical and information-bibliographic work with the involvement of modern information technologies; * creatively find solutions for new problems and situations; * mentor students during research project; * competently present the results of research and project activities. |  |  |  | | --- | --- | | Course title | **Academic letter** | | Component | Subject component, Optional component | | Cycle | Major disciplines | | Module | Research in Biology 24 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of pedagogical and subject competence:   * Competence area for interaction (3,4) * Competences in conducting scientific research (4,7)   Pre-service teachers analyze the features of academic writing, and the ways of correct writing and execution of written types of work in accordance with the principles of academic integrity. The discipline is aimed at the formation of pre-service teachers’ writing skills, as well as skills in designing all types of written works in accordance with existing requirements. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * use the knowledge gained within the discipline for writing, registration of all types of written works, in accordance with the requirements; * work with databases of scientific publications, bibliographic sources, and make references to the sources; * use citations correctly in compliance with the referencing system at use; * present information to the audience, interact with the audience, and competently build communication based on the goals and situation of communication. |  |  |  | | --- | --- | | Course title | **Content-language integrated learning (CLIL) in biology** | | Component | Subject component, Optional component | | Cycle | Major disciplines | | Module | Research in Biology 24 academic credits | | Academic credits | 5 | | Course Description/ competencies | The purpose of this course is to improve the following areas of pedagogical and subject competence:   * Competence area in Pedagogy and Didactics (1) * Competence area for interaction (5) * Competence area for professional development (8,9) * Conceptual-theoretical knowledge competencies (2). * Competences in conducting scientific research (7) * Competences in the science application (8,12, 13)   Pre-service teachers explore the basic approaches, techniques and forms used in content-language integrated learning (CLIL) in biology. During the course, pre-service teachers acquire knowledge of biology, while improving their foreign language knowledge and skills. | | Learning outcomes | **Pre-service teachers who demonstrate competence can:**   * identify language problems of students; * use communicative and interactive tasks that contribute to a better understanding of biology studied in a foreign language; * apply error correction strategies that encourage the correct use of a spoken foreign language; * use activities in the classroom that contribute to both studying biology and developing foreign language skills; * use authentic educational material. |  |  |  | | --- | --- | | **FINAL ATTESTATION 8 academic credits** | **FINAL STATE CERTIFICATION 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)*** | Final state certification of the graduate is mandatory and is carried out after mastering the educational programme in full. The aim of the certification 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 - teaching biology in schools.  **Final qualification work (thesis work/ thesis 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** | | | | | | | | | | Structure and functions of plant organisms 6 academic credits |  | 6 |  |  |  |  |  |  | | Diversity of plant organisms 5 academic credits |  |  | 5 |  |  |  |  |  | | Plant Physiology 5 academic credits |  |  |  |  | 5 |  |  |  | | Structure and functions of animals (1,2) 9 academic credits |  |  | 4 | 5 |  |  |  |  | | Human Biology 5 academic credits |  |  |  |  | 5 |  |  |  | | Human Anatomy 5 academic credits |  |  |  |  |  |  |  | | Human and Animal Physiology 5 academic credits |  |  |  |  |  | 5 |  |  | | Individual development of living organisms 6 academic credits | 6 |  |  |  |  |  |  |  | | Cytology, histology and embryology 6 academic credits |  |  |  |  |  |  |  | | Patterns of inheritance and variability 5 academic credits |  |  |  |  |  | 5 |  |  | | Genetics and the basis of breeding 5 academic credits |  |  |  |  |  |  |  | | Molecular Biology 5 academic credits |  |  |  |  |  |  | 5 |  | | Comparative anatomy and evolution of living organisms 4 academic credits |  |  |  |  |  |  | 4 |  | | Evolutionary teaching 4 academic credits |  |  |  |  |  |  |  | | Biogeocenology 5 academic credits |  |  |  |  | 5 |  |  |  | | Ecology of plants, animals and humans 5 academic credits |  |  |  |  |  |  |  | | Bioresources of Kazakhstan 5 academic credits |  |  |  |  |  | 5 |  |  | | Flora and fauna of the world 5 academic credits |  |  |  |  |  |  |  | | Environmental Chemistry 5 academic credits |  |  | 5 |  |  |  |  |  | | Theoretical foundations of inorganic chemistry 5 academic credits |  |  |  |  |  |  |  | | Biochemistry 5 academic credits |  |  |  |  |  | 5 |  |  | | Bioorganic Chemistry 5 academic credits |  |  |  |  |  |  |  | | Biophysics and Bioinformatics 4 academic credits |  |  |  |  |  |  |  | 4 | | Scientific foundations of natural science 4 academic credits |  |  |  |  |  |  |  | | Biometrics 5 academic credits |  |  |  |  | 5 |  |  |  | | Experimental Biology 5 academic credits |  |  |  |  |  |  |  | | Microbiology with the basics of biotechnology 5 academic credits |  |  |  |  |  |  | 5 |  | | Applied Biology with the basics of soil Science 5 academic credits |  |  |  |  |  |  |  | | STEM Education in Biology 5 academic credits |  |  |  |  |  |  | 5 |  | | Digital Technologies in Biology 5 academic credits |  |  |  |  |  |  |  | | Design of STEM Education 5 academic credits |  |  |  |  |  |  |  | | Conceptual Biology Training 5 academic credits |  |  |  |  |  |  | 5 |  | | Modern approaches to the organization of biological experiment 4 academic credits |  |  |  |  |  |  |  | 4 | | Methodology of biological research 4 academic credits |  |  |  |  |  |  |  | | Research and project activities in biological education 4 academic credits |  |  |  |  |  |  |  | | Academic Letter 5 academic credits |  |  | 5 |  |  |  |  |  | | Content-language integrated learning (CLIL) in biology 5 academic credits |  |  |  |  |  |  |  | | Educational practice and methods of its implementation at school (Botany) 2 academic credits |  | 2 |  |  |  |  |  |  | | Educational practice and methods of its implementation at school (Zoology) 2 academic credits |  |  |  | 2 |  |  |  |  | | **FINAL ATTESTATION - 8 academic credits** | | | | | | | | | | **Final attestation** |  |  |  |  |  |  |  | 8 | | **Academic credits in total** | **30** | **30** | **30** | **30** | **30** | **30** | **30** | **30** | |
| 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. |

# 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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