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GRADUATE MODEL

**of the master's
educational programme
«7M01519-Biology»**

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INTRODUCTION

The development of a competence-based graduate model, as one of the main directions of implementing the Bologna Process, is intended to answer the question of what professional tasks a specialist of a certain level (position) and a certain profile should be able to solve. Shaping a modern model of a university graduate that meets the needs of stakeholders and all interested parties is the main strategic goal of Korkyt Ata Kyzylorda University and is supported by the staffing, educational and methodological, information and material and technical resources required for the educational process. To ensure high-quality training of bachelor's graduates who are in demand on the labour market, the university pursues a purposeful staffing policy and systematically improves its material and technical base.

1. Description of the EP

The field of professional activity of graduates in the area of training 7M01519-Biology covers natural science education in all training profiles: the educational, social and scientific spheres.

Educational programme 7M01519-Biology

2. Components of the graduate model of the educational programme

The main components of the graduate model of the educational programme include information on the goals and objectives of the educational programme, the objects, types and areas of professional activity, the competence model of the specialist (Appendix 1), including descriptors, types of competences in accordance with the educational programme, and the learning outcomes of the educational programme.

2.1 Goals of the educational programme

Training highly qualified and competitive specialists in the field of biology who are in demand on the labour market, have a high level of professional culture and are able to solve professional tasks in the field of biological education.

Objectives of the educational programme:

In the field of teaching activity:

- Using systems of scientific knowledge about the environment, accepting different points of view and cultural diversity, knowing and understanding the concept of sustainable development;
- Planning and implementing the educational process in line with learners' needs and achievements on the basis of modern, research-based teaching technologies;
- Applying various tools and criteria for assessing learners' achievements (abstracts, reports, theses, essays, portfolios, etc.);
- Conducting applied research to solve situation-specific problems (under supervision);
- Independently choosing an educational programme, selecting and developing didactic materials for it and using them in the educational process on the basis of pedagogical reflection.
- Developing in learners the values needed for life in a democratic society: civic and patriotic convictions,
 - tolerance, cultural diversity, social rights and acceptance of inclusion.
 - Planning, monitoring and assessing learners' activities;
 - Working in a multicultural environment and implementing the principles of multicultural education and upbringing;

➤ Creating conditions for learners' socialisation and professional self-determination and preparing them for an informed choice of profession;

➤ Creating a safe (psychologically, socially and physically) learning environment and developing learners' skills in different age groups

➤ Healthy lifestyle, nature conservation, energy saving, sustainable use of natural resources and adaptation to climate change.

➤ Planning classes in the discipline(s) taking into account the specifics of the programme's topics and sections and in accordance with the curriculum;

➤ Developing learners' capacity for reflection, self-assessment and self-development.

In the field of organisational and managerial activity:

➤ Using legal and regulatory knowledge and observing ethical principles in professional activity.

➤ Ability to take the principles of sustainable development into account in professional activity and to create conditions for preserving learners' health and safety in the educational process.

➤ Organising interaction with public and educational organisations, groups of learners and parents to solve professional tasks. Organising positive and constructive interpersonal relations among all participants in the pedagogical process.

In the field of professional development:

➤ Carrying out professional reflection on one's activity.

➤ Setting self-development goals on the basis of professional reflection.

➤ Pursuing professional self-education and personal growth, designing one's further educational path and professional career.

In the field of professional development:

➤ Carrying out professional reflection on one's activity.

➤ Setting goals for one's own development on the basis of professional reflection.

➤ Pursuing professional self-education and personal growth, designing one's further educational path and professional career.

2.2 General and specialised (professional) competences

a) universal:

- general scientific (GSC):

➤ possesses an integrated system of scientific knowledge about the environment, understands modern concepts and the picture of the world, the worldview system and his/her place and role in it

➤ ability to critically analyse and evaluate modern scientific achievements and to generate new ideas when solving research and practical tasks, including in interdisciplinary areas (GC-1);

➤ conducting a dialogue expressing specific communicative intentions required for professional negotiations (GC-2);

➤ is able to apply modern methods and technologies and to carry out the educational process in various educational institutions (GC-3);

➤ to be competent: to apply knowledge, skills and personal qualities for successful activity in the field of the environment and biological diversity (GC-4);

b) professional competences (PC):

➤ is competent in the effective planning of scientific research and the processing of experimental data (PC-1);

➤ the competences enable future educators, teachers and education specialists to correctly apply scientific and methodological approaches in teaching natural science disciplines (PC-2);

➤ the knowledge, skills and abilities that students develop after mastering the discipline, which can be applied to the scientific organisation and conduct of pedagogical research and the analysis of its results. These competences are aimed at developing the skills and abilities students

need to conduct research in pedagogy effectively (PC-4);

➤ a teacher's competence includes the ability to organise and deliver the educational process effectively, taking into account learners' individual characteristics (PC-5);

➤ ability to distinguish the morphofunctional features of the main organ systems in different classes of vertebrates (PC-7);

➤ a set of competences that make it possible to master the necessary knowledge and skills in Science, Technology, Engineering and Mathematics and to apply them effectively in the educational process (PC-10);

➤ through mastering the competences, possesses the knowledge and skills required for effective teaching of natural science disciplines and organisation of the educational process (PC-11);

➤ a set of professional competences reflecting the acquired knowledge and skills in the natural sciences (PC-12);

➤ a set of professional skills and knowledge that make it possible to use information and communication technologies effectively in teaching (PC-13);

➤ the competences include students' ability to use natural resources effectively, manage environmental risks, develop sustainable development strategies and foster environmental responsibility in society (PC-15).

2.3 Matrix mapping the learning outcomes of the educational programme to the competences developed
LEARNING OUTCOMES (learning outcomes developed by module)

Learning outcome/	Module title	Module learning outcome	Module disciplines
M1 Scientific knowledge	<p>The master's student reproduces the main historical stages in the development of science and scientific schools and explains the differences between the empirical and theoretical levels of scientific knowledge. Applies the categories of scientific rationality when evaluating scientific texts. Analyses the philosophy and structure of scientific knowledge and the logic of scientific discoveries. Justifies the choice of a scientific approach in a specific research situation. Formulates his/her own position in the debate on the status of science in modern society.</p> <p>Is able to analyse pedagogical and psychological situations and identify their causes and consequences. Is able to develop pedagogical and psychological approaches to solving professional tasks. Is able to critically evaluate pedagogical and psychological approaches and propose improvements.</p> <p>Uses terminology common in the professional field in a foreign language. Understands oral and written professional information (instructions, descriptions, business correspondence). Uses a foreign language in typical professional situations. Analyses and synthesises the content of professional texts, identifies their structure and argumentation. Evaluates the appropriateness of language use in a professional context.</p> <p>Uses tools and platforms (e.g. Jupyter, Google Colab, ChatGPT) to solve typical research or educational tasks. Solves research and innovation tasks using information and communication technologies; designs and implements his/her own AI- and ICT-based projects to solve tasks in his/her professional field.</p> <p>Applies experimental methods in practice in a teaching or laboratory setting. Compares different types of experiments and data collection methods. Develops an experimental plan that meets scientific requirements. Evaluates the reliability of the data obtained and the correctness of the experiment conducted. Applies teaching techniques when designing biology classes.</p>	ON1,3	History and Philosophy of Science
		ON2,9	Foreign Language (Professional)
		ON3,5,6,9	Higher School Pedagogy
		ON1,3,9	Management Psychology
		ON7	Biodiversity of the Fauna and Flora of the Aral Sea Region

	<p>Applies ICT, interactive methods and modern pedagogical technologies in teaching practice. Creates original teaching aids and learning materials. Compares the effectiveness of different pedagogical approaches to developing cross-curricular competences.</p> <ul style="list-style-type: none"> - Analyses the effectiveness of different approaches and methods of teaching natural science disciplines. Develops his/her own lesson fragments, teaching aids and didactic materials. Develops and implements his/her own interdisciplinary STEAM project. Creates an innovative solution to a real problem by integrating knowledge from all STEAM fields. Is able to develop openness to innovation and capacity for innovative activity. - Applies knowledge of anatomy to determine whether an animal belongs to a particular taxonomic group. Compares the anatomical features of different classes of vertebrates. Applies anatomical and physiological research methods to solve practical tasks. Formulates his/her own proposals for improving research methods in anatomy, physiology and biological diversity. Develops socially responsible personal behaviour aimed at ensuring public safety. 			
2 Science (by branch) and innovation/	<ul style="list-style-type: none"> - The master's student reproduces the main historical stages in the development of science and scientific schools and explains the differences between the empirical and theoretical levels of scientific knowledge. Applies the categories of scientific rationality when evaluating scientific texts. Analyses the philosophy and structure of scientific knowledge and the logic of scientific discoveries. Justifies the choice of a scientific approach in a specific research situation. Formulates his/her own position in the debate on the status of science in modern society. - Uses terminology common in the professional field in a foreign language. Understands oral and written professional information (instructions, descriptions, business correspondence). Uses a foreign language in typical professional situations. Analyses and synthesises the content of professional texts, identifies their structure and argumentation. - Applies methods of scientific inquiry (observation, experiment, modelling) to specific examples. Analyses the structure of a scientific text, identifying its aim, objectives, hypothesis and methods. Formulates his/her own research problem and justifies its relevance. Critically evaluates scientific publications in terms of logic, validity and novelty. - Is able to analyse pedagogical and psychological situations and identify their causes and consequences. Is able to develop pedagogical and psychological approaches to solving professional tasks. Is able to critically evaluate pedagogical and psychological approaches and propose improvements. - Applies experimental methods in practice in a teaching or laboratory setting. Compares different types of experiments and data collection methods. Develops an experimental plan that meets scientific requirements. Evaluates the reliability of the data 	ON1,2,4 ON3,5,6,9	Methodology of Science and Methods of Scientific Research Methods of Teaching Biology in Higher Education	
		ON1,3,6 ON5,7,9	Scientific and Methodological Support of Natural Science Education Bioethics and Organisation of Biological Experiments	
		ON1,3,4 ON3,5	Methodology of Scientific and Pedagogical Research Pedagogical Experiment in Modern Sociocultural Conditions	
		ON3,6 ON8	Adaptive Didactics Design of the Educational Environment	
		ON7	Comparative Anatomy of Vertebrates Fundamental Problems of Human and Animal Physiology	
		ON6 ON2,3,6	STEAM Education Innovative Educational Technologies	
		ON3,8,9 ON7	Natural Science Education in General Secondary and Higher Education Institutions Environment and Biological Diversity	
		ON2,3,8 ON5	Natural Science Functional Literacy Technological Foundations of Developing Cross-Curricular Competences in Teaching	
		ON5,9	Information Technologies in a Teacher's Professional Activity	

	<p>obtained and the correctness of the experiment conducted. Applies teaching techniques when designing biology classes. Applies ICT, interactive methods and modern pedagogical technologies in teaching practice. Creates original teaching aids and learning materials. Compares the effectiveness of different pedagogical approaches to developing cross-curricular competences.</p> <ul style="list-style-type: none"> - Analyses the effectiveness of different approaches and methods of teaching natural science disciplines. Develops his/her own lesson fragments, teaching aids and didactic materials. Develops and implements his/her own interdisciplinary STEAM project. Creates an innovative solution to a real problem by integrating knowledge from all STEAM fields. Is able to develop openness to innovation and capacity for innovative activity. - Uses tools and platforms (e.g. Jupyter, Google Colab, ChatGPT) to solve typical research or educational tasks. Solves research and innovation tasks using information and communication technologies; designs and implements his/her own AI- and ICT-based projects to solve tasks in his/her professional field. - Applies knowledge of anatomy to determine whether an animal belongs to a particular taxonomic group. Compares the anatomical features of different classes of vertebrates. Applies anatomical and physiological research methods to solve practical tasks. Formulates his/her own proposals for improving research methods in anatomy, physiology and biological diversity. Develops socially responsible personal behaviour aimed at ensuring public safety. - The master's student can list the basic concepts and terms related to scientific literacy and sustainable development (e.g. scientific method, hypothesis, experiment, data). Can develop small projects or learning materials aimed at popularising scientific knowledge and developing scientific literacy among various target audiences. Designs an educational process aimed at developing learners' personal culture in line with the concept of sustainable development of society. 	<p>ON 8 ON 1,3,4</p>	<p>Application of Artificial Intelligence in Science and Education Natural Science Education for Sustainable Development Methodological Foundations of Research in Biology</p>
<p>M3 Final Attestation</p>	<p>- Assessment of the master's student's scientific, theoretical, research and analytical level, the professional and managerial competences developed, and readiness to perform professional tasks independently in accordance with the requirements of professional standards and educational programmes. Writing and defence of the master's thesis</p>	<p>ON1-9</p>	<p>Final Attestation</p>

Matrix of correspondence between learning outcomes and competences developed in the educational programme 7M01519 – «Biology»

Competences developed	ON1	ON2	ON3	ON4	ON5	ON6	ON7	ON 8	ON 9
GC1	+		+						
GC2		+							+
GC3	+				+	+			+
GC4	+		+						+
PC1	+	+		+					
PC2	+		+		+	+			+
PC4	+		+	+	+		+		+
PC5			+		+				
PC6			+			+			
PC7							+	+	
PC8			+	+	+	+	+	+	+
PC9			+	+	+	+	+	+	+
PC10						+			
PC11		+	+			+		+	+
PC12		+	+				+	+	
PC13					+				+
PC14					+				+
PC15	+						+	+	
PC16			+	+	+	+	+	+	+
PC17			+	+	+	+	+	+	+
PC18			+	+	+	+	+	+	+
PC19	+	+	+	+	+	+	+	+	+

2.4. Personal qualities of a specialist in EP 7M01519-Biology:

1. Scientific, analytical and critical thinking: analyses and evaluates modern scientific achievements, proposes new ideas when solving research tasks, critically evaluates scientific publications in terms of logic, validity and novelty.
2. Research abilities and research ethics: draws up an experimental plan, collects and processes data correctly, evaluates the reliability of results, observes research integrity and academic discipline.
3. Professional competence and responsibility for one's work: applies knowledge of biology, anatomy, physiology and biodiversity to practical tasks, carries out professional activity in accordance with legal and regulatory norms and ethical principles.
4. Communication skills and openness: builds constructive relations with all participants in the pedagogical process (learners, parents, colleagues, public organisations), is able to conduct professional dialogue and negotiations.
5. Tolerance and cultural sensitivity: accepts different points of view, cultural diversity and the principles of inclusion, is able to work in a multicultural environment.
6. Civic and patriotic stance: adheres to democratic values, social responsibility and patriotic convictions and develops them in learners.
7. Pedagogical skill and learner orientation: takes into account learners' individual characteristics and needs, stimulates interest in learning, creates a safe and supportive learning environment.
8. Openness to innovation and initiative: applies modern pedagogical technologies and the STEAM approach, creates original teaching materials, is capable of innovative activity.
9. Digital literacy: makes effective use of ICT and artificial intelligence tools (Jupyter, Google Colab, ChatGPT, etc.) in research and educational tasks.
10. Environmental responsibility and healthy lifestyle: adheres to the principles of sustainable development, contributes to nature conservation, sustainable use of natural resources and preservation of biodiversity.
11. Reflection and self-development: reflects professionally on his/her activity, designs a path of personal growth and professional career, is ready for lifelong learning.
12. Organisational and leadership abilities: plans the educational process, carries out monitoring, works effectively in working groups, is able to manage risks.
13. Professional proficiency in a foreign language: understands, analyses and applies professional information in a foreign language.

Conclusions

The graduate model of the master's programme «7M01519-Biology» is aimed at training highly qualified and competitive specialists who are in demand on the labour market. The model includes the goals and objectives of the educational programme, general scientific and professional competences (GC-1–GC-4, PC-1–PC-15), learning outcomes (LO 1–9) and a matrix of their correspondence by modules and disciplines.

A master's graduate of the programme has in-depth scientific and theoretical knowledge in biology, research and analytical skills, pedagogical skill and the ability to apply digital technologies. He/she is able to plan a scientific experiment and analyse its results, applies modern methods and the STEAM approach in teaching natural science disciplines, and takes a responsible stance on biodiversity conservation and sustainable development.