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FORMING THE PERSONAL EDUCATIONAL TRAJECTORY OF FUTURE ENGINEERS THROUGH A DIGITAL PLATFORM

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Abstract. The article describes a model for forming the personal educational trajectory (PET) of future engineers on the basis of information-methodological support, as well as the architecture of a digital platform. The model consists of four blocks (target, content, technological, and diagnostic), and its innovative element is a mechanism for automatically forming an initial and a dynamic PET through a three-stage diagnostic system. The data-base architecture, comprising 13 interconnected tables within the platform, the integration of artificial intelligence, and the "Profession Direction" teaching method are described in detail.

Keywords: personal educational trajectory, digital platform, information-methodological support, diagnostic system, artificial intelligence, engineering education, four-block model, database.

Introduction. In the modern higher-education system, the process of training future engineering personnel requires approaches based on the principle of personalization. UNESCO's "Education 2030" agenda defines meeting the individual needs of learners as a global priority [1; 2]. The rapid changes in the labor market demand that engineers acquire not only theoretical knowledge but also concrete professional competencies. This, in turn, gives rise to the need to personalize the educational process in a career-oriented manner and to improve information-methodological support on the basis of modern technologies [3; 4].

The concept of the personal educational trajectory (PET) has a broader meaning than the concepts of the individual educational route (IER) and the individual educational direction (IED), holistically encompassing the content, activity, and process dimensions of the student [5; 6; 7]. A.V. Khutorskoy defined the PET as "an individual path of activity aimed at mastering the educational program while taking into account the student's personal abilities, interests, and motivation" [1]. However, in existing research, the issue of forming the PET in engineering education on the basis of information-methodological support through a digital platform has not been sufficiently studied [8; 9; 10].

The aim of the research is to improve the model for forming the PET of future engineers on the basis of information-methodological support and to scientifically substantiate its practical application through a digital platform.

Structure of the Model. Within the framework of the research, the model for forming the PET on the basis of information-methodological support was improved as a four-block system. The target block consists of three external determinants — the social order, the State Educational Standard (SES) and qualification requirements of the field, and the student's needs and professional interests. The social order is expressed through labor-market requirements, directions of economic development, and state policy. The SES and qualification requirements define the minimum and optimal levels of competencies that a graduate of each educational field must master [11].

The content block consists of educational programs, the curriculum, study programs (syllabi), and an individual curriculum based on the personal educational trajectory. In the subject-content component, the learning outcomes of each subject's syllabus are differentiated by profession. For example, in the case of the subject "Database Management Systems," the learning outcomes are distributed across the professions of "Programmer" (P), "Network Administrator" (NA), and "Information Security Specialist" (ISS) [12].

The technological block includes the element for forming the initial (primary) PET. This is the main innovative component of the model: through the e-learning platform, the student undergoes a three-stage diagnostic process — a professional-interests questionnaire, a test of foundational knowledge and practical competencies, and an aptitude diagnostic. As a result, the student's career-oriented primary PET is formed on the platform [13; 14].

The diagnostic block consists of indicator diagnostics, quality indicators, recommendations for the student's PET, and the element for forming the dynamic PET. The dynamic-PET element, based on the student's results during the educational process, makes it possible to modify the career-oriented trajectory [15].

Database Architecture of the Platform. The platform has a database architecture consisting of 13 interconnected tables. The main tables are the following: the Professions table (profession name and identifier); the Professions–Fields linking table (a "many-to-many" relationship); the Interests Questionnaire table (with scores of Yes = 2, Partly = 1, No = 0); the Foundational Knowledge Test table (four-option test questions); the Foundational Practical Competencies Assessment table (a two-stage assessment: AI + teacher); the Aptitude Questionnaire and Test tables; the Elective Subjects table of the curriculum (with the percentage of relevance to the profession); the Internship Enterprises table; and the linking tables [16; 17].

Three-Stage Diagnostic System. The first stage is the diagnostics of professional interests. Questionnaire questions are presented for each profession, and the points collected are converted into a percentage. The formula is: Percentage = (points collected × 100) / maximum points. The second stage covers foundational knowledge and practical competencies. Closed tests and practical tasks are given. Practical tasks are assessed using a two-stage scheme: first, artificial intelligence performs an automatic analysis, and then the teacher, acting as an expert, gives the final grade [18; 19]. The third stage is aptitude diagnostics. A self-assessment questionnaire (Yes = 1, No = 0) and an objective aptitude test are administered.

The results of all three stages are integrated using weighting coefficients ($K_1 = 0.30$; $K_2 = 0.40$; $K_3 = 0.30$): Final percentage = Interest% × K_1 + (Knowledge + Practical)% × K_2 + Aptitude% × K_3. The first place in the ranking is regarded as the profession recommended to the student, and on this basis the elective subjects and the internship enterprise are selected automatically.

The "Profession Direction" Teaching Method. This method, developed by the author, shapes the learning content in a career-oriented manner based on the student's diagnostic results. The essence of the method is as follows: each topic of a subject's syllabus is labeled with profession codes for its learning outcomes (for example, LO3(P), LO3(NA)). Independent-study topics are adapted to the profession. Lecture review questions and practical tasks are differentiated by profession. Assessment criteria are developed on the basis of a matrix that combines four levels by profession (high, medium, lower, low) and four criteria (creative, partially exploratory, reproductive, low) [12; 20].

Integration of Artificial Intelligence. An important innovative aspect of the platform is the integration of artificial-intelligence technologies into the assessment process. This is carried out through a two-stage scheme: in the first stage, the AI model automatically analyzes the student's answer to a practical task and provides an initial score and a text comment; in the second stage, the teacher reviews the AI's comment and assigns the final score and conclusion. This approach serves to enhance the objectivity of assessment [18].

Forming the Dynamic PET. The diagnostic block of the model includes the element "Forming the Student's Dynamic Personal Educational Trajectory." This element makes it possible to reshape the student's career-oriented trajectory during the educational process on the basis of results (grades and other indicators). For example, if a student has chosen the profession of "Programmer" and an analysis of the learning outcomes reveals an inclination toward the profession of "Information Security Specialist," the platform recommends switching to that profession, and the PET is re-formed [15; 21].

Conclusion. As a result of the research, the model for forming the PET of future engineers on the basis of information-methodological support was improved as a four-block system. The main innovative

elements of the model are: a three-stage diagnostic system, a 13-table database architecture, AI integration, the “Profession Direction” teaching method, and the mechanism for forming the dynamic PET. The platform was developed under the name “Innovation Navigator” and was introduced into the educational process of three higher-education institutions. In the future, it is planned to adapt the platform to other educational fields (energy, construction, mechanical engineering) and to further expand the AI component.

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