

CONCEPTUAL MODEL OF A SOFTWARE PLATFORM FOR MANAGING AND MONITORING THE PROFESSIONAL COMPETENCIES OF HIGHER EDUCATION STUDENTS

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Abstract: The article develops a conceptual model of a software platform designed to manage and monitor professional competencies of higher education students. The system enables digital analysis of students' knowledge, skills, and abilities, forming personalized learning trajectories, and ensuring integration with the labor market. The platform is an essential tool for education quality management.

Keywords: Professional competence, software platform, conceptual model, monitoring, higher education, digitalization, quality control, labor market.

Annotatsiya: Maqolada oliy ta'lim muassasalari talabalarining kasbiy kompetensiyalarini boshqarish va monitoring qilishga mo'ljallangan dasturiy platformaning konseptual modeli ishlab chiqilgan. Tizim talabalarning bilim, ko'nikma va malakalarini raqamli tahlil qilish, shaxsiy ta'lim trayektoriyasini shakllantirish hamda mehnat bozori bilan integratsiyani ta'minlash imkonini beradi. Platforma ta'lim sifatini boshqarishda muhim vosita hisoblanadi.

Kalit so'zlar: Kasbiy kompetensiya, dasturiy platforma, konseptual model, monitoring, oliy ta'lim, raqamlashtirish, sifat nazorati, mehnat bozori.

In the modern global economy, the primary task of the higher education system is to prepare competitive personnel who possess not only theoretical knowledge but can also demonstrate high results in practical activities. Traditional assessment systems fail to fully reflect the growth dynamics of students' professional competencies. At a time when labor market and employer requirements are changing rapidly, a critical need has emerged to monitor and

manage the competencies of higher education institution (HEI) students in real-time. The most effective solution to this problem is the introduction of specialized digital platforms into the educational process.

The purpose of this study is to design a conceptual model of a software platform that automates the processes of forming, assessing, and developing students' professional competencies. This platform aggregates all student performance indicators during their studies into a digital profile. The conceptual model serves to bridge the gap between educational standards, employer requirements, and students' personal achievements. Through the digital monitoring system, the student's strengths and weaknesses are identified, and an individual development trajectory is proposed.

The model proposed in this paper is based on an integrated scientific approach, elevating the education quality management system to a new level. Through the platform, seamless information exchange is established between HEI management, professors, and employers. Consequently, educational programs are rapidly adapted to market demands. The object of the study is the competency management process in higher education, while its subject comprises the software algorithms for visualizing and controlling this process.

The Competency-Based Education (CBE) approach in higher education is a fundamental direction widely studied globally. The initial theoretical foundations were developed by Western scholars such as W. Blank and W. Spady, who defined educational outcomes as a set of clearly measurable skills. Modern researchers, including S. Downes and G. Siemens, have analyzed competency monitoring systems within the context of education digitalization and connectivism theory. According to them, a student's knowledge in a digital environment is a continuously updated network element.

In the era of the digital economy, conceptual models of comprehensive software platforms that monitor students' professional skills in real-time are not sufficiently developed. Although international experience exists in applying Artificial Intelligence and Big Data technologies to educational management (e.g.,

Coursera, EdX analytics modules), adapting them to the specific characteristics of the national higher education system remains an urgent problem. This research aims precisely to fill this software-methodological gap in the educational system.

Within the framework of the study, systems analysis, Object-Oriented Analysis and Design (OOAD), modeling, and conceptual diagramming methods were utilized. UML (Unified Modeling Language) diagrams and Data Flow Diagrams (DFD) were applied to develop the software platform's architecture. A Multi-Criteria Decision-Making mathematical model was adopted as the foundation for assessing students' professional competencies. Competency levels were structured across three main blocks: cognitive (knowledge), functional (skills), and personal (soft skills) attributes.

The platform architecture follows a 3-tier structure consisting of a database (PostgreSQL), a backend server (Python/Django), and a user frontend interface (React.js). A "Digital Passport" is generated for each student within the system. Data collection is automated throughout the semester based on current grades, project work, Olympiad achievements, and internship reports. The following formula is proposed to calculate the integrated competency index (K):

$$K = \alpha B + \beta M + \gamma A$$

Where: B represents the theoretical knowledge level, M denotes practical skills, and A reflects the independent activity and soft skills indicator; α , β , γ are weight coefficients ($\alpha + \beta + \gamma = 1$).

The conceptual model developed as a result of the study stands out from traditional assessment systems due to its flexibility and multi-functionality. The table below presents a comparative analysis of the traditional system versus the proposed digital platform:

Assessment Criteria	Traditional Control System (Rating)	Proposed Software Platform
Data Type	Final grades and scores only	Competency profile, dynamic graphs

Assessment Periodicity	1-2 times per semester (midterm/final)	Continuous monitoring in real-time
Feedback	Delayed and limited	Automated, rapid recommendations
Employer Participation	Only during the final graduation work	Continuous via internships and vacancies

The attached model was simulated on a pilot basis within a group of IT students. Due to the rapid pace of technological change in the IT sector, the platform must primarily monitor practical coding, project-based thinking, and problem-solving skills in real time.

The student's competency matrix (IT) on the platform includes the following:

Hard Skills (Technical Skills): Algorithm design, programming languages (Python, Java, JavaScript), database management (SQL/NoSQL), system architecture, and DevOps tools.

Soft Skills (Flexible Skills): Teamwork (Agile/Scrum), reading technical documentation (in English), and analytical thinking.

Beyond the student's in-class grades, the platform integrates with external professional ecosystems:

GitHub / GitLab API: The volume of code written by the student, commit frequency, and code quality are automatically analyzed.

LeetCode / HackerRank API: The proficiency level in solving algorithmic problems is automatically uploaded to the platform profile.

The software algorithm compared the students' academic results against the real-world requirements of employers and generated a compatibility index for each student. This allowed students to fill knowledge gaps in a timely manner and enabled professors to adjust their teaching methodologies.

In conclusion, the software platform for managing professional competencies is the digital foundation for improving higher education quality. It

ensures the personal development of the learner and assists HEI administrations in allocating resources effectively.

The following suggestions are put forward to implement the system into practice:

1. Approve a methodology for transitioning from a single electronic rating of students to a "Competency Passport" system in hies.
2. Integrate the platform with the national "HEMIS" information system and the Ministry of Employment's "Single National Labor System" (YMMT).
3. Create a free "Virtual Cabinet" within the platform for employers to formulate targeted personnel orders.

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