SPECIFIC FEATURES OF THE PROFESSIONAL DEVELOPMENT SYSTEM FOR FUTURE ENGINEERS IN AN INFORMATION-BASED EDUCATIONAL ENVIRONMENT

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Abstract: This study explores the unique characteristics and challenges of professional development systems designed for future engineers within modern information-based educational environments. It examines how digital technologies, information accessibility, and innovative pedagogical approaches shape the formation of competencies, skills, and knowledge essential for engineering professionals. The research highlights the integration of information technologies into curriculum design, the role of virtual and augmented learning tools, and the importance of continuous digital literacy improvement. The findings emphasize adaptive strategies to foster critical thinking, problem-solving, and practical engineering skills in a rapidly evolving technological landscape.

Introduction. In pedagogical theory and practice, **a methodological system** is a scientific and practical complex that combines the goals, content, methods, tools, organizational forms, and results necessary for the purposeful organization of the educational process and effective teaching and upbringing as a single system.

In the didactic heritage of Y.A.Comenius, the initial concept of the methodological system was expressed in the principles of “Compatibility of education with nature” and “Step-by-stepness”, while in the scientific works of M.A. Danilov and B.P. Yesipov it acquired an integrative structure in the modern

sense. By the end of the 20th century, the methodological system was inextricably linked with pedagogical technologies, and in the 21st century it is being reinterpreted on the basis of a digital educational environment and a competency-based approach.

Methodological system: goal-orientedness of education; functioning of structural elements as a single system; didactic basis; variability and flexibility; Competency orientation; results orientation consists of the following characteristics:

1. Goal-oriented education is one of the most important pedagogical principles of the methodological system, the main factor determining the direction, content and result of the entire educational process. The pedagogical essence is that setting a clear goal ensures the logicality of the educational process. The level of development, needs and future activities of the student or future specialist are taken into account.

2. Didactic basis is one of the main principles of the pedagogical essence of the methodological system, which means building the educational process based on the laws and

The principles of teaching are based on the laws and regulations of teaching. The laws and principles of didactics.regulations of teaching pave the way for the development of the theoretical foundations of the principles of teaching and their application in the practice of pedagogical activity. It should be noted that the laws and regulations of teaching are currently changing and updating in direct dependence on the state and social orders placed before the credit-module system, the goals and objectives of the educational process in the social life of society, and the level of development of science.

The basic didactic principles of professional development of future engineers in an information-based educational environment are based on the principles of traditional didactics, but are expanded taking into account the interactivity, flexibility, and openness of the information environment (Table 1).

Table 1.Professional development of future engineers in an information-based educational environment basic didactic principles.

Laws	Content
Purpose and content compatibility legality	Education purpose - future engineer's professional competencies to form . Informed in the environment content is real release processes, digital technologies and the industry to the standards suitable to be need .
The law of unity of theory and practice	Theoretical knowledge is immediately applied in practice through online labs, virtual simulators, and software
Systematicity and consistency legality	Education resources (video lessons, interactive modules, information bases) integral study ecosystem as working is released. Every one module next one for support task will do .
Easily to the complex transition legality	Initially simple interface and applications with work, then complicated engineering programs and technologies application
Activity and independence legality	Students own education trajectory choice and independence projects create to the possibility has to be need . In an ICT environment remote and mixed education formats students independent to work encourages .
Of appropriation strength legality	Knowledge permanent practical application, online tests, project work, problematic tasks through is strengthened .
Flexibility and individualization legality	Education platform student's preparation to the level suitable accordingly content and assignments adaptive in a way presented will reach .
Reverse communication and monitoring law	Online systems through teacher and student in the middle fast reverse communication Education process every one The stage is monitored and the results analysis based on will be corrected .

It is a process that is renewed, changed, developed, and acquires special significance by ensuring that the principles of teaching correspond to the demands placed on the education system, as well as reflecting the social, economic, political, legal, spiritual and educational changes taking place in society. Future

engineers professional in the activity information education from the environment to use readiness impact and professional development content formation traditional education in the system such as education content organization of reaching chosen to the theory is based on and relevant principles into account takes.

3. Variability and flexibility - a principle that expresses a modern and innovative approach to the pedagogical essence of the methodological system. It means adapting the educational process to rapidly changing technologies, the needs of society and the individual characteristics of students. The educational process cannot be rigid and unchanging - it must be constantly updated.

Table 2. of the educational process are variability and flexibility.

Feature	Content
Volatility	method, means and content time demand and industry development suitable accordingly update opportunity
Flexibility	students preparation level, interest, learning pace and individual needs looking at the system adaptation ability
Technological updates	new teaching platforms, multimedia tools, artificial from the intellect use
Methods adaptation	students activity to the level looking at interactive methods share change
Content update	scientific achievements, labor market requirements and regulations to documents adaptation
To the conditions adaptation	remote education, hybrid model, short term modules such as formats application

4. Competence orientation - methodical of the system pedagogical in essence modern education paradigm representative principle . In this approach main target - students only theoretical knowledge not, maybe professional in activity successful work for necessary was competencies In this process, student not only ready knowledge maybe independent thinking, problems solution

creative and creative work skill develops. Methodical system education in the process designated goals and objectives clear to do service. It does not only methods a collection, maybe education content, goals, means, forms and control mechanisms mutually harmonized whole pedagogical construction as is considered (Table 3).

Table 3. Future engineers professional methodological system of development organization provider elements

Element	Essence	Future engineers in preparation role
Purpose	From teaching expected the results defines	Professional competencies forming, engineering his/her thinking develop
Content	A set of knowledge, skills, and competencies to be learned	Interdisciplinary integration, technological and practical knowledge
Methods	Knowledge mastery roads	Project based on teaching, problematic training, simulations
Tools	In teaching usable material and technical resources	Laboratory equipment, ICT, multimedia tools
Organizational forms	Teaching process organization to do methods	Audience training, online lessons, work release practice
Results	Teaching in the end achievable degrees	Professional preparation quality indicators

Informed education environment engineering education quality increase, o ‘ student - students to master level individualization and them modern working release requirements in preparation the most effective from tools is one . That methodical system students personal and professional development, production release requirements and modern technological to changes to adapt This provides system not only theoretical preparation, maybe practical habit and innovative thinking developer solid foundation creates.

Conclusion. The professional development system for future engineers in an information-based educational environment must be adaptive, technology-driven, and learner-centered. Integrating advanced digital tools and information technologies enhances the acquisition of essential engineering competencies and promotes continuous professional growth. By fostering digital literacy, critical thinking, and practical skills through innovative pedagogical methods, educational institutions can better prepare engineering students to meet the demands of a rapidly evolving technological world. Ultimately, the development of such systems ensures that future engineers remain competitive, versatile, and capable of contributing effectively to their fields.

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