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Professional Culture as Basis for Engineering Masters' Professional Activity

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Today, the enhancement of engineering master's competitiveness requires a cultural ground. The article justifies that the formation of a cultural ground is achieved through the development of a professional and project-oriented culture, as well as a scientific and methodological culture of master students within the process of engineering education. Both professional and project-oriented, and scientific and tutorial cultures are presented in the article as important qualities of engineering master students; their structural components are identified taking into account future masters' professional activities. The inability of the existing pedagogical models to solve the identified problem sets a task of developing two basic models: a model providing focused development of a professional and project-oriented culture and a model for the development of a scientific and tutorial culture of engineering master students.

Key words: master student, engineering education, professional culture, model simulation.

Modern practice shows that in order to raise the competitiveness of an engineering master graduate a certain cultural basis of his/her professional activity is needed. Today, professionals in any sphere develop their own professional competences, knowledge, skills, abilities and expertise to assure their own competitiveness based on a sufficient level of a professional culture. Besides, the new concept of Russian education that correlates with the formation of a competitive and developed personality is based on the principle of gaining knowledge, skills and abilities in the context of an integrated panhuman culture [1, 2, 5]. These conditions define the importance and topicality of the problem of developing a professional culture as a foundation for future professional activity of engineering master students [3, 7].

The scientific data analysis has led to a conclusion that the professional culture (in particular the project, scientific and methodological ones as professional characteristics of a master's personality) is a certain way for realization of his/her professional career.

Project-based learning plays an important role in training master students for their professional development [4; 8].Project design is a practical tool for communication [4, 8]. Professional project-based culture of master students is seen by the authors as a comprehensive framework of a person that consists of an integrative system of social, professional and personal characteristics built upon interconnected and interdependent constituents (axiological, cognitive, pragmatic, behavioral), which, in their turn, are formed based on the system of values of professional self-development. This system of values appears as an imperative for the professional competency of engineering master students (Table 1).

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Table 1. Structure and contents of professional project-oriented culture of engineering master students

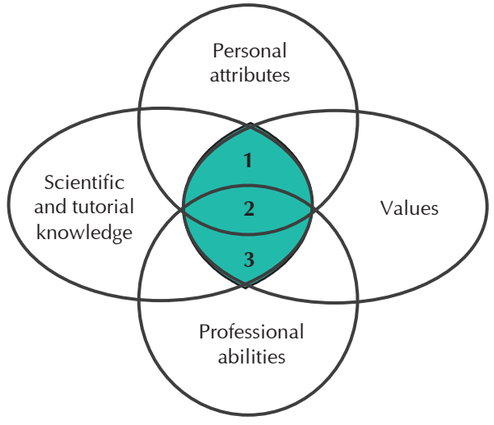
Components	Content
Axiological	1) Understanding the value of human life. 2) Showing tolerance towards communication partners and strive towards mutual understanding. 3) Knowledge of values of professional and project-oriented culture (PPOC) as its basis, fostering the organization of professional activity. 4) Understanding the significance of the PPOC culture for professional development. 5) Intellectual abilities. 6) Politeness, tact, truthfulness, justice.
Cognitive	1) Grasp of a system of knowledge on nature, its laws, mechanisms, humanistic ways of acting and their cultural form; knowledge on rules and norms of research, design and efficiency assessment. 2) Readiness to enhance own knowledge on professional activities, culture and its types, professional and project-oriented culture and its core components. 3) Ability to make contacts with communication partners, to fortify communicative interaction. 4) Showing empathy to communication partners. 5) Attractiveness in communication, ability to make oneself well-disposed and trusted.
Pragmatic	1) Ability to navigate within communicative or etiquette situations. 2) Ability to analyze, plan and execute. 3) Ability to design business communication. 4) Ability to navigate within abnormal situations. 5) Possession of skills on mediaplanning and budget planning. 6) Ability to use kinetic communication tools. 7) Ability to analyze and assess professional activity and its results. 8) Knowledge on technology, means and tools of practical activity and application of a range of tools for solving professional problems.
Behavioral	1) Ability to transform values of professional and project-oriented culture, interpret socially-valuable experience. 2) Existence of an individualized professional style of action, ability to perform creatively. 3) Existence of organizational skills. 4) Ability to behave assertively. 5) Existence of a need for creativity, self-development, self-improvement in a profession, implementation of innovations in a professional area.

Analysis of a number of research works has indicated that master students, who seamlessly combine scientific and pedagogic activities, are capable of representing learning material in a generalized and systematized manner, able to bring together figural and verbal forms of data representation, able to analyze and foresee students' difficulties [5; 9]. The authors are convinced that pedagogic activities of master students are insufficient, if the educational process of these students does not include, to a full extent, such opportunities that are aimed at achieving higher results of educational activity, in particular, results, achieved by scientific and research activities. In other words, the efficiency of master student's pedagogic activity depends, in a way, on the depth of integration of scientific, methodological and innovative activities provided for him/her. The authors' opinion is that the mechanism of such integration is determined by the task-oriented development of scientific and tutorial culture of engineering master students.

The concept of "scientific and tutorial culture of engineering students" is based on the dialectics of the unity of a general (professional culture of a specialist as a whole, as a complicated concept) and a specific (which is determined by the specifics of scientific and tutorial activities of an engineering master student). The structural components of the scientific and tutorial culture of engineering master students are presented on fig. 1.

In theory and on practice professional education of engineering master students has gained vast experience in formation of both professional and project-oriented cultures. However, the problem of development of the professional and project-oriented culture, as well as the scientific and tutorial culture of a future master graduate is still under-researched. Inability to use the existing pedagogic models for solving this problem has set a task for development of two basic models: a model assuring task-oriented development of the professional and project-oriented culture and a model

Fig. 1. Structural components of the scientific and tutorial culture of master students



1-2-3 – scientific and tutorial culture of a master students
1 – professional self-awareness; 2 – creative thinking;
3 – scientific and tutorial skills.

for development of the scientific and tutorial culture of engineering master students.

Methodological landmarks for research of the development process of the professional and project-oriented culture of engineering master students are the key ideas of such approaches as system, activity, cultural, holistic, axiological and professional approaches. The integration of these approaches allows constructing a model for development of the professional and project-oriented culture (PPOC) of engineering master students. This model consists of four interconnected modules: "Motivation and Aims", "Content and Organization", "Process and Methods" and "Assessment and Results" (fig. 2).

Specifics of this model lie at the roots of its professional focus, technological and didactic sequencing, integration of the enlisted modules, interaction between them and strive for achievement of the planned results.

Speaking of the model for development of the scientific and tutorial culture of engineering master students it should be noted that this model, in its turn, is focused on the development of professional self-awareness, creative thinking and scientific and tutorial skills of future masters. The model includes the following key modules: "Theory and Methodology", "Perspectives and Aims", "Content and Concept", "Organization and Operation" and "Integration and Evaluation". A short description of each module is listed below.

In particular, the module "Theory and Methodology" is based on two core components: methodological approaches and psycho-pedagogic theories and concepts. This module integrates ontological understanding of essence and specifics of the realization of scientific and tutorial culture development process. Scientific views on the process of individual's rise towards a certain culture are also determined. This element includes: theory of individual and his/her development through activities; theory of professional and personal development and self-development; concepts of personal and

Fig. 2. Modules of a model for development of the professional and project-oriented culture of engineering master students

Module "Motivation and Aim"

Functions	■ **Motivation** ■ **Task-orientation**
Factors	■ **External factors:** specifics of socio-professional relations, employers' requirements, professional and educational culture of an HEI, status and prestige of the profession within society ■ **Internal factors:** socio-cultural interspace of the profession, its specifics, personal professional experience, specifics of interactions with related field-specific areas
Stages of motivational process	■ **Stage 1.** Formation of a primary motive ■ **Stage 2.** Formation of a specified motive ■ **Stage 3.** Choice of a specified aim and an impulse for action
Result	■ **Result:** strive for acquiring professional and project-oriented culture

Module "Content and Organization"

Functions	■ **Information** ■ **Organization**
Principles	■ Phasing, cultural conformity, practical focus, interdisciplinary integration, professional orientation, facilitation, reflection
Structure of PPOC	■ Axiological component ■ Cognitive component ■ Pragmatic component ■ Behavioral component
Development program for PPOC	■ **Section 1:** Informational and theoretical (acquiring the information needed) ■ **Section 2:** Practice-oriented (acquainting with methods, forming particular skills) ■ **Section 3:** Comprehensively reproductive (solving comprehensive tasks) ■ **Section 4:** Project-based and creative (forming skills of PPOC, expanding project activity expertise)
Interdisciplinary relations	■ Business communications, basics of integrated communications, imagology, corporate culture, theory of communications and research

Module "Process and Methods"

Functions	■ **Release of information** ■ **Presentation**
Teaching methods	■ Monologue, dialogue, problem-based, project-based, games, workshops, reflective, etc.
Forms of work	■ Binary lectures, lectures – conferences, PR-projects, business games, role and story games, workshops, competitions, project seminars, practicums, image workshops, extracurricular activities, etc.
Stages of PPOC	■ Propaedeutic ■ Organizational and prognostic ■ Procedural and motivational ■ Integrational and remedial
Stages of PPOC acquisition	■ Primary review of material ■ Comprehension of material ■ Acquisition of material ■ Application of knowledge, skills and attitudes gained to practice

Module "Assessment and Results"

Functions	▪ **Diagnosis** ▪ **Correction**
Stages	▪ Organization ▪ Data collection and processing ▪ Data interpretation
Criteria and indicators	▪ **Axiological** (focus on formation of PPOC, focus on creation of conditions) ▪ **Cognitive** (knowledge of norms and rules, fostering of skills and examples of PPOC) ▪ **Pragmatic** (possession of knowledge, skills, and attitudes of PPOC) ▪ **Personal** (responsibility, creativeness, reflectiveness, tolerance)
Levels	▪ Adaptive, reproductive, creative
Tools	▪ Questionnaires for students and teachers ▪ Interviews with teachers ▪ Tests ▪ Expert assessment ▪ Observation protocol ▪ Observation diary ▪ Analysis of documents ▪ Analysis of students' work results ▪ Diagnostic cards of assessment of PPOC components ▪ Self-evaluation

professional development in continuous education, etc.

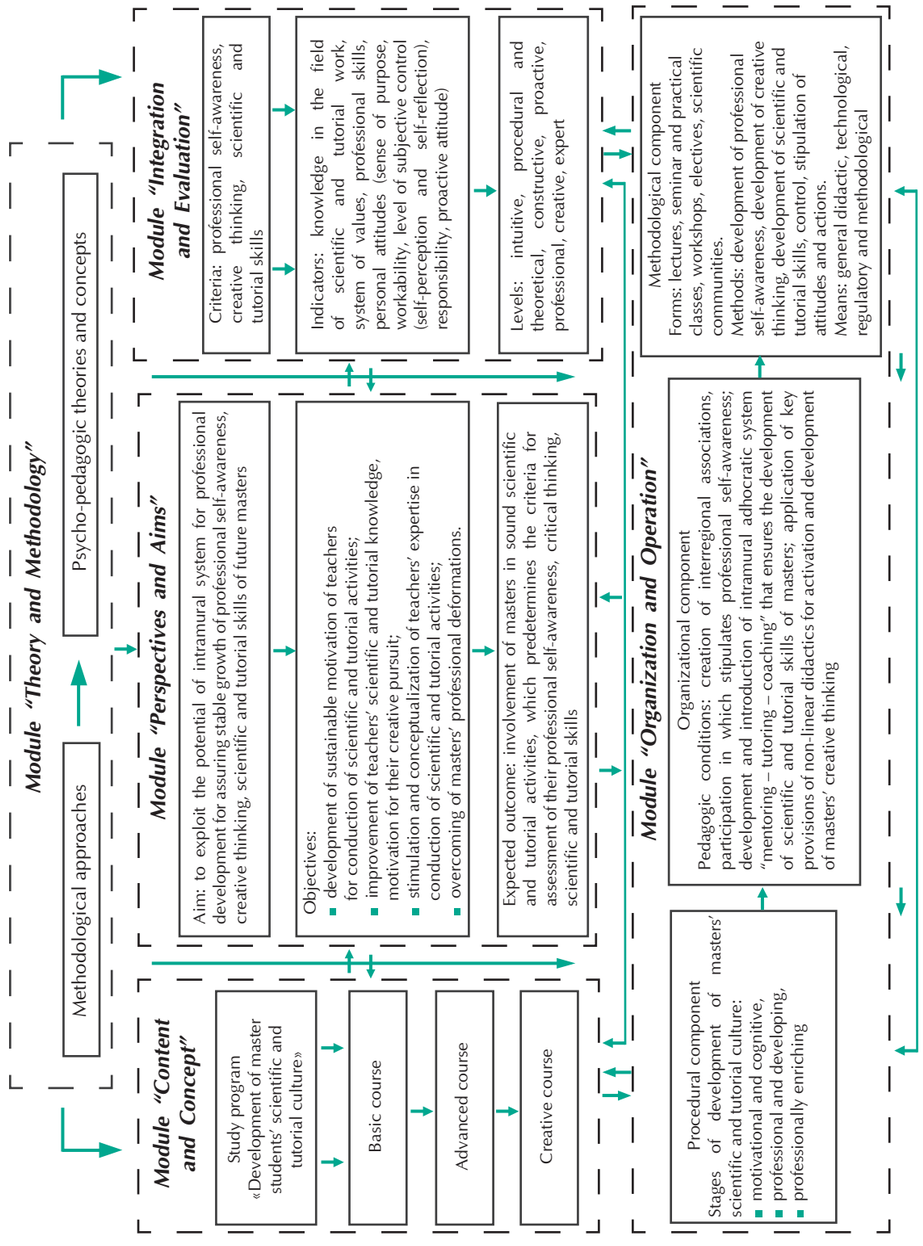
The "Perspectives and Aims" module determines a particular strategy and vector for the development process of the scientific and tutorial culture of engineering master students. As practice shows, it is the aim that determines an object's future state, i.e. the state, to which all object of a particular activity are aimed; whereas the expected outcome is the development of the scientific and tutorial culture of engineering master students.

The module "Content and Concept" reflects the conceptual fulfillment of core Master Degree majors for efficient execution of methodological, innovative and scientific activities. This module represents a vocational study programme, which is aimed at ensuring sustainable development of future masters' scientific and tutorial culture.

The module "Organization and Operation" consists of several components: procedural, organizational and methodological. Procedural component reflects the process of development of a future master's scientific and tutorial culture. Organizational component determines pedagogic conditions that provide a "comfortable" environment for efficient development process of the scientific and tutorial culture (fig. 3).

Methodological component is determined by forms, methods and means for development of masters' scientific and tutorial culture. The choice of forms aimed at realization of the proposed model's aim is determined by a gradual involvement of master students in the development process

Fig. 3. Model of development of master students' scientific and tutorial culture



of the scientific and tutorial culture. It should be noted that it is valuable to introduce participative teaching and learning methods to master students' training [6]. The means are seen as material and ideal objects that can be used to ensure the introduction of the characteristics fostered to the system of engineering master students' personal characteristics. At this, it is rational to distinguish general didactic, technological and regulatory, and methodological means.

In order to evaluate the level of concordance between the expected and the achieved outcomes, as well as to receive feedback, the model includes a module "Integration and Evaluation". This module includes not only the criteria for development of scientific and tutorial culture of engineering master students, but also the levels necessary for correlating master students' outcomes in the process of their goal achievement.

Finally, it should be noted that the issue of developing master students' professional and project-oriented culture, as well as their scientific and tutorial culture is highly topical and is determined by the fact that master degree is the final stage of the full cycle of higher education that is aimed at training scientific and pedagogic elite of the society, rather than preparing a mass of specialists. Master degree envisages a deeper understanding of theory in the chosen field of study and a more thorough to train for scientific and tutorial activities in that field. One of the key aims of master programmes is training responsible, initiative and proactive agents of communication, cooperation and co-creation, with a high level of professional culture development. Therefore, in the context of the modern realm, the system of engineering master students' training should be reconsidered and the emphasis should be put on the development of the professional and project-oriented, as well as the scientific and tutorial cultures.

ENGINEERING EDUCATION AND TRAINING: CHALLENGES AND EXPERIENCE

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