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## PROFESSIONAL STRUCTURE COMPETENCIES OF FUTURE ENGINEERS

**Baranova O.,**  
*assistant*

*Mykolaiv National Agrarian University*

**Medvedeva L.,**  
*senior teacher*

*Mykolaiv National Agrarian University*

Of the above definitions, the project culture of the individual contains not only knowledge and skills, but also some are professionally important personality traits. In other words, the concept of "project personality culture" is interrelated with the concept of "specialist personality structure". Personality qualities have been considered by many researchers. In the works of K. Platonova, I. Ivanov, D. Kettell, E. Fromm, Z. Freud and others considered various aspects and aspects of building a model of personality. In this study, the authors rely on the personality structure of the specialist, which was proposed by E. Zeer [1] and presented by the authors of the monograph [1, p. 27] in the form of table 1. In this table, competence means awareness, erudition of the individual in a particular field of work. Under professional competence is understood "a set of professional knowledge, skills and methods of effective performance of professional activities" [1, p. 23].

The main components of professional competence, the authors [1, p. 23 - 24] include:

– socio-legal competence: knowledge and skills in the field of interaction with social institutions and people, as well as mastery of techniques of professional communication and behavior;

– special competence: readiness to independently perform specific activities, solving typical professional problems, the ability to adequately assess the results of their work, the ability to independently master new knowledge and skills in the specialty;

– personal competence: the ability to continuous professional growth and training;

– auto competence: an adequate idea of one's own socio-professional qualities and mastery of methods of overcoming possible professional destruction.

Key qualifications are understood as "relatively stable integrative ensembles (symptom complexes) of professionally important personality traits" [1, p. 25].

Substructures of personality can be divided into two groups:

a) due to natural inclinations,

b) those that can be developed as a result of pedagogical influence.

**Table 1**

## Professionally determined structure of the specialist's personality

<b>Substructures of personality</b>	<b>Socio-psychological and psychophysiological components of the substructure</b>	<b>Professionally determined ensembles of substructure components (key qualifications)</b>
<b>Professional orientation</b>	Inclinations, interests, attitudes, expectations, attitudes, motives	<i>Socio-professional abilities:</i> willingness to cooperate, focus on achievement, success and professional growth, corporatism, reliability, social responsibility, etc.
<b>Professional competence</b>	Professional knowledge, skills, qualifications	<i>Economic competence,</i> special and personal competence, self-competence
<b>Professionally important psychological qualities</b>	Attentiveness, observation, creativity, determination, contact, self-control, independence, etc.	Professional independence, socio-professional intelligence, ability to plan technological processes, diagnostic capabilities, professional mobility, self-control, etc.
<b>Professionally significant psychophysiological properties</b>	Energetism, neuroticism, extroversion, visual-motor coordination, reactivity, etc.	<i>Generalized professional abilities:</i> coordination of actions, speed of sensorimotor reactions, endurance, resistance to stresses, etc.

The first group includes professionally significant psycho-physiological properties and partially – professionally important psychological qualities. The analysis allows us to present the sources of the concept of "design culture of future engineers" as follows (figure 1). The inscriptions above the arrows convey the meaning of the relationship between the sources and the concept being defined.

**The first approach.** On the basis of generalization of definitions "project culture of the teacher", "project culture of subjects of educational process", "project culture of the person", "structure of the person of the specialist" we will give such interpretation to concept "project culture of future engineers-teachers": it is the qualitative characteristic of development of integrative properties specialist, characterized by mastery of design, systems, analytical thinking and worldview, achieved as a result of mastering theoretical knowledge and practical skills in project activities and the development of professionally important qualities that improve and create new objects, objects, technologies, processes, in including pedagogical, in order to meet the growing material, spiritual, informational and other needs of people.

**The second approach.** In order to research, form or develop the project culture of the future engineer-teacher, a definition based only on generalization is not enough. Therefore,

we construct another definition on the basis of "explication by" splitting "concepts in accordance with the various possible shades of their content". This method is constantly used by science when it comes to logical analysis of expressions and clarification of their content in accordance with the requirements of science".

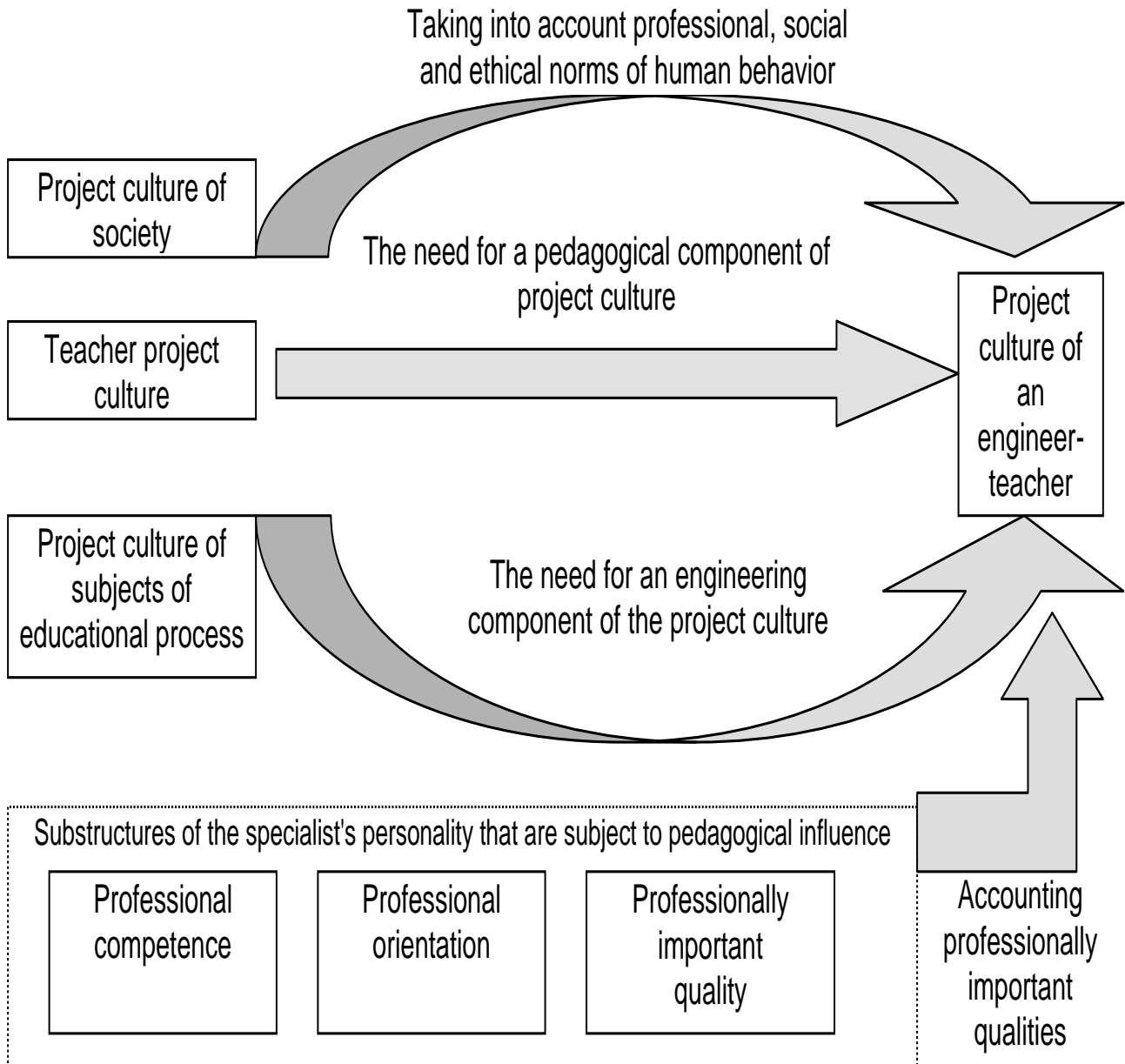


Fig. 1. Sources of the concept of "project culture of future engineers"

As mentioned above, the concept of professional culture is widespread in the psychological and pedagogical literature [1, 2, 3, 4, 5, 6, 7]. Based on a number of works, we can assume that for an engineer, professional culture is synthesized from many components (figure 2).

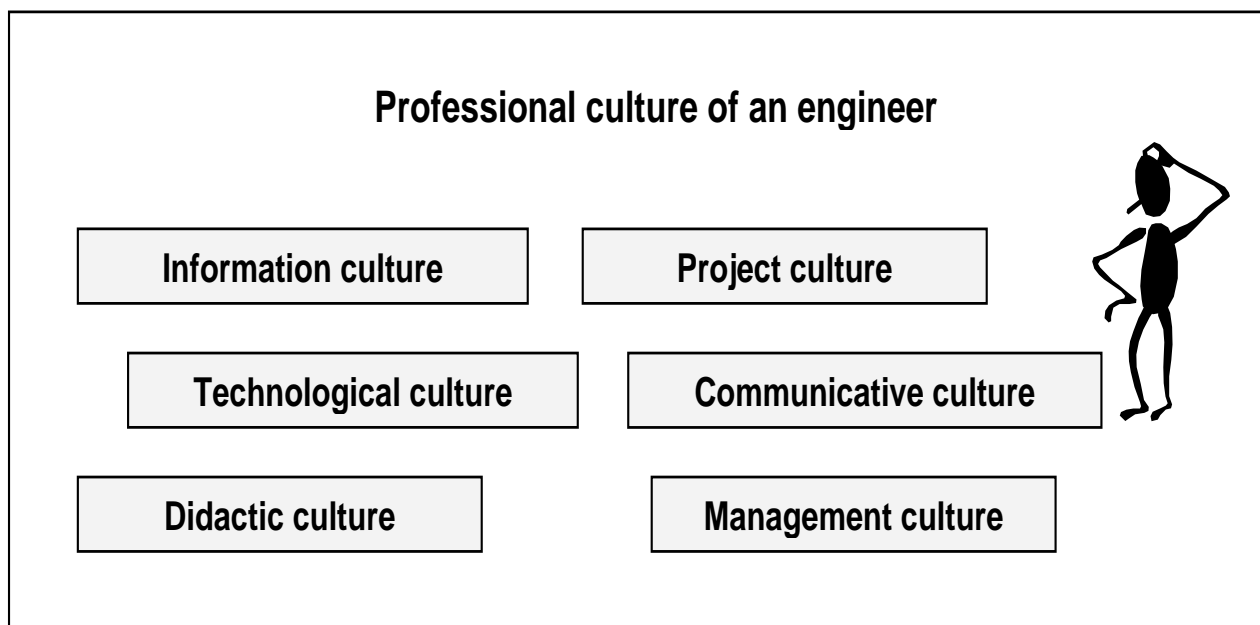


Fig. 2. Some components of the professional culture of the engineer

The basis of the engineering component of the professional culture of the engineer is characterized primarily by design, information and technological culture. There is much in common between project and information cultures, because both reflect a new level of socialization and inculturation of man. Therefore, to implement the second approach to define the concept of "project culture of the engineer" we use the logical scheme of explication of the concept of "information culture of students of technical specialties" [4], namely, considering this concept as a multifaceted and multilevel phenomenon.

The explication of the concept of "project culture of future engineers" can be made using two variations, expressed in word forms: "aspects of project culture" or "components of project culture". When it comes to approaches to research (formation, development) of project culture, the authors distinguish cognitive, operational-content, communicative and value-reflexive aspects. When it comes to the meaning of the concept of PC in terms of knowledge and skills that characterize these aspects, it is advisable to use the word form "components of PC". Since the research plan is primary and the content is secondary, the word form "aspects of project culture" is used everywhere in the dissertation to simplify teaching. Let's analyze the above definition and separate in it (by analogy with [4, 5, 6]) semantic units on four aspects of studying the phenomenon of "design culture of future engineers":

- ***in the cognitive aspect:*** knowledge for design activities, based on systems analysis and a systematic approach to the design object; knowledge of rules and standards of behavior in the information design environment; readiness to put forward a range of ideas for the project, the ability to choose the optimal (appropriate) idea;

- ***in the operational-substantive aspect:*** skills and abilities of design activity, based on a systematic approach to the design object; compliance with design standards; willingness to independently determine the needs and opportunities for activities in the project; ability to evaluate the project and make its presentation;

- *in the communicative aspect*: observance of laws, norms, rules and standards of behavior in the information environment of design, confident stay in the subject-professional community;

- *in the value-reflexive aspect*: ethical, aesthetic, value-content and moral qualities of the individual as the author of the project.

We will take the proposed explication of the scientific category "engineer's design culture" as a basis for further research. In this explication, cognitive and operational-substantive aspects reflect professional competence, and professionally important psychological qualities and professional orientation reflect communicative and value-reflexive aspects.

Thus, the concept of "engineer's design culture" is constructed, constructed as an interdisciplinary general methodological category. It differs from the concept of "project culture of personality" taking into account the pedagogical component, from the concept of "project culture of the teacher" taking into account the engineering component and from other related concepts by disclosing professionally determined personality traits of the engineer.

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