

19th PCSF 2019
Professional Culture of the Specialist of the Future
LEGAL COMPETENCY OF THE FUTURE ENGINEER

E. G. Shikhanova (a)*, N. A. Razveykina (b), M. G. Reznichenko (c)
*Corresponding author

(a) Samara National Research University, 443086, Moskovskoye shosse, 34, Samara, Russia, Elen69295@rambler.ru

(b) Samara National Research University, 443086, Moskovskoye shosse, 34, Samara, Russia, razveykina@ssau.ru

(c) Samara National Research University, 443086, Moskovskoye shosse, 34, Samara, Russia, rezmary@mail.ru

Abstract

Problems of engineering education all over the world raise questions of the future engineer competency. And modern society requires that the engineer has legal competency, which is the main part of the personal legal culture. However, among researchers there is still no common understanding of what competency and competence are, and how they relate to legal culture. The purpose of this study is to define the concept of the engineer's legal competency and to determine its role in forming legal culture. For this purpose we analyzed the researches on the topic of competence-based approach and engineering education, studied Russian legislation in the field of education, took into account the pedagogical experience of the authors, observed the students and interviewed them. As a result, we systematized the competences of tech fields of education (bachelor degree), taking into account their legal nature, formulated the most comprehensive understanding of legal competency in our opinion, determined the ratio of legal competency and legal culture. This allowed us to point out the shortcomings of the engineering education system in the formation of a legal culture and suggest how these gaps can be filled and give recommendations for the formation of high level legal culture as well.

© 2019 Published by Future Academy www.FutureAcademy.org.UK

Keywords: Legal culture, legal competency, engineer-student, engineer education.



1. Introduction

In today's world, the legal culture of a person reflects in his activities. What we shall refer to as legal culture is a social phenomenon which includes the historically accumulated legal experience, accepted by a person and his relation to legal reality recognized him through an individual stable value.

Legal culture is an integral part of the general and professional culture allowing the engineer to be an active subject of various legal relations, not only as a member of society, but also as a professional. As considered in society, social institutions of higher education are responsible for the formation of legal culture in high level. The student's legal culture is an integral composition and the peak of its development coincides with the period of a young man studying at a university.

Today, the system of higher education in Russia is based on the formation of competences of a future engineer that are regulated by the federal state educational standard (hereinafter - FGOS). This means that, exploring the professional culture of future engineer, we can talk about the need to form a skills or a set of skills that establishes the legal competency as part of legal culture of a student-engineer.

2. Problem Statement

The problem of educating highly qualified engineers in Russia and over the world is relevant. International and Russian studies highlight different modern problems of higher education for engineers: the importance of creating new standards for training engineers by way of expanding humanities (Hadgraft, 2017; Lazutina, Tempel, & Tempel, 2017); the need to balance the theory, practice and experience in the educating process (Nickola & Kriek, 2017); the motivation to learn including the humanities (Kitova, 2015; Pokrovskaya, Petrov, & Gridneva, 2018; Popova & Vdovina, 2016; Reyes, Enfedaque, & Gálvez, 2017); need for continuing of engineering education (Lawanto, Uziak, Villanueva & Scheaffer, 2017); formation of a correct understanding of technical terminology from the point of the scientific research culture (Nikiforova, 2015); develop of sociocultural skills, including legal competence, as our society requires (Chudinov, 2013) and no exit out the bounds of the technical sciences in engineer education (Cheshev, 2016; Egbert, Everett, Crockett, Farrell & Staehle, 2018; Flynn, Everett & Whittinghill, 2015; Gazaliyev, Yegorov, Ogoltsova, Yerakhtina, 2015). However, it remains unclear what legal competence of future engineer is.

Many authors try to define what "competence" and "competency" are, what their relationship is. Usually, the understanding of these terms is based on the following signs: general ability, knowledge system, skills, experience, actions and motivation, ability to solve problems, a set of qualities and characteristics. We tend to agree with the opinion of Alieva (2015) who implies that "competence in generalized characteristics: the neoplasm of personality, the quality of a citizen-professional, the formation ... through individual mastering and creative mastery of competences" (p. 279).

Researchers such as the following also addressed the issues of determining the legal competences of students and the ways of their formation: Gorbushina (2007), Myagkova (2009), Korotun (2014), Vysockiy (2011), Soboleva (2013) and others. Basically, researchers consider legal competence as integral elements of education, including the complex of knowledge, skills, abilities, and personality traits. For example, Myagkova (2009) represents the structure of legal competence as a legal

consciousness, legal thinking, readiness and ability for legal activity. According to Gorbushina (2007), “legal competence is an integrative property of an individual, expressed in the totality of competences in the legal field of knowledge, the ability to influence actively on the legal protection of freedoms and legal interests of the individual, to perform socially important functions” (p. 13). Similar views are held by Soboleva (2013) and Korotun (2014). Vysockiy (2011) put another context in this concept. He considers legal competence as the potential for the professional duties, taking into account the concept as an objective characteristic as a set of powers, rights and duties that a person should or may have, the maximum set of capabilities, knowledge, skills and abilities in a particular specialty. Chudinov (2013) gives the most complete definition of the legal competence of the future engineer. He includes four elements in legal competence: the result of education and training; a comprehensive description of the legal knowledge and skills mastered by the graduate; level of formation of legal consciousness; readiness and ability of the graduate to participate in the legal reality.

3. Research Questions

We assume that the process of forming the engineer legal competency is interrelated with the process of forming the individual legal culture. Legal culture is a fundamental component for the sociocultural development of personality, which has a number of contradictions in the modern conditions of global informatization as the authors note (Aladyshkin, Kulik, Michurin, & Anosova, 2017; Bylieva & Nam, 2018). It should be underlined that students with major in "Humanities" have a significant part of social and cultural disciplines while student-engineer are deprived of the possibility to develop legal skills in the educational process (Shikhanova, Klenkina, & Reznichenko, 2018). At the same time a great scientific and technological progress, digitalization and globalization of the economy require that the creators of progress (future engineers) obtain legal knowledge, developed legal thinking and effective legal behavior. The ever-growing need is driving the formation of a high level legal culture of future professional engineers during the education. In addition, the researchers emphasize that these requirements are challenging to fulfill within the framework of the traditional educational concept. It would thus be of interest to find new pedagogical instruments for this purpose (Cheshev, 2016; Chudinov, 2013; Kitova, 2015; Lazutina et al., 2017).

In addition, it is well known that "competence" and derived from it "competency" are a scientific substantiation of the "common values" of education, according to the educational concept. Competence is a key concept of higher education which is also an indicator of the quality of educational activities. This idea set the goal of education beyond the traditional concepts of it as a system for the transfer of knowledge and skills.

However, to date, researchers have not come to a single definition of the terms "competence" and "competency". Therefore, the subject of research in this article is the legal competency and legal competences of the future engineer, regulated in Russia by the FGOS of higher education.

4. Purpose of the Study

Our primary objective of this study is to concretize the phenomenon of "legal competency of the future engineer", determine the relationship between "legal competency" and "legal culture", and find the role of legal competency in shaping the legal culture of the future engineer.

5. Research Methods

Throughout this paper, we make extensive use of a set of methods adequate to the subject of the study: theoretical analysis of literature on Philosophy, Jurisprudence, Pedagogy, Psychology, Sociology; content analysis of legislation regulated the education of engineers; analysis of the author’s pedagogical experience; empirical methods like observation, questioning, testing and self-assessment of students in Samara University.

6. Findings

Our study showed that the complex of competences fixed in FGOS varies depending on the scope of education and specialty. Approaches to the set of vital and professionally significant competences of an engineer are conditioned by different reasons: social and economic changes in society, scientific and technical progress, and the state's need for specialists of a certain profile. The profile of the university also plays an important role in determining the leading competences formed at the university. The peculiarity of the competency-based approach consists in the consideration and definition of competences in their interconnection and interdependence. This allows us to present the result of education as the system of competences that a student should master and which should be formed by a higher education teacher with regard for his specialization and qualification.

Summarizing the above opinions of the authors, we conclude that legal competency includes the specialist’s legal literacy (including knowledge of laws), the ability to use legal acts, readiness for legal behavior, the ability to protect one’s own and others’ rights, which are developed in the higher education.

The analysis of the regulatory acts shows that there are general cultural (hereinafter - GC), general professional (hereinafter - GPC) and professional (hereinafter - PC) competences in the Russian education system. It seems that engineer students should have legal competences that can be included in the list of GC, GPC and PC, depending on the field of education.

Due to the purpose of the study we analyzed some bachelor degree FGOS of higher education for engineer specialists on the basis of Samara University (Samara National Research University). We wanted to find legal competences in different FGOS according to the classification (Table 1).

Table 01. Legal competences of future engineers due to field of education

Legal competences	Field of education
Ability to use the basics of legal knowledge in various fields of life (GC-4), or Ability to use regulatory acts in their activities (GC -5), or Ability to use general legal knowledge in various fields of activity (GC-6)	All tech fields of education
Ability to use regulatory acts in their activities (GPK-8), or	Radio engineering

Ability to use regulatory legal documents in their professional activities (GPK -6) or Ability to master the skills of handling regulatory and technical documentation and possession of methods for control compliance of the technical documentation to standards, technical conditions and regulatory documents (GPK -15)	Electronics and Nanoelectronics Applied Mechanics Power Engineering Biotechnical Systems and Technologies Laser Equipment and Laser Technology Aircraft Industry
Willingness to enforce work and labor discipline (PC-8); Willingness to implement in practice of safety regulations, industrial hygiene, fire safety and labor protection standards (PC-10)	Power Engineering
Ability to develop instructions for personnel operating technical equipment and software of biomedical and environmental laboratories (PC-16); Ability to develop design and technical documentation, execute completed design work in the subject area of biotechnical systems and technologies (PC-21); Willingness to monitor the compliance of projects with technical documentation for products and devices for medical and environmental purposes to standards, specifications and other regulatory documents (PC-22)	Biotechnical Systems and Technologies
Ability to control the compliance of the developed projects with technical documentation and standards, specifications and other regulatory documents (PC-18)	Laser Equipment and Laser Technology
Ability to execute completed design work with verification of the compliance of the developed projects with technical documentation, standards, specifications and other regulatory documents (PC -7)	Machine-building Engineering
Ability to participate in the development (based on existing standards and other regulatory documents) of design and working technical documentation in the field of automation of technological processes and production, their operational maintenance, product life cycle management and its quality, in measures to monitor the compliance of developed projects and technical documentation with existing ones standards, specifications and other regulatory documents (PC -5)	Automation of Technological Processes and Production Design and Technological Support of Machine-building Production
Willingness to use the organizational and legal framework of management and business (PC -19)	Metallurgy
Ability to compile and maintain technical documentation and established reporting according to approved forms, including accounting for the resource and technical condition of aircraft, as well as providing regulatory working conditions for employees of the engineering and aviation service, fire safety and environmental protection (PC -12)	Technical operation of aircraft and engines

The table 1 below shows that the legal component is available both in the basic general cultural, general professional and professional competences as well. Legal general competence is the student ability to use the acquired legal knowledge in various areas of their activities. As legal general professional competence, skills are being developed to use legal documentation in their professional and other activities. Legal professional competence includes readiness for a certain amount of legal powers (control over compliance with labor discipline, control over the development and compliance with

regulatory documents at the enterprise), as well as active actions in maintaining or developing regulatory documents, checking compliance of existing documents with regulatory acts.

Another main focus should be paid to the fact that we chose for analysis only competences with clear legal character, but higher education FGOS also contains competences with a hidden legal context, for example, competences related to the ability to certify and standardize products or the ability to manage personnel, etc. Such competences imply the existence of a certain amount of legal knowledge, ability to work with legal bases, skills of interpretation of legal norms, readiness to use available legal knowledge, skills and abilities. Along with this, it is necessary to take into account that the quality system of professional education does not stand still and it will be based on progressive information technologies, which, as noted by Alexankov, Trostinskaya, and Pokrovskaya (2018), will be the key to change the requirements for future engineer, including legal requirements.

7. Conclusion

The study allows us to conclude the integral nature of legal competences. It is possible to determine the legal competency of the future engineer as a set of general cultural, general professional and professional competences with legal nature and law-providing nature. Such competency will undoubtedly allow the graduate to exercise their rights and fulfill duties in the process of social and professional activities qualitatively.

Thus, we concluded that legal competency is an integral part of legal culture. Russian higher education system forms the cognitive component of legal culture since legal knowledge is included in each tech fields of education. The behavioral-activity component of the legal culture is contained in the legal competencies of some tech specialties and is expressed in the ability and readiness of the future engineer to use legal knowledge in the realization of his labor function. However, in the higher education FGOS there are no competences that would allow the future engineer to form the emotional-volitional component of legal culture, we mean to develop a graduate's positive attitude to the legislation of his country, to take an active legal position, to motivate solving problems in the legal field.

The significant difference between legal competency and legal culture is the scope of their application. Legal competency can be formed in higher education only within a specific profession and work. The concept of "legal culture" is much broader as it includes not only professional legal culture, which is based on the engineer legal competency, but also legal knowledge, values, and human behavior outside of his work activity. Formation of the engineer legal competency will allow us to get a competent professional graduate who will perform his duties in accordance with the legal documents he has studied, but we will not be able to get a person with a high level legal culture at the exit from the university.

In our further research we will look how to fill in the gaps in the formation of legal culture. So it seems possible through extracurricular work with students. Extracurricular activities and pedagogical space of the university have a real potential for the formation of the legal culture of specialists regardless of their profile, in particular, it allows to form the emotional-volitional component of the legal culture that is not part of legal competency.

Acknowledgments

The authors thank the Samara University and his staff for the opportunity to do research and students of the Samara University for participating in surveys.

References

- Aladyshkin, I., Kulik, S., Michurin, A., & Anosova, N. (2017). Information Prospects For Socio-Cultural Development: Contradictory Grounds. *The European Proceedings of Social & Behavioural Sciences*, 35, 19-25. <https://doi.org/10.15405/epsbs.2018.02.3>
- Alexankov, A. M., Trostinskaya, I. R., & Pokrovskaya, N. N. (2018). Industry 4.0 Requirements For Quality Of Human Capital And Competencies Formed Within Educational Institutions. *The European Proceedings of Social & Behavioral Sciences*, 34, 26-34. <https://doi.org/10.15405/epsbs.2018.02.4>
- Alieva, L. V. (2015). Vospitatel'nyj potencial obrazovatel'noj deyatel'nosti vuza cennostnaya osnova formirovaniya obshcheprofessional'nyh kompetencij studentov [The Educational potential of the educational activities of the University value the basis of formation of professional competence of students]. *Kazan Pedagogical Journal*, 4(1), 278-284. [in Rus.] Retrieved from <https://elibrary.ru/item.asp?id=23762581>
- Bylieva, D., & Nam, T. (2018). Social Norms in Virtual Worlds of Computer Games. *International Conference Communicative Strategies of Information Society (CSIS 2018). Advances in Economics, Business and Management Research*, 289, 369-373. <https://doi.org/10.2991/csis-18.2019.75>
- Cheshev, V. V. (2016). Inzhenernoe myshlenie v antropologicheskom kontekste [Engineering Thinking in the Anthropological Context]. *Philosophy of science and technology*, 1, 104-117. [in Rus.] Retrieved from <https://elibrary.ru/item.asp?id=26189737>
- Chudinov, O. R. (2013). Pravovoe obrazovanie v inzhenerno-tehnicheskom vuze [Legal education in the engineering technical college]. *Scientific notes of Orel state university*, 5(55), 201-205. [in Rus.]
- Egbert, P., Everett, J. W., Crockett, F., Farrell, S. & Staehle, M. (2018). Growing an engineering living and learning community. *Global Journal of Engineering Education*, 20(1), 23-29. Retrieved from <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85041903799&partnerID=40&md5=79bc2ec4e312bdda746c740dad4873f0>
- Flynn, M., Everett, J., & Whittinghill, D. (2015). The impact of a living learning community on first-year engineering students. *European Journal of Engineering Education*, 41(3), 331-341. <https://doi.org/10.1080/03043797.2015.1059408>
- Gazaliyev, A. M., Yegorov, V. V., Ogoltsova, Y. G., Yerakhtina, I. I. (2015). Methodological provision of technical students' vocational education when studying humanities. *Mediterranean Journal of Social Sciences*, 6(4S3), 542-546. <https://doi.org/10.5901/mjss.2015.v6n4s3p542>
- Gorbushina, M. V. (2007). Aspekty formirovaniya pravovoj kompetentnosti studentov special'nosti «Social'naya rabota» v usloviyah vuza [Aspects of formation of legal competence of students of the specialty "Social work" in the conditions of high school.]. *Kazan Pedagogical Journal*, 3, 10-15. [in Rus.] Retrieved from <https://cyberleninka.ru/article/n/aspekty-formirovaniya-pravovoy-kompetentnosti-studentov-spetsialnosti-sotsialnaya-rabota-v-usloviyah-vuza>
- Hadgraft R. G. (2017). New curricula for engineering education: experiences, engagement, e-resources. *Global Journal of Engineering Education*, 19(2), 112-117.
- Kitova, E. T. (2015). Sovremennye cennostnye orientacii inzhenernogo obrazovaniya [Modern value orientation of engineering education]. *Siberian pedagogical journal*, 4, 49-52. [in Rus.] Retrieved from <https://elibrary.ru/item.asp?id=24131436>
- Korotun, A. V. (2014). Pravovoe obrazovanie kak uslovie formirovaniya pravovoj kompetencii social'nyh pedagogov: opyt realizacii [Legal education as a condition of formation of legal competence of social teachers: experience of realization]. *Pedagogical Education in Russia*, 11, 107-113. [in Rus.] Retrieved from <https://elibrary.ru/item.asp?id=22986698>

- Lawanto, O., Uziak, J., Villanueva, I., & Scheaffer, M. (2017). Continuing engineering education: a needs assessment for the introduction of a graduate certificate programme. *Global Journal of Engineering Education*, 19(3), 186-193. Retrieved from <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85034615547&partnerID=40&md5=66badb8dd6e318546ca2138556d72083>
- Lazutina, T.V., Tempel, Yu.A., & Tempel, O.A. (2017). Rol' filosofii kak formy mirovozzreniya pri osvoenii kompetencij obuchayushchimisya tekhnicheskikh napravlenij v sisteme sovremennogo vysshego obrazovaniya Rossii [Philosophy's role as a form of worldview in mastering competences by students of the technical specialisations in the modern Russia's higher education system]. *Integration of education*, 1(86), 19-34. [in Rus.]. <https://doi.org/10.15507/1991-9468.086.021.201701.019-034>
- Myagkova, S. V. (2009). Struktura i funkcii pravovoj kompetentnosti rukovoditelya obshcheobrazovatel'nogo uchrezhdeniya [Structure and functions of legal competence of the head of educational institution]. *Psychopedagogics in Law Enforcement*, 3, 19-21. [in Rus.].
- Nickola, G., & Kriek, J. (2017). Innovative training for work integrated learning in electrical engineering: opportunities and challenges. *Global Journal of Engineering Education*, 19(3), 225-230.
- Nikiforova, N. (2015). The Concept of Technology and the Russian Cultural Research Tradition Technology and Culture, *John Hopkins University Press*, 56(1), 184-203.
- Pokrovskaya, N. N., Petrov, M. A., & Gridneva, M. A. (2018). Diagnostics of Professional competitions and Motivation of the Engineer in the Knowledge Economy. In S. Shaposhnikov (Ed.), *Proceedings of the 2018 Third International Conference on Human Factors in Complex Technical Systems and Environments and Environments (ERGO)* (pp. 28-31). St. Petersburg, Russia: IEEE. <https://doi.org/10.1109/ERGO.2018.8443851>
- Popova, N. V., & Vdovina, E. K. (2016). Motivational ICT potential aiming at satisfying of the goals in FLT in a technical university. In A.L. Nazarenko (Ed.), *ICT in Linguistics, Linguodidactics and Intercultural Communication*, 7, (pp. 426-436). Moscow: University Book.
- Reyes, E., Enfedaque, A., Gálvez J. C. (2017). Initiatives to foster engineering student motivation: A case study. *Journal of Technology and Science Education*, 7(3), 291-312. <https://doi.org/10.3926/jotse.265>
- Shikhanova, E. G., Klenkina, O. V., & Reznichenko, M. G (2018). Zakonomernosti formirovaniya pravovoj kul'tury budushchih specialistov v vospitatel'nom prostranstve vuza [The regularities of developing students' legal culture within a university educational environment]. *Novosibirsk State Pedagogical University Bulletin*, 8(6), 87-103 [in Rus.] <http://doi.org/10.15293/2226-3365.1806.06>
- Soboleva, M. A. (2013). Pravovaya kompetentnost' kak professional'no znachimoe kachestvo budushchego specialista sfery zdavoohraneniya [Legal competence as a professionally significant quality of the future healthcare specialist]. *Bulletin of Orel State University*, 2(31), 260- 268. [in Rus.].
- Vysockiy, L. A. (2011). Formirovanie pravovoj kompetentnosti studentov kolledzha na osnove integrativno – modul'nyh tekhnologij obucheniya [Formation of legal competence of College students on the basis of integrative – modular technologies of training]. *People and education*, 4(29), 105-109. [in Rus.]