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**EDUCATIONAL ASPECTS OF MODERN ENGINEERING
KNOWLEDGE QUALITY**

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Abstract

Engineering is studied as a domain of human intellectual activity, where an important role is played by intangible resources. The authors distinguish education as the most relevant intangible resource in the development of modern engineering. It is demonstrated that the determining factor of the modern engineering is image knowledge, oriented on the spiritual perfection of the personality, perceiving the surrounding world in images. The article justifies the need for a dialectic relation between the quality of knowledge and the existing education system with the forms of education historically developed by different nations, providing the conditions for the development of natural personal qualities. The underlying philosophical purpose of education is to create a perfect, harmonically developed person. This is the main value and objective of the education system acknowledged by the authors. At the contemporary stage of the social development, one of the main tasks of the entire education system is to determine the quality of knowledge oriented at an educated person. This is the quality of knowledge that would ensure the well-balanced development of one's personal potential, the internal, unthought, or even irrational needs. Otherwise the potential that does not find any cultural employment may become destructive for nature and for every person, turning into a socially dangerous phenomenon.

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1. Introduction

The ontological basis of human existence is the relations of cognition and transformation of reality. These relations are the way for the person to cognize the matter as a whole. The reality cognition process facilitates the development of one's individual essence, the development of his personal and professional potential that will manifest themselves in the social relations and material production. One of such forms of social relations is science. The main task of science is the cognition of the laws of nature to be applied in the productive or technical activity. Obviously, the experience and technical practice-orientation of science facilitated the development and evolution of the engineering activity or engineering. In the most general way, engineering "is the domain of human intellectual activity, a discipline, a profession with the objective to apply the achievements of science and technology, the laws of nature and resource to solve the problems and tasks, and to achieve the goals set by the humankind" (Levkov & Figovsky, 2016, p. 1). It is not hard to notice that the main mission of modern engineering is not about creating a technical means to solve the problem of human existence at a given moment of time. Modern engineering is rather an activity, associated with the transformation of the natural environment; it is rational consumption of material resources for the benefit of the society and the person. Basically, the object of engineering is material resources intended for the support of material production.

The dialectic relation between engineering and science, material production and education is a distinctive feature of the current stage of engineering development, which is closely connected to the development and implementation of scientific knowledge that represents the technology development patterns. The distinctive features of modern engineering are invention, design, construction and modeling of different technical patterns and information technologies. In the well-developed conditions, the training of engineering staff becomes an object of philosophical reflection, as it requires theoretical insight and definition of the actual problems, the solutions of which determine the further success of modern engineering development. The progress and universal application of information technologies, development of international education system discover new opportunities not only for the improvement of engineering but also for the perfection of the intellectual and cultural development of the modern society. The core of the process is the person as the main generator and consumer of knowledge. The growing significance of knowledge at the current stage of social development has manifested itself in the concept of the information society. A relevant factor of modern engineering development is the quality of knowledge acquired in the process of education, as well as the spiritual perfection of the personality, perceiving the surrounding world through images. It should be remarked that the spiritual perfection finds its manifestation not only and not as much in the "do no harm"-like restrictive principles; this is, first of all, the search for the purpose of human life.

2. Problem Statement

Thus, we are interested in education not only from the point of view of one's personal survival but from the point of view of survival of the entire humankind. However, the metaphysical individualism, holding back the development of the individual essence of a person, has penetrated the education and professional training systems, including engineer training. This doctrine has been consistently implemented

into the consciousness of people for a definite purpose, which is to create an easily controllable consumerist mass culture society. The education system existing in the world today does not direct the approach to teaching to the necessary extent; as a result, the person finds himself incapable of self-expression or comprehending the integrity of being. He acquires something that provides a set of features specific for a teacher, a constructor etc. This circumstance is emphasized by representatives of different sciences. For example, Abramova and Balganova (2018) relate the transformation of the modern society to the quality of education. Nalivayko et al. (2017) define knowledge as reflected reality. Churinov (2010) distinguishes between perfect knowledge and imageless knowledge. The problem of forming a multifaceted professional qualities and personality of a modern specialist from the dialectic (comprehensive) point of view is studied by Korshunov et al. (2019). The necessity of continuous self-development of the future students as an underlying personal feature of a comprehensively developed personality was formulated by Shafranov-Kutsev and Gulyaeva (2019). The task of expanding the “reading infrastructure” intended to shape the humanitarian aspect of the personal development from the comprehensive (dialectic) point of view was analyzed by Asonova et al. (2018). Psychological aspects contributing to the formation of a comprehensively developed personality (motivation, psychological readiness, purposefulness, psychological security) were researched into by Savchenkov (2020), Perikova et al. (2020), Ptashko et al. (2020), Kachimskaya and Smyk (2020), Petrov et al. (2019), Sharafutdinova and Nizovskikh (2019), Vasileva and Tomilova (2019). Innovation direction of an engineering education development as part of a comprehensive (dialectic) approach were analyzed in articles by Breydo et al. (2019), and Rubin et al. (2019). This is why the problem of the quality of knowledge of an educated person is becoming especially relevant.

3. Research Questions

The research encompasses the following questions.

- Why does the quality of knowledge acquired in the education process become a subject for philosophical reflection?
- What is the basis for forming the image and imageless knowledge?
- What should an educated person image look like?

4. Purpose of the Study

The answers to the set questions are expected to make an appropriate contribution into the development of the recommendations for the improvement of the quality of knowledge, essential for the development of modern engineering.

5. Research Methods

At all times, the main attribute of a person has been his education, understood as a dialectic combination of technical and humanitarian knowledge. “Knowledge appears as a result of cognition (reflected reality) in the wide sense of the word, as an aggregate cognition and the experience of a social

subject” (Nalivayko et al., 2017, p. 31). Moreover, in the modern world knowledge acquires more relevance as an underlying factor of developing the new quality of culture; specific value is given to the questions of spirituality and gnoseological orientation of a person. For a social subject, knowledge is dialectically related to education. The meaning is well conveyed by the Russian word *obrazovanie* “education” (its root coincides with the word *obraz* “image”). An educated person has an *image*, a shape an uneducated person does not; to a certain extent, he would be *imageless*. Imageless knowledge is developed on the basis of the dualism principle. According to this principle, an ideal essence, which exists independently from the material one, cannot aspire to be an image of reality. In this case, the imageless knowledge should be either the representant doubling the reality with the ideal representant essences (any social ideal) or a representation, i.e. a free description, a free reconstruction of reality.

In its turn, *image knowledge* is based on the world integrity principle, according to which the ideal cannot be anything else but an image of reality, the existence of the proto-image essence. In this case, the image knowledge should be only an image of reality, inseparable from its proto-image.

As a quality of knowledge, *imageless knowledge* manifests itself in being an attribute to this or that degree of freedom of a social subject or a representant (as an essence independent from its beings) or as a representation, i.e. an existence independent from its essence. At the same time, as the quality of knowledge, *image knowledge* reveals its specificity in being an attribute to relations between people, as well as relations between nature and society. Image knowledge is associated with the orientation of human activity to certain values, peculiarities of the world outlook of the representatives of this or that culture. Therefore, the efficiency of modern engineering, as well as human behaviour, is determined by the degree of consideration of the cultural values dominating in the society, and specificity of people’s perception of the world.

Imageless knowledge reveals its properties in the ability to be an attribute to this or that degree of freedom of a social subject or to serve as a representant, i.e. an ideal essence, or a representation, i.e. an existence, a voluntary description of reality. Image knowledge is dialectically related to the proto-image, i.e. knowledge is an image which reflects the actual reality.

Consequently, the modern system of education is also based either on representation, or reflection of the actual reality, where engineering (technical activity) is supposed to be a practical act, engineering in its proto-image. For this reason, education is the main tool of developing knowledge in today’s information society; this is the only way of exploring the genetically determined intellectual potential of the society, which is essential for developing a well-rounded personality. It is important to emphasize that the knowledge of a modern man should not be of kaleidoscopic nature; it shall be image knowledge, facilitating the improvement of the relations between the members of the society, as well as between the society and nature.

In today’s information society, or knowledge society, it takes an adjustment to the international tendencies to be successful; it naturally draws changes in different spheres, including education. Such changes often cause a representation of the laws of development of nature, society, and human thinking, i.e. such changes make modern education *imageless*. For this reason, the main objective of modern education should be the creation of appropriate conditions for the development of natural personal qualities of a man. However, the possession of purely academic knowledge gets less and less efficient as an indicator of one’s education quality.

The dominating tendency of the modern information society is a free transition through the national borders of resources, people, and ideas. The majority of countries are participating in international projects, getting involved in student and faculty exchange programs. The traditions and standards of international education are freely spread across the borders: this is the cultural transformation of society, which manifests itself in globalization and internationalization of culture, as well as in the desire to maintain its own originality. As mass media, television and Internet crush the cultural borders, bringing today's education to an imageless state.

For this reason, image knowledge and image thinking are professionally essential for modern engineering. Current condition of the material production, scientific and technical progress require the engineers to demonstrate a high degree of civil, social and moral responsibility, as an engineer is expected to evaluate technology and technical achievements not only from the production performance point of view but also from the humanistic and moral perspective. Humanitarization of technical activity underlies the development of a creative personality, a subject and objective of modern engineering relying upon the image knowledge. This is what creates the respective requirements to the personality of an engineer as the key figure of modern engineering. At the present moment, the person faces the problem of choosing between two alternatives of development based on the image knowledge and imageless knowledge. The first one implies the realization of the interconnection between man and nature, respect for the nature for further co-development. The second one features a consumerist attitude to nature with production of all the resources it provides, conquering the nature completely. According to the dialectic principle of the universal interconnections, man and nature are inextricably intertwined, making the first way the only acceptable option for the humankind. If the second option is selected, the humankind will be much more likely to fall into the trap of its own arrogance, as no technical achievement is capable of taming the power of nature.

6. Findings

This way, the main philosophic sense of engineering education is to bring up a perfect, harmonically developed engineer. The activity of an engineer implies a subjective attitude to nature; the result of his activity is the solution of engineering tasks in the technical and technological domains. This is why the level of technical and technological development indicates the development level of modern engineering. For this reason, the process of harmonization of the relations between man and nature shall encompass the essence of the changes that have taken place in the engineering domain. They include, first of all, the changes in the role of science and education as intangible resources.

At the present moment, we see one of the main tasks of education development in providing harmonic progress of personal potential. Otherwise, the potential that finds no application in the cultural sphere may become destructive to the personality itself and dangerous to the society as a whole. A modern man must have a duty toward himself, which is to educate himself, to raising his particular nature to the perfection of nature.

It is not a secret that in our century of science and technical progress it is hard to live without knowledge and a spacious mind. At the present time, education is a way to the future. A person going to the future is unthinkable without a broad mind, without understanding his role in society. To acquire enough

knowledge, to learn using it in life, to become an educated person is the most important task of every member of today's information society.

The century of scientific progress we live in requires more than just standardized, common actions; it demands agile thinking, creative approach, ability to apply knowledge in various spheres of activity. The future of any country lies in educated people. This is when the historically developed school of education and personality breeding acquires an important meaning as a continuously operating matrix, based on which the nation reproduces itself in every next generation. Therefore, it is education that is expected to become the main means of forming knowledge in modern society, and it should be image knowledge.

The ultimate product of such an education system is an educated person. What will this educated person be like? What kind of image is that? In this image, we see perfection, causing a respective integrated (not kaleidoscopic) understanding of the world, the integrity of all advantages of the personality. One may achieve the integrity of being only through finding integrity in himself. Social experience explicitly demonstrates that teaching the highest moral standards, independence and creativity from the very childhood makes people think right, act right, continue the original traditions of his culture and arrange his activity to maintain the original features of his mentality. These are the qualities essential for the development of modern engineering; these are the qualities that make up an educated person image.

7. Conclusion

To conclude, it should be emphasized that the system of education plays a critical role in the development of modern engineering. This is education that serves as the main tool of developing modern engineering knowledge; it is also a means of shaping the current state of the social consciousness and pressure of the social subconsciousness; it is the only way of exploring the genetically determined intellectual potential of the nation, required to breed a well-rounded, educated personality.

- Image knowledge acts as the knowledge that reflects reality;
- Imageless knowledge acts as a kaleidoscopic, representative knowledge (true is what is subjectively applicable).

At that, it should be highlighted that the quality of knowledge of a modern person must not be kaleidoscopic, it should be image knowledge. The essence of modern engineering should be the historically developed school of education and shaping of the personality as a continuously operating matrix used to reproduce the nation in every next generation. This is why modern engineering should rely on the essential motives of everything developed by the humankind during the entire history of its existence.

References

- Abramova, M. A., & Balganova, E. V. (2018). Quality of Higher Education as the Determinant of the Social Development. *Philosophy of education*, 7, 3-12. <https://doi.org/10.15372/PHE20180401> [in Russ.]
- Asonova, E. A., Romanicheva, E. S., Senenko, O. V., & Kikteva K. S. (2018). Infrastructure of Reading: Experience of Description from the Subject Position. *Matters of Education*, 2, 26-45. <https://doi.org/10.17323/1814-9545-2018-2-26-45> [in Russ.]

- Breydo, I. V., Stazhkov, S. M., Bobryakov, A. V., Khomchenko, V. G., Kabanov, A. A., & Katalinich, B. (2019). International network Internet project of integrated engineering education. *Higher Education in Russia*, 28(1), 9-20. <https://doi.org/10.31992/0869-3617-2019-28-1-9-20> [in Russ.]
- Churinov, N. M. (2010). Perfect Knowledge and Imageless Knowledge. *Theory and History*, 2, 133-148. [in Russ.]
- Kachimskaya, A. Yu., & Smyk, Yu. V. (2020). School children's subjective perception of psychological security in the framework of interpersonal relationships with a teacher. *Science for Education Today*, 10(1), 97-111. <https://doi.org/10.15293/2658-6762.2001.06> [in Russ.]
- Korshunov, I. A., Peshkova, V. M., & Malkova, N. V. (2019). Successful Strategies of Implementation of the Additional Professional Training Programmes at the Professional Educational Organizations and Institutions. *Matters of Education*, 1, 187-214. <https://doi.org/10.17323/1814-9545-2019-1-187-214>
- Levkov, K., & Figovsky, O. (2016). Innovative Engineering: Methodological and Educational Aspects. *Scientific and Culturological Journal*, 3. <http://www.relga.ru/> [in Russ.]
- Nalivayko, N. V., Ushakov, P. V., & Ushakova E. V. (2017) Anthropological Turn in the Sociocultural Knowledge and Education Philosophy. *Philosophy of Education*, 3, 28-37. <https://doi.org/10.15372/PHE20170303> [in Russ.]
- Perikova, E. I., Atamanova, I. V., & Bogomaz, S. A. (2020). Peculiarities of psychological readiness to innovation activity for the youth in Saint Petersburg and Tomsk. *Science for Education Today*, 10(1), 62-78. <https://doi.org/10.15293/2658-6762.2001.04> [in Russ.]
- Petrov, A. M., Volodina, K. A., & Belyaeva, T. A. (2019). The role of the psycho-physiological characteristics of a person in his professional development. *Education and Self Development*, 14(4), 63-71. <https://doi.org/10.26907/esd14.4.06> [in Russ.]
- Ptashko, T. G., Chernikova, E. G., Perebeynos, A. E., Sokolova, N. A., & Sivrikova, N. V. (2020). Interrelation of a teenager's personality direction type to the specifics of their social activity. *Science for Education Today*, 10(1), 79-96. <https://doi.org/10.15293/2658-6762.2001.05> [in Russ.]
- Rubin, Yu. B., Lednev, M. V., & Mozhzhukhin, D. P. (2019). Research into competition: competences structuring in university programs on entrepreneurship. *Higher Education in Russia*, 28(1), 21-33. <https://doi.org/10.31992/0869-3617-2019-28-1-21-33> [in Russ.]
- Savchenkov, A. V. (2020). Sustainable motivation to perform teaching activity as part of professional flexibility of future teachers. *Science for Education Today*, 10(1), 43-61. <https://doi.org/10.15293/2658-6762.2001.03> [in Russ.]
- Shafranov-Kutsev, G. F., & Gulyaeva, L.V. (2019). Professional self-identification as the leading factor of competition-orientation and competitiveness of the high school students. *Integration of Education*, 1, 100-119. <https://doi.org/10.15507/1991-9468.094.023.201901.100-118> [in Russ.]
- Sharafutdinova, M. N., & Nizovskikh, N. A. (2019). Psychological readiness for management and self-control of behavior as components of the potential competitiveness of senior pupils. *Education and Self Development*, 14(4), 71-80. <https://doi.org/10.26907/esd14.4.07> [in Russ.]
- Vasileva, E. Yu., & Tomilova, M. I. (2019). Assessment of communicative competence of residents. *Education and Self Development*, 14(4), 82-90. <https://doi.org/10.26907/esd14.4.08> [in Russ.]