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**ECOLOGICAL IMPERATIVE IN SOCIAL RESPONSIBILITY
STRUCTURE OF ENGINEERS**

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Abstract

Changes in the world social and political situation, functional changes in an engineering activity and its globalization lead to the rise of new questions. There is a necessity to form new approaches and mechanisms for the formation of engineers' responsibilities. Common sense and social responsibility should be the basis for engineering. The solution of moral problems associated with technology and technological solutions on Nature transformation leads to the formulating "Code of Ethics for engineers". Professional responsibilities and obligations of future engineers should be given in the system of higher professional education. Various approaches to this issue show that this challenge is complex and unsolved. Social responsibility of engineers should be a continuous learning based on the accumulated experience of previous generations. Actuality of this issue can be explained by the solutions made by technocratic approaches. Thus, the problem of humanization and humanization of engineering is very important. The aim of the study is to determine the importance of ecological imperative in the formation of social responsibility of an engineer. We define the essence of the social responsibility of engineers, to analyze the quality of humanitarian training engineers, to present the dynamics of an ecological component in engineering worldview. Moreover, the results of engineers' activity should be aimed at the interest of humanity and environment preservation. Ecological knowledge is interpreted as the highest achievements of human culture, a desire to create conditions for co-evolution and harmonization of relation of the "Nature-Society" system and to form an engineer with new ecological thinking.

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1. Introduction

Changes in current social reality require humanization of various areas of human activities, especially of a technical activity. Humanity is directly related to the consequences of technological development. There is an urgent need for technological progress management. Society is issued the challenge to generate values and target ideas about future.

Due to this, ethical and technical issues and the growth of social responsibilities of engineers are timely. This issue is beyond professional and corporate social responsibilities. Solving professional tasks in their activities, modern engineers deal with moral, ethical issues. The main objective of training engineers is not only the achievement of a high level of professional competence, but the formation of moral values, a sense of duty. At CXI Engelmeir Scientific Conference the minuses of one-sided technical education that provide narrow professional knowledge, develop utilitarian and rational worldview stereotypes in professional activities were discussed.

Engineering activity is multifunctional and includes entrepreneurial, political, economic, scientific and environmental aspects. Thus, the formation of philosophical and moral principles should not be based only on technological recipes

The aim of our study is to determine the importance of ecological imperative in the formation of social responsibility of an engineer. To achieve this goal, it is necessary to solve the following tasks: to define the essence of the social responsibility of engineers, to analyze the quality of humanitarian training of engineers, to present the dynamics of ecological component in engineering worldview.

Basic research methods used in this study are logical, historical and system-activity ones.

2. Methods

The issue of social responsibility of an engineer is multidisciplinary; that is why, it remains unsolved. There are various aspects of this issue such as political, religious, professional, ecological, social ones and etc. The solution to this issue is complicated by the fact that, on the one hand, it is not new, but on the other hand, it is complicated by the nature of engineering activity and its influence on social reality. Engineering work is complex and its results can be seen in all spheres of human activity.

The problem is compounded by the fact that the concept of “responsibility” has various interpretations. It is known that this concept is derived from the Latin word «respondere», which means “to respond”. The term “responsible” appeared in English and romance languages in the XVI century. Similar terms can be found in German, French, Spanish and other languages. The analysis of the concept “responsibility” can be found in the works of several scientists (Buber, 1947; Lorengan, 1972)

The globalization of modern society, the priority of technocratic thinking show the need for philosophic understanding of engineer’s responsibility. The responsibility of engineers is examined from the historical and philosophical viewpoint in K. Mitchem’s work (Mitchem, 1995).

We cannot but agree with H. Jonas who considers that today’s realities of the past moral norms are not able to determine the future prospects and problems of human survival. It is necessary to create new imperatives for engineering (Jonas, 1984).

There are various approaches to the study of the essence of modern engineering (Beckmann, 2000), engineering ethics (Agazzi, 1998), moral responsibility of engineers (Ropohl, 1987).

The aim of our study is not to study the features of engineering activity in changing conditions of social process, but to analyze approaches to engineering ethics needed for understanding engineer's responsibility.

The problems of engineering ethics have been studied since 1970s-1980s. The moral dimension of engineering activity is a characteristic of human social impact on society. Engineering ethics is examined as an applied ethics; this means that an engineer should bear a moral responsibility for his/her activity. Ethical standards should regulate professional activities of engineers. On the one hand, engineers must be responsible before humanity; on the other hand, humanity depends on the consequences of technological development. Thus, the issue of engineer's responsibility should be studied from ethical and philosophical viewpoints. The Codes of Ethics for engineering are being formulated. The Codes have already been formulated in some organizations/societies such as National Society of Professional Engineering, California Society of Professional Engineers, British Computer Society.

As a rule, moral code and ethics are manifested through such relations as "engineer-society", "engineer-employer", "engineer-client" and "engineer-other engineers". In his work "Ethics for engineers – a flexible code of morality", A. Yu. Sogamonov considers that Robert Baum has presented the right definition of the concept of engineering ethics. He formulates five fundamental elements for engineering training:

- Students' moral conscience and imagination should be formed;
- Students should understand engineering ethics, the essence of professional activity and the social effect of this activity;
- Students should be given the basics of ethical analysis and discourse, ethical theories and moral language;
- Moral responsibility needed for the future professional activities should be formulated;
- Students should have the skills for resolving moral dilemmas and moral ambivalence etc.(Baum, 1983).

Engineering activities are directly related to the global problem "Society-Nature". Due to the global environmental issues, we consider that future engineers should study environmental imperative of social responsibility at universities. Social responsibility is aimed to change the existing traditional scientific and engineering worldview where the humanistic visions of technological development processes and engineering activities should be formulated.

3. Results

The formation process of a paradigm depends on the quality of engineering training at universities.

Various conceptual solutions are identified with the issues of environmental education, and there are some fundamental points for reforming:

- environmental education reform depends on total education reform that is in crisis now;
- educational processes focus on sustainable development of society;
- environmental education is changed in a new information space;

- environmental education is related to internationalization, humanization and formation continuity of a new paradigm of thinking;
- environmental education should be continuous to expand its potential.

At the present stage of social transformation, there is a necessity to form a new paradigm “Man and Society” as a new concept of ecological humanism.

A. Schwetzer notes that separation of ethics and culture is impossible. According to him the ultimate aim of civilization should be spiritual and moral perfection of humans. Reviving the ancient principle of ahimsa that means ‘not to injure’ and ‘compassion’, A. Schwetzer notes that all life is sacred including that which is lower than a human one in the scale.

The mistake of today’s education is that education is considered as a service. The quality of professional education is determined by short-termed, immediate needs of an employer. Moreover, a subjective opinion is possible.

Another mistake of highly qualified engineers training is that education has become a commodity. If we agree with the words “Cadres decide everything”, the relations in the system “Cadres-Employer” should be harmonious. Thus, human resources should meet the demands of time, and an employer should be at the high level of self-actualization to understand his/her employees (Maksimova, 2015).

Due to a system approach, engineering training issues are different. Firstly, engineering training should be analyzed as a special social activity that has its own subject, object, goals and results. Secondly, a specialist is a system and a part of a higher system. Thus, as a system s/he is presented as the integrity consisting of organically interrelated elements. Moreover, as a part, s/he is included in a higher system – society, a system of social relations.

The quality of engineering training is based on social needs and motivations existing in the definite historic period due to modern requirements and continuity to the legacy of the past. Moreover, it has an internal logic of development proved by the resolutions of internal contradictions.

We consider that the concept of “quality of engineers” is a philosophical and sociological one that includes a high level of professional and ideological education when a specialist can rapidly adapt to changed circumstances, realize his/her intellectual and spiritual potential. The quality of engineers is not limited by space and time.

Ecological culture is based on creating environmental ideology. Today, it is fashionable to talk about deideologization as a kind of panacea for social contradictions, but ideology is a system of political, moral, legal, philosophical, religious and environmental views.

The key purpose of the environmental ideology should be the restoration of harmonious relations between Society and Nature. Eco-anthropocentrism with two equal components of the system “Nature – Society” is formed instead of anthropocentrism.

The standards of environmental and noosphere education are examined. Environmental education can be seen as a socio-cultural activity, social institution and specific relationships. In this paper, this is the process of “teacher and student” interaction, and the results of this interaction are knowledge transformation, consolidation and validation aimed at solving ecological tasks: environment protection, rational use of natural resources, environmental regulations and application of this knowledge to solve professional tasks. These objectives can be achieved by the inclusion of environmental education in engineering training.

The concept of noosphere education is wider; as it is based on the philosophical understanding of natural and social problems of ecology that is presented as a system of scientific and technical, methodological and practical views on nature aimed at sustainable development of society.

It is known that if the environment education is focused only on knowledge transfer, it does not change the current ecological situation; however, it only fulfils an educational function. It is necessary to combine theoretical and practical knowledge obtained during human activities. We consider that noosphere education should be based on environmental education that is understood as an educational process that forms a belief system aimed at achieving environmental quality, harmonization and co-evolution in the “Society-Nature” relations.

The problems of environmental education have various conceptual solutions, but there are some fundamental points:

- Environmental education reforms are linked to the reforms of the whole education system that is in crisis now;
- Environmental education processes are aimed at sustainable development of society;
- Evolution of environmental education is carried out in a new information space;
- Environmental education is connected with internationalization, humanization and continuity in the formation of a new paradigm of thinking;
- Environmental education should be continuous.

Modern higher education is characterized by transition from stable conservatism to active evolutionism. Humanization and environmentalization should form a new style of professional thinking.

Globalization leads to the globalization of environmental education. The development of environmental projects will be possible if they are internationalized, that is why, Russian education should integrate into global education. Ultimately, the internationalization of environmental education should internationalize social activity on the Earth. .

Thus, the process of co-evolution can be in scientific and theoretical space where scientific and humanitarian paradigms are combined. The most important challenge is the problem of man and the understanding of socio-biological evolution. Social evolution, civilization does not stop biological evolution of man. Vernadsky often says about structural and functional changes in the brain under the influence of civilized development of man.

Modern solution of environmental problems has three approaches: ethical, moral and pragmatic.

An ethical approach is opposed to a pragmatic one. The ethical approach examines ecological issues as an anthropological catastrophe and the pragmatic approach studies the idea of cleaner production. A moral approach is between two other approaches, and it is focused on rational use of nature. It leads the formation of a new paradigm of ecological thinking and ecological imperative.

A new paradigm of ecological thinking should include an understanding of equal rights and a compromise solution to nature. The system of values is needed to recognize that nature has intrinsic value. This is a paradigm of the man and nature unity, a dynamic balance between human activities and natural biocenosis. Because of careless human behavior, a man faces the problem of understanding his/her role in the system of biological regulation and the fundamental shift in the paradigm of thinking. There are various views on the “Society-Nature” problem. The views are different, but they have an ethical basis. Moiseev (2016) notes that a modern understanding of the world should be different, as

ecological imperatives will lead to a new vision of causes, characters, and possible confrontations of nations, peoples and civilizations.

The ecological imperative is requirement, injunction and instruction. The imperative is linked with responsibility, obligation where there is a need for acting according to duties. A man has an idea on how to act according to the duties, and doing this, s/he comes close to the sublime.

It should be noted that in foreign philosophy a lot of attention is paid to ecological imperative. Ecological imperative is a result of civilization development in its definite form. It appears under the definite social and historical conditions. The anthropogenic impact on environment, the critical state of relations in the “Nature-Society” system influence on the formation of inhibiting mechanisms in ecological consciousness and social activities that help to build harmonization between society and nature, to develop rational mechanisms of nature transformation.

Thus, ecological imperative is a moral and sociological concept denoting a historically established system of norms, regulations, values and mechanisms of social actions to regulate and meet harmonization of relations in the “Nature-Society” system.

Ecological imperative is important for social engineering practice, especially in destabilized relations of nature and a man. Moreover, the principles of ecological imperative are formulated in practice.

4. Conclusion

The problem of engineer’s responsibility attracts specialists’ attention from different fields of science. It is diverse and can be observed in all spheres of human activity; that is why, it requires a new approach for solution. Nowadays, an engineer should be guided by common sense. The results of engineer’s activity should be aimed at the interest of humanity and environment preservation. Ecological knowledge is interpreted as the highest achievements of human culture, a desire to create conditions for co-evolution, to harmonize relations in the “Nature-Society” system, and to form an engineer with new ecological thinking.

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