

## Humanitarian and humanistic values in modern higher engineering education: from design to reality

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**ABSTRACT:** The modern trends of Russian policy towards higher engineering education are focused on overcoming the technocratisation of thinking. The concept of engineering education humanisation proceeds from the principles of fundamentality and integrity, according to which the change of the educational process lies in the unity of its target, content and procedural components. This approach made it possible to articulate the goal of the Humanitarisation Project of the Industrial University of Tyumen (IUT), Tyumen, Russia, as establishing an integral cultural and educational environment at the IUT. The project is aimed at modernising educational activities at the IUT. In this article, the analysis of the project implementation and its results are presented and discussed. The results indicate that the process of humanisation is not limited to the substantive aspects, such as goals and content, but it extends to technologies and innovative teaching methods. The authors conclude that attention should be paid not only to separate events, but also to the creation of a new paradigm of engineering education, a new cultural and educational environment at the IUT, a new model of an engineering university graduate.

**Keywords:** Engineering education, humanitarisation, humanisation, soft skills, cultural and educational environment, modern technical university

### INTRODUCTION

Currently, not only Russia, but also other countries, the technogenic civilisation as a whole, have been experiencing a serious educational crisis. The essence of this crisis lies in the *dehumanisation* of the educational system. The need for broadening education by the inclusion of humanistic and humanitarian aspects can be a response to self-limitations in the development of the modern technogenic rational civilisation [1][2].

The model of engineering education most common today is aimed at developing basic knowledge and skills, narrowly defined professional competencies, professionalisation and specialisation, and a technocratic way of thinking. At the same time, current trends have determined the principal changes of engineering education requiring the modern engineer to master a much wider range of key skills than highly specialised scientific, technical and engineering disciplines can offer.

The concept of humanisation of education at a technical university is to refute professional limitations and develop new competencies that go beyond the professionalisation and specialisation of the profession [3]. The humanisation of education, in general, is aimed at the development and application of soft skills that contribute not only to professional, but also to personal growth. The realities of the modern educational paradigm confirm that overcoming technocratic thinking is possible when education is based on broad sociocultural knowledge, where general humanitarian values play a special role. The fusion of humanitarian/humanistic and technical education should be carried out not only within the framework of one specialty of humanitarian engineering [4-6], but should cover the entire body of engineering education.

### LITERATURE REVIEW

Humanisation of engineering education is an important aspect of the general process of knowledge acquisition at today's stage of development of science and engineering practice. It is argued, that good engineers should be responsible citizens and be aware of history of civilisations, ideas and practices that would help benefit the society as a whole. Canadian researches offer a path for increasing soft skills that includes complementary modules, on-line tools, guidebooks and special courses for prospective engineers, such as law, business or ethics. It is believed that *all of this would go a long way toward maximizing the value of, and appreciation for... humanities and social sciences content and competencies* [7].

Some researchers from the Western scientific community tend to focus on humanisation referring to individual values in professional education rather than socially significant aspects of personality development and training. Thus, Galvin and Todres note that

*Humanisation is a certain point of view or value, which means being humane and, moreover, finding ways to act in this direction. Such an approach also requires practical translation into more experimental (experienced) fruits of those actions that make people feel more humane [8].*

Devis-Rozental and Clarke argue that

*...education is, or it should be, person-centered; it refers to acquiring knowledge and experience of any type to enrich our experience and help us understand the world around us [9].*

In this aspect, it is important to note that humanitarisation and humanisation are not identical concepts and have different semantic meanings.

Humanitarisation concerns value creating and supporting, it expresses a strong belief in the value of human life, its significance and its protection. Tregua et al argue that

*...market actors co-create value by integrating resources, such as skills and knowledge, and by exchanging service-for-service, a process coordinated by shared institutional arrangements that define nested and overlapping service ecosystems [10].*

At the same time, humanitarisation nowadays is not only considered from its theoretical and methodological aspects, but also as an applied method to train professionals. A modern engineer today is a person who is able to realise the significance of, and the responsibility for the results of his/her professional activity. According to German philosopher and psychologist Karl Theodor Jaspers

*...Technology is only a means in itself it is neither good nor evil. Everything depends upon what man makes of it, for what purpose it serves him, under what conditions he places it. The question is, what kind of man take possession of it, what sort of creature man will prove himself to be through the use he makes of it [11].*

Hence, the objective process of integration leads to the understanding of the engineer as a subject of social activity and social responsibility [12]. It is logical then that in the implementation of innovative technological processes, humanitarisation plays a special role and so it should in the education of future engineers.

## FEATURES AND OBJECTIVES

The humanitarisation of engineering activity is complex and associated with meeting the needs of today's and future employers; effective professional adaptation in the team (including showing organisational skills); development and improvement of labour (project, production and interpersonal), and culture [12]. The meaning of the humanitarisation paradigm of technical education lies in the harmonious integration of general cultural education and vocational training. In view of that, a goal of education is personal development, and appropriate training is a means to achieve this goal. Consequently, if training becomes an end in itself, then the goal is replaced by the means, and the professional and universal cultural unity is being skewed towards *technocracy*. As a result, personal development as a strategic goal is replaced by a pragmatic one, which implies teaching a profession and a obtaining professional skill set.

To overcome the limitations of the established approach, humanitarisation can be considered as a system of measures primarily aimed at promoting the meaning of human being in the world through understanding the nature and human interactions with it, increasing the number of humanitarian/humanistic disciplines, developing students' world outlook, as well as curbing the tendencies towards technocratisation of higher engineering education [13].

One possible solution to the problem of humanitarisation/humanisation of education in technical universities can be found in interdisciplinary training on the border of humanities and technical areas (on the border of the animate and inanimate, material and spiritual, biology and technology). Social sciences and humanities disciplines at universities should be treated as fundamental courses, so as to change stereotypes of thinking and accept the humanitarian culture [14]. However, there are also other equally significant solutions, such as expanding the range of humanities; transdisciplinarity to create holistic modules of humanities and science disciplines; at technical universities, enabling second degree acquisition in the humanities, social sciences or economics; strengthening the training of engineers in such fields as languages and law; student-centred learning; creating a humanitarian environment at the university.

When developing the concept of humanitarisation of engineering education at the Industrial University of Tyumen (IUT), Tyumen, Russia, the authors of this article proceeded from the principles of fundamentality and integrity. The aim was to provide a holistic change in the educational process across all its components - its target, content and procedures, as well as the corresponding educational and humanitarian environment of the IUT. Such a perspective

makes it possible to set the overall goal of the Humanitarisation Project of the IUTas ...*creation of a holistic cultural and educational environment at the university, which develops the facilities for training a modern engineer who is prepared to solve complex sociotechnical problems.*

## PROCESS

When focusing on the practical and experimental components of the humanitarisation of engineering education, it should be noted that the authors define it as a process of creating a sociocultural environment for the professional training of engineers-to-be. A significant role in the technical university graduate's professional growth is played by soft skills that contribute to the development of humane culture. Being a necessary component of professional activities, soft skills can be defined as a collection of interpersonal and social qualities that permit the individual to function well in society and to achieve their objectives [15].

Thus, the modernisation of educational activities has led to the new concept of humanitarisation of engineering education at the IUT. The system-based construct of the project is the formation of a competence-based model of a modern technical university graduate, which includes, among other things, monitoring the level of soft skills among employers and students. Employer monitoring is an established tradition at the IUT. A survey of representatives of IUT industrial partners concerning the demand for soft skills confirmed that the representatives of leading companies have a meaningful approach to solving this problem. Traditional Russian training practice is based on four groups of soft skills: communicative, research, project and pedagogical skills. To adapt this approach to the specific teaching process at a technical university, the authors updated top ten skills required in the future (see Table 1).

Table 1: Top ten soft skills required according to the employers.

S1 - solving complex problems
S2 - critical thinking
S3 - creativity
S4 - personnel management
S5 - coordination and interaction
S6 - emotional intelligence
S7 - judgment and decision making
S8 - customer orientation
S9 - negotiating
S10 - cognitive flexibility

According to the Russian Federal State Educational Standard 3++, subjects, such as Team Building, Time Management, Basics of Self-Management, Professional and Personality Development, Ethics and Psychology of Professional Activity should be included in the curriculum. The need for a deeper interpenetration of the humanities and technical modules requests the expansion of the humanities listing. Therefore, since 2018, in addition to the basic modules, such as history, philosophy, pedagogy and methodology of science, a number of experimental modules aimed at developing students' personality have also been included in the curriculum (see Table 2).

Table 2: Elective modules aimed at students' personal development.

Curriculum	Module 1	Module 2
Biotechnical Systems and Technologies, Bachelor's degree	Methods for effective business communication: Psychology of Professional Development, Basics of Elocution, Mastery of Presentation.	Protection of labour activity: Intellectual Property Right, Innovation Activity Regulation, Legal and Regulatory Texts Language.
Mechanical Engineering, Bachelor's degree	Organisation of effective team interaction: Psychology of Team Management, Basics of Business Ethics and Corporate Culture, Russian for Business Communication.	Protection of labour activity: Intellectual Property Law, Regulation of Innovation Activity, Legal and Regulatory Texts Language.
Logistics and Supply Chain Management, Bachelor's degree	Methods of professional communications: Psychology of Business Communication, The Ethics of Public Speaking, Business Communication.	Professional development: Psychology of Professional Development, Leadership and Personal Effectiveness, Speechwriting Techniques of a Modern Leader.

Transport and Technological Machines and Complexes Operation, Bachelor's degree	Practice of effective communications: Team Psychology, Ethics and Etiquette of Business Communications, Basics of Corporate Culture.	Professional development: Psychology of Professional Development, Leadership and Personal Efficiency, Speechwriting Techniques of a Modern Leader.
Trade Activity, Bachelor's degree	Methods of effective business communication: Psychology of Public Speaking, Techniques of Communicative Interaction, Business Presentations.	

Since 2020, additional elective subjects have been implemented, such as Personality Development, Basics of Russian and International Law, Political and Legal Competence, Legal Status of the Modern World, Legal Foresight, Stress Management, Professional and Business Ethics, Negotiation, Basics of Elocution, etc.

As the outlined experience of humanitarisation shows, the educational process is not limited to its aims and contents. It is necessary to have both procedural and technological support. In this case, humanitarisation is provided by the activities of all the participants of the educational process. For example, as the main professional activity of an engineer is design engineering, therefore, this aspect should be mostly reflected in the curriculum. To implement this task, project-based teaching technologies have been included in the educational process, as well as interactive activities as part of the teaching process. For example, the history module includes the subject History of Oil and Gas Industry in Russia. This method contributes to the development students' abilities to solve social and professional problems within their historical context. In this aspect, it is particularly important that the students have an opportunity to master their broad set of skills for accomplishing their job tasks.

As part of humanitarisation/humanisation and skills broadening, an interdisciplinary approach has been adopted at the IUT. Interdisciplinarity is determined not only by the nature of current knowledge, but primarily by the new requirements of labour market for today's specialists. The interdisciplinary approach promotes non-standard thinking, as well as the ability to solve complex problems that continuously evolve at various areas of scientific, practical or professional activities. In this way within the ethics and psychology of professional activity module, the Personal Presentation subject has been implemented. The new student-centred paradigm is largely implemented via the introduction of information technologies in the training process. An important role in the process of humanitarisation/humanisation/skills broadening is played by developing on-line courses. For example, the Department of Humanities at the IUT has developed, tested and implemented an open on-line history course for both full-time and part-time engineering students.

The humanitarisation/humanisation/skills broadening of engineering education contribute to the development of professional mobility and competitiveness on the international education market. In view of that, some Master programmes include humanities subjects taught in English. For example, currently, Philosophy and Methodology of Science offered for the Master students of Offshore Drilling and Geological Steering is taught in English. As part of the IUT Higher School of Engineering (EG) Project, the Master students of Logistics are currently studying philosophy in the English language. A number of study and training guides for the abovementioned subjects are published in English.

The new paradigm of education requires the development of new educational routes that would allow students to choose their individual educational trajectories. For this reason, IUT teachers are involved in the process of implementing an experimental model on developing an individual trajectories for the subject History, so that students could choose in accordance with their personal choice for in-depth study of one problems from the available electives, such as the Main Trends of the Soviet Electric Power Industry, the Arctic in the Russian National Strategy, History of Oil and Gas Industry of Russia, Industrialisation of the Tyumen North, Socioeconomic Processes, Labour and Entrepreneurship in Russian History, Tyumen Region in Russian History, Russian Civilisation: Features of Formation, Functioning and Transformation, etc.

The effectiveness of student-centred teaching aimed at co-operative designing and testing the results of intellectual engineering activity, has been motivating teachers to further develop existing pedagogical approaches. At the IUT, the changes within the framework of the humanitarisation of engineering and technology education enabled transformation from an information-transmitting approach of teaching to a personal-creative one. The search for new humanitarian/humanistic educational forms has led, for example, to recognising the need for gamification technologies to be integrated into educational activity as they can motivate students and teachers to achieve new goals more effectively. In general, gamification refers not only to creating and using educational games, but to the whole process involved in gaming, such as team building skills acquisition, increasing motivation across the team, learning to compete in a friendly environment. Some elements of gamification have already been used by IUT teachers in several subjects, such as Philosophy, History and Philosophy of Science, Psychology and Pedagogy of Higher Education, etc. The implementation of game-based tasks requires competent and technologically savvy teachers, which in turn implies the need for continuous training and retraining of academic staff, especially in the use of modern technologies.

Training engineering personnel within the framework of humanitarisation should not be limited only to the educational process, but should extend to other aspects of life. This approach enables to redirect the traditional way of teaching towards new trends, and to facilitate the development of each student, so that they reach their full creative, intellectual and human potential, while being an active participant in learning process.

A whole range of additional educational approaches is being tested at the IUT. For example, by the inclusion of engineering students in such competitions as All-Russia Historical Dictation; the Annual Tyumen Region Competition of Regional Natural History Projects; *V. Muravlenko* Students' Scientific Project Competition; *My country - My Russia* youth project contest; *Koinonia* youth philosophical society; *Step into the Future* regional scientific young researchers forum; *Youth of Tyumen* city forum, etc. Apparently, such a wide range of students' interests contributes to overcoming the stereotypes of technocratic thinking and to the establishment of their humane culture.

The implementation of engineering education humanitarisation is facilitated by the strong partnership between the IUT and scientific and public institutions at the state and international levels, whose activities are aimed at promoting humanistic values and knowledge, thus enriching the worldview of a technical university graduate. Among those institutions are: West Siberian Branch of the Federal Research Sociological Centre of the Russian Academy of Sciences, Moscow - Tyumen, Russia; Tyumen Scientific Centre of the Siberian Branch of the Russian Academy of Sciences, Tyumen, Russia; Centre of Culture and Knowledge of Paris, France; Southern Philosophical Society of Bishkek, Kyrgyzstan, etc.

## CONCLUSIONS

Based on the outlined approaches and initiatives, it appears crucial for technical universities to develop a special creative atmosphere for the education of a future specialist and to provide opportunities for a general cultural development of that specialist by including humanistic and humanitarian aspects in the educational process. Humanitarisation/humanisation/skills broadening of engineering education should be an integral part of the educational environment transformation. Therefore, a technical university as an educational institution can greatly contribute to the formation of a future specialist. This can be achieved by a holistic approach to education that takes into account a new paradigm of education, and a new cultural and education environment leading to a new technical university graduate ready to address 21st Century problems in a socially responsible way. More specifically:

1. The new paradigm of engineering education should include training specialists with a wide range of key hard and soft skills, competitive at the local labour market, possessing sociocultural skills and demonstrating humanistic values in their professional activities.
2. The new cultural and educational environment should contribute to students' self-realisation and should be based on the transformation from a means into a goal, from an object into a subject of cultural and educational activities; an environment that creates the conditions for an individual trajectory of professional development and students' and graduates' success.
3. The new model of a technical university graduate tailored to the modern world's realities that means being prepared for the social and humane challenges emerging in their professional activities.

To sum up, according to the educational policy of Russia, the concept of humanitarisation is aimed to refute the professional limitations and to develop the soft skills of future engineers. The narrow technocratic thinking can be overcome only by implementing and integrating broad sociocultural knowledge, with emphasis on humanitarian and humanistic values.

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