Principles of sustainable development in education: opportunities and reality

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Abstract. At the end of the XX century, the concept of sustainable development was formulated and certain steps in its implementation were taken. There is a reliable tool for solving existing problems in the development of modern civilization - the education system. Education for sustainable development (ESD) must change the thinking and behavior of our planet's population. This article considers examples of the implementation of the goals and tasks of sustainable development in the Perm Institute of Railway Transport. An analysis of work programs and a survey of students allow to draw certain conclusions about what opportunities exist in a technical university for the implementation of the principles of sustainable development in education.

1 Introduction

The basic formulation of "sustainable development" was first described in 1987 in a report by Gro Harlem Brundtland, who managed the UN Commission on environment and development. Sustainable development is a development, in which the satisfaction of the needs of present generations is carried out without loss of the ability of future generations to satisfy their own needs [1].

The development of civilization can be carried out at the expense of a strong and weak concept of sustainable development. The strong concept of sustainable development implies the limited use of natural resources by the current generation in order to preserve the resource base for future generations. The weak concept of sustainable development involves converting natural resources into knowledge and technologies, that will help future generations maintain a high quality of life. Meanwhile, the UN Commission on environment and development believes, that the development of modern civilization proceeds more like within the framework of a weak concept of sustainable development and is risky.

The UN defined 17 goals for the development of our civilization: the poverty eradication; eliminating famine and improving nutrition; ensuring a healthy lifestyle; ensuring universal quality education; ensuring gender equality; ensuring the rational use of water resources; ensuring universal access to inexpensive and reliable energy sources; promoting economic growth for all; creation of a stable industrial and innovative infrastructure; reducing inequality; ensuring ecological safety; ensuring a rational model of

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consumption and production; combating climate change; preservation and rational use of seas and oceans; protection and restoration of terrestrial ecosystems; assistance in building a peaceful society; activation of work within the framework of a global partnership. For listed goals, we see the centuries-old problems of mankind. To a greater extent, these goals are development benchmarks, that inspire humanity to find ways to solve existing problems.

In order to achieve the implementation of the tasks set, it is necessary to use not only new technologies, finances and political mechanisms, but also to change the thinking and behavior of the world's population. This global task can be realized within the framework of the education system. UNESCO is the lead institution for education for sustainable development (ESD). The ESD concept is forming. It is based on the principles of universality and continuity of education; interdisciplinary approach; interaction between teacher and student; comprehensive support from society and the state; combination of training and upbringing; integration of knowledge to create ecologically sustainable models for the development of society.

All these tasks were formulated under the influence of research, carried out by the Club of Rome. In 1972, the first report was presented to the Club of Rome "The Limits to Growth", signed by Donella Meadows, Dennis Meadows, Jorgen Randers and William Burns. Scientists modeled several scenarios for the development of the planet from 1970 to 2100, and came to the conclusion about the need for global changes in the life of the Earth's population, otherwise the planet will face a catastrophe. Two decades later, the authoring team came to the conclusion in the book "Beyond Growth", that humanity is outside the zone of sustainable development [2]. Such structural transformations are needed, that will eliminate the very reasons for the system's out of growth limits. Among the destabilizing factors, the factor of social inequality in low developed countries was also identified. Poverty accompanies demographic growth in poor countries, generates an increase in funds, allocated for consumption needs. In these conditions, a simultaneous restructuring of the consumption model in rich and developing countries is necessary. The Meadows set growth limits for the material side of this process. For nature, the danger is not the development of civilization, but the destruction, that accompanies this process. Therefore, transformations and development should be accompanied by the deepening of knowledge, the improvement of society, and the cultural development of mankind. Wisdom, community, responsibility should determine the actions of people to solve global problems.

Thus, the system of education and upbringing is becoming an important element in solving the assigned tasks in the context of sustainable development.

2 Materials and Methods

Research on innovative development programs in the universities of the Russian Federation was undertaken repeatedly [3]. A research by Novosibirsk State Pedagogical University analyzed a very wide range of innovations in educational activities: accessibility of education to different categories of the population, inclusion issues, health-saving learning technologies, e-learning, modern extramural education, the social orientation of university projects. We will not consider the entire range of activities, carried out at the Perm Institute of Railway Transport, which are required for innovative activity. Let's speak of those moments, that, in one way or another, affect the area of global problems. Let's try to find out the influence of objective and subjective factors on the implementation of ideas of sustainable development in the educational environment of the university and comprehend the results of this impact on the student audience. We also use an axiological approach, that allows to identify the significance of new ideas for our students.

In order to understand, how our system of training specialists for the railway industry responds to the challenges of the time, we should analyze the content of the work programs in the directions of training and the number of hours, allowed for acquaintance with the problems of interest to us. Thus, we will use the document analysis method in our research.

It is also necessary to provide data from conversations and surveys with students, which will show the degree of students' awareness of the problems of human development and the dangers, that accompany this development. We use the methods of sociological survey here.

3 Analysis of the obtained data

We analyzed the work programs of the disciplines, for which specialists were and are being trained at our institute "Operation of Traffic" (OT), "Lines of Communication" (LC), "Train Support Systems" (SS), "Construction of Railway Bridges and Transport Tunnels" (CRW), for 2012, 2017 and 2021. The following subjects were highlighted, which speak of topics, related to the achievement of sustainable development. This is philosophy, ecology and civil protection. We give the data in Table 1.

Table 1. Changing the number of hours to get acquainted with global problems

Training programs	Year	Philosophy		Ecology		Life safety	
		Class hours	Total hours	Class hours	Total hours	Class hours	Total hours
OT	2012	54	108	36	72	36	108
	2017	36	144	54	108	54	180
	2021	36	144	32	108	54	144
SS	2012	54	108	36	72	72	180
	2017	36	144	34	144	54	180
	2021	36	144	32	108	54	144
LC	2012	54	108	36	72	51	144
	2017	36	144	36	144	54	180
	2021	36	144	32	108	54	144
CRW	2012	54	108	36	72	72	180
	2017	36	144	36	108	54	180
	2021	36	144	32	108	54	144

As we can see, when studying the subject "Philosophy", where the topic "Global problems of our time" is raised, the total number of hours increases from 108 to 144, but the class hours decrease. This leads to the fact, that the study of the material is transferred to self-study by students, with all that it implies. Here it is possible to assess the knowledge gained, but there is not enough time to discuss the topic.

For the discipline "Ecology" we see an increase in the total number of hours from 72 to 108 and a decrease in class hours from 36 to 32 in the specialty OT and CRW. In the specialties of SS and LC, class hours also decrease from 36 to 32, and the total number of hours first doubles (in 2017 compared to 2012), and then decreases to 108 hours. There was also a change in the name of the subject to "Engineering Ecology". That is, the discipline acquired a more specialized character.

In the discipline "Civil Protection", we observe a reduction in the total number of hours for studying the discipline in all specialties, and an increase in class hours in the specialty OT and LC (from 36 to 54 and from 51 to 54, respectively). On specialties of SS and CRW, the number of class hours is reduced from 72 to 54 hours.

Such changes are associated with changes in curricula, but affect the opportunity for a more detailed study of global problems, the principles of sustainable development on the whole.

In the specialty "Technosphere Safety" (TS), the range of subjects is wider, therefore we put the data in Table 2.

Table 2. Changing the number of hours for getting acquainted with global problems during the TS speciality training.

Year		Disciplines	Class hours	Total hours
2012	1	Philosophy	36	108
	2	Ecology	36	108
	3	Life safety	72	144
	4	Transport security management	54	144
	5	Industrial ecology	36	72
	6	Emergency protection	36	72
	7	Industrial safety	94	288
	8	QMS, occupational safety and health, ecological safety	40	108
	9	The history of the evolution of the biosphere and technosphere	36	72
2017	1	Philosophy	36	108
	2	Life safety	54	180
	3	Chemistry and engineering ecology	126	468
	4	Transport security management	54	180
	5	Modern methods of protection of the biosphere, technosphere, methods and devices	54	216
	6	Industrial safety	90	252
	7	Industrial ecology	72	216
2021	1	Philosophy	36	144
	2	Life safety	54	144
	3	Chemistry and engineering ecology	126	468
	4	Industrial ecology	72	216
	5	Modern methods of protection of the biosphere, technosphere, methods and devices	54	216
	6	Industrial safety	90	252

In terms of the TS specialty, which most of all responds to global challenges and contributes to the training of specialists, familiar with the issues of sustainable development, we see, that the number of subjects, within which issues of our interest can be raised, is decreasing.

In terms of philosophy and civil protection, we see similar processes with class hours, described in the analysis of Table 1. The discipline "Ecology" is combined with the discipline "Chemistry" and, accordingly, loses part of the hours for studying ecology itself.

Several years ago, the list of disciplines included the subject "Creating an accessible environment in transport", where future engineers get acquainted with the characteristics of different groups of passengers, learn to work with them and create the necessary conditions for them. Of course, this has not only educational, but also pedagogic value.

Thus, we can note, that the compilers of educational programs, when training specialists for the railway industry, pay attention to the issues of ecological and ecohumanistic

education of our interest, but the class hours for studying these topics are steadily decreasing.

We have already noted above, that in order to solve the tasks of sustainable development, it is necessary to improve society and the formation of new thinking and a culture of consumption. Such moments are implemented through the action of the humanitarian environment. There are many definitions of the humanitarian environment in modern methodological literature. V.L. Kurguzov notes, that the humanitarian environment is a consciously formed humanitarian orientation of educational programs and disciplines, that form the person [4]. Researcher L.E. Saraskina notes, that the humanitarian environment is an educational space, where active teaching methods are used, that contribute to the implementation of the concept of goal-setting [5]. R.M. Petruneva writes, that the humanitarian environment is a combination of structures, technologies and administration for the humanization of education [6]. L.G. Viktorova and L.V. Petrova notice, that in a technical university, the content, structure and methods of teaching should reflect general cultural processes, use historical experience, traditions, cultural achievements [7]. L.A. Konyaeva defines the humanitarian environment as activities leading to the formation of a mindset, value orientations and motivations; should include pedagogical, scientific-research and extracurricular activities of students [8]. It can be said, that the majority of specialists define the humanitarian environment as an educational space. Professor E.A. Martynova in one of his articles ("The humanitarian environment of a university as a condition for the formation of a graduate's cultural competence") gives an example of such a space in the form of a technological park. The technological park is a structure, where scientific-research and educational activities are integrated, interdisciplinary links are expanding, academic mobility is increasing, research is being conducted, various courses are being carried out, and periodicals are published [9].

The professional skills of a technician are somewhat different from those of the humanities. A technician should think and act clearly, be able to subordinate his actions to instructions, order his activities within the framework of available technologies. His activity should be technological in nature. Most students of a technical university consider humanitarian subjects to be superfluous. They do not plan to refer to this information in their future activity. A pragmatic approach requires higher education to either get a degree or get a specific profession. It is very difficult to convince a student, that his life consists not only of work in the specialty, but also includes many other aspects. The cult of money and success has been established in modern Russian society. To achieve visible success, there is no need to study history, philosophy, literature, and acquaintance with cultural traditions. Education within the framework of the concept of sustainable development requires a constant and systematic appeal specifically to the humanitarian potential of training specialists. An engineer, as a creator of new technologies, should understand the principles of the existence of not only modern civilization, but also the civilization of the future, the civilization, to which we strive in the framework of achieving sustainable development.

Since our civilization is technogenic, let us consider the attitude of students to technogenic hazards. An express survey among 25 students showed, that almost 100% of students, being in job training (welding production), jeopardized safety measures, knowing, that they were jeopardizing. In particular, they looked at the welding without protective equipment. Among the students surveyed, 40% were participants in car accidents, 12% became participants in fires at home and in a dormitory, 76% of students have an idea of man-made danger, 96% know about protective measures and necessary precautions in cases of technogenic hazards, but nevertheless, manage to break the rules.

We note, that in order to comply with safety rules, the most effective way for our students (in their own opinion) is external control, and not internal rules and beliefs. We

train specialists, associated with work in a high risk area, therefore, we need theoretical knowledge of safety and, most of all, practical skills in this area, matrixed into muscle memory. It turns out, that students know, how to act, but break the rules, risking their lives and health.

The concept of sustainable development implies the availability of education, its universality. The availability and universality of education is implemented through the social protection of students. Children from 15 to 18 years old study in our educational institution. These are 1st and 2nd year students of SVE and HE. According to the law on education, any entrant can get an education at our university. Orphaned children have benefits at entry on state-financed openings, receive a social scholarship. Children from low-income families, orphaned children have benefits, when providing places in a dormitory. All students can receive free medical care. The student union can once a year dole out money for students in need.

Control over the observance of children's rights is also carried out through safety briefings. The requirements for the provision of educational services are also met. For example, during the pandemic, online classes were organized in subjects to comply with the lockdown. In 2020, according to the decision of the university management, there was no planned increase in tuition fees for students, studying on an off-budget basis. In April 2021, in the assembly hall of the institute, a meeting-conversation was held between the employees of the Juvenile division of the Perm Linear Department of the Ministry of Internal Affairs of Russia on transport and the Perm Transport Prosecutor's Office with 1st year students of the SU SVE. Such meetings are regular.

it can be said, that students of our institute often take part in the volunteer movement. Volunteers also participate in social events. For example, in April 2021, they took part in the "Apple for a Cigarette" action, aimed at promoting a healthy lifestyle, organized by the Committee of the Perm regional branch of the Sverdlovsk railway. Participation in the All-Russian action of mutual assistance "We are together". On March 3, 2021, volunteers of the Perm Institute of Railway Transport "Ural State University of Lines of Communication" carried out a very important work at the Perm-1 station. The students talked with visitors and employees of the station, reminded them of the need to take precautions during a pandemic, and those, who were without masks, were strongly recommended to put them on. The students also distributed reminder leaflets, as well as oranges - a source of vitamins and good mood, one of the symbols of the action.

According to the plan of educational work of the institute, in May 2021, an ecological month was held for students. Students took part in cleaning the bank of the river Egoshihi, they cleaned up the grave of engineer A.I. Ber, the first head of the technical school of the Ural Railroad, took part in an ecological picnic, watched documentaries about waste recycling and careful attitude to things. Similar events are held annually (the exception was 2020 due to the pandemic).

Thus, our students are part of society and participate in social processes. They not only receive social assistance, but they themselves are ready to provide it by taking part in social actions.

The institute has two levels of education: secondary vocational and higher. This predetermines continuing education by the chosen specialty.

Every year, students are independently tested on the Internet in the i-exam system in order to check the degree and quality of education. Over the past years, issues, related to global problems, have been mandatory in the list of questions. The number of students, who know and are able to identify global problems, remains quite high (over 70%).

4 Conclusions

At the Perm Institute of Railway Transport, educational and character building work is being carried out, contributing to the education of students in the framework of the concept of sustainable development. But many of the students of a technical university are not inclined to take an interest in materials that, in their opinion, go beyond the scope of professional training.

More attention in the training of railway engineers is paid to professional tasks, rather than general issues, that are present in the concept of sustainable development.

Educational programs take into account modern trends in the development of civilization in their content. Quite often, these moments are of an acquainting nature, and more practical actions, related to the educational process, are needed to form a new culture of thinking and consumption. We often talk about good and right things: ecology, saving resources, rational consumption, discussing the problems of inequality and the opportunities of its eliminating it, but, leaving the audience, we face the reality, where these problems exist, and there is no way to solve them. It is minded to see a decent infrastructure for the implementation of our tasks. So that students see how it should be and what they should implement in professional and civil life. Otherwise, we observe a practical disregard for the positive attitude of the students. We note, that the principles of sustainable development are discussed in the educational process, but have not yet become an imperative of student behavior. To a greater extent, students implement the model of ordinary, rather than rational consumption.

The fascination with online education technologies, which intensified during the pandemic, looks somewhat alarming. On the one hand, it made training possible and relatively affordable. On the other hand, it revealed a complex of new problems, related to the health of participants in the educational process.

Socialization of students is carried out both within the framework of education and in the educational system. It is not only of professional nature, but also takes into account the current problems of the world community. At the same time, empirical social practice prevails over theoretical comprehension of the concept of sustainable development. Achieving sustainable development requires an indoctrination, and we are trying to create an environment, that promotes these changes.

We believe, that a substantive analysis of how education and upbringing in a university are structured within the framework of the concept of sustainable development, will provide a move beyond symbolism to action, namely, the formation of new thinking, that affects the actions of people.

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