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Futurization of Education: Results of the Quasi-Experiment

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Abstract

The article is devoted to the study of the actual readiness of young students to separate themselves from individual experience and think about the future beyond personal needs. The most significant ideas of futurists about the mechanisms of thinking and shaping the future are analyzed. It is argued that the futurists, realizing the fundamental importance of educational activities, did not specify specific measures for the futurization of education. Empirically, the article is based on qualitative and quantitative methods. In the period from March 2022 to February 2023, a quasi-experiment, observation and interviews were conducted among Russian students. Theoretical and methodological analysis of the problem and the results of sociological research allowed the authors to develop ways to solve this problem based on individual and group work of students. Personal observations of the authors made it possible to assess the willingness of students to reflect on the future beyond personal experience and to identify possible obstacles to the educational strategy of futurization. The problem raised by the authors of the article actualizes the issue of accumulating experience in the field of future research, social forecasting, initiatives of international organizations, the development of original educational methods for integrating future issues into the education system.

Keywords: future, philosophy, education, higher education, futurization, futurization of education, futures literacy, future consciousness.

1. Introduction

The intensification of technical and technological innovations, the increase in the volume of information, the acceleration of the pace of social relations are the markers of our time. They were comprehended even in classical works on futures studies (Toffler, 1990a; Toffler, 1990b), (Fukuyama, 2003), etc. The understanding of modern trends has been consistently associated with a humanitarian problem, how to ensure the optimal human existence in conditions of abnormal rates of change? In fact, the futurists of the 20th century pointed out the humanitarian problem.

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Human's impotence in front of the future was conceptualized in terms of "future shock" (A. Toffler) and "future phobia" (I. Bestuzhev-Lada). These concepts denote the destructive reaction of a person to the changes taking place. Fear of radical changes, the destruction of the habitual way of life is systematically suppressed by "presentism" (I. Bestuzhev-Lada), that is, reflections on the future as an extended present.

The humanitarian problem is complicated by the special focus on new technologies. F. Fukuyama drew attention to this in the book "Our Posthuman Future". He claimed that the biology labs are symbols of modernity (Fukuyama, 2003). This means that technology not only reorganizes the world around a person, but also directly affects the person himself. Human has become projected, subject of design and programming (Callaghan, 2018). Transhumanism, for example, sees in a person a link to "posthuman", which is modified to such an extent that it will no longer be a person (Bostrom, 2003).

The key to solving the problem futurists saw and still see in education. This circumstance can be explained by several reasons: firstly, education is a channel for the exchange of experience between generations, and secondly, it is a socialization environment that provides a person with knowledge, skills, competencies for an optimal existence in the future. For a long time, they have been betting on education in solving the humanitarian problem. At the same time, education also needs to correspond to the time. According to A. Toffler, "The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn and relearn" (Toffler, 1990a).

Futurists and forecasters have long been trying to move from theory to practice. For example, back in the '60s. R. Jungk called for the formation of special research groups ("prognostic cells") in all educational institutions and was convinced that at least a third of school and university classes would be devoted to future problems. Children will study the projects that have not yet been realized and discuss the books that have not yet been published. Fantastic literature will come out of the underground and take a worthy place on the shelves of school libraries.

Later, A. Toffler in "Future Shock" wrote about the need to create "councils of the future" in each school (Toffler, 1990a). According to the American futurist, the members of the councils should devote themselves entirely to studying the future in the interests of the present. The main activity of the councils will be reduced to designing variants of the prospective future. Moreover, the initiative groups should determine the educational trends corresponding to future versions.

Today, educational portals are developing, aimed at informing young people about trends. In particular, "Teach the Future" is a supporter of the reorientation of world education in the face of the climate and environmental crisis (Teach the Future). Noteworthy is Futures Day on the formation of futures literacy organized by UNESCO Chair (Unesco Chair..., 2020). Modern futurists are dealing with the problem of literacy concerning the future, developing a methodology for the formation of literacy. Futures literacy relies on a person's mental faculties to allow imagination. N. Larsen, K. Kæseler Mortensen, and R. Miller write that literacy concerning the future can be formed through the discipline of anticipation. It allows us to learn how to get to know the unfamiliar (Larsen, 2020). It all proves that the translation of scientific theory into educational practice is taking on broader forms. The problem of literacy concerning the future has come to the fore.

The contemporary education system in Russia does not have effective means to solve the humanitarian problem. This is represented in scientific research on the problem. Russian higher education became available to the masses in the 90s of the twentieth century (Bessudnov i dr., 2017). Despite this, a "crisis of higher education in Russia" is seen nowadays (Vakhitov, 2019). The main crisis feature of Russian education is the imbalance between market relations and the traditional, Soviet way of education. This way of education is characterized by rigid specialization, which is present in most educational programs.

Certain factors in Russian education interfere with the fulfillment of the request of futurization. First, in the education system, the list of disciplines about the future is reduced to planning in business, but excludes, for example, courses on bioethics and engineering ethics (Sawyer, 2006). Secondly, educational institutions function as "repeater amplifiers" (Pereslegin, 2004), which hinders the introduction of educational innovations and reduces the cognitive activity of students. Thirdly, in the conditions of capitalism people are not used to reflect on the prospects for the development of society and their contribution to the future of the social whole, but is guided by a particular interest and preoccupied with a personal future. As a result, the very possibility of students to distract from individual needs and to think about things that lie beyond personal experience is in question.

Russian philosopher A. Ursul argued that humanity should “include the mechanism of accelerated futurization of education” (Ursul, 2012a: 134). In essence, activation of the mechanism of futurization means a turn of the education system towards the future. In the interests of progressive development and the consonance of relations with the environment, education should be “ecologized” and “futurized”. There is no doubt that education should have mechanisms that work to forestall destructive natural and social processes. The indicated idea raises questions about the method(s) of inclusion and the details of this mechanism. In the opinion of A. Ursul, it is necessary to pay close attention to the future “in all possible subjects and directions of the educational process” (Ursul, 2012a: 138). The problem again is to identify and take measures in achieving such attention. Unfortunately, nowadays these ideas are declared, not embodied.

The term “futurization” itself is not new. In particular, it was used in the context of psychiatry and denoted an excessive emphasis of thoughts on the possible and not the present (Pringuey, 2018). In 1970s. H.W. Eldredge used the term “futurization” (along with the synonym “futurism”) in relation to university courses. The term meant the orientation of educational courses to inform students about current trends. The scholar noted that in the social and human sciences, “futurization”, or “futurism”, has not been realized to a large extent (Eldredge, 1975).

In this article, by “futurization” we mean a strategy focused on integrating the problems of the future into the system of education, as well as the humanitarian response of participants in the educational process to technical, technological, political, and other trends.

In the book “Revolutionary Wealth”, A. Toffler mentioned that education system is conservative in the questions of the future. According to the futurist, the ‘machine’ of education is traveling slowly, preventing the movement of progressive social institutions. A. Toffler and other futurists agree that the current system of education does not correspond to the time (Grady, 2003: 67). In this case, the problem lies not only in the conservatism of educational policy but also in the search for means of checking the level of cognitive activity of students. In other words, futurists and educators should think about how to check the student's readiness to talk about the future. In the context of this study, the question can be reformulated: by what means can be determined students' readiness to distract from individual experience and to reflect on things that lie beyond this experience.

In our research, we were faced with the fact that most of the Russian students are not informed about technical and technological trends, hi-hume, and transhumanism. Using the terminology of S. Ahvenharju, we can say that a “sense of contemporary trends and challenges” is under question (Ahvenharju, 2018). Without this “sense” (despite the fact that this is only one of the factors identified by the scholars), an effective solution to the humanitarian problem is hardly possible.

Complicating the situation is that students focus on gaining knowledge in their specialty. We assumed that there is a gap between the intensification of technological development and student ignorance. In this regard, we formulated the main research question: how is it possible to bridge the gap between objective conditions (technical and technological progress) and the level of awareness of students about high technologies? Research hypothesis: one of the possible reasons for this gap lies in the orientation of the thinking of Russian students. The research purpose: to reveal meaningfully the peculiarities of thinking of Russian students that hinder the futurization of education.

2. Theoretical Framework and Methodology

2.1. Theoretical Framework

A. Ursul presents the conceptual foundations of the futurization of education in his papers. The philosopher gives the definition of futurization, which we took as a basis. He defined futurization as a strategy of advanced education with an orientation of the educational process towards a sustainable future (Ursul, 2012b: 20). Thus, futurization has a global goal: the prevention of global disasters (for example, environmental) through proactive decisions. Advanced decisions require advanced consciousness (Ursul, Ursul, 2014: 34). In Russian studies, the term “futurization” has been worked out only in the most general terms. In A. Ursul's works, there are no indications of the mechanisms for the implementation of futurization in education, which raises the problem of implementing this strategy. On a theoretical level, the existing conceptualization is insufficient. That is why we use G. Biesta's “subjectification” as the conceptual foundations of futurization. The scholar formulated the premise that the student should be the subject of his life, the source of his own decisions, and not the object of educational technologies and methodological intervention. First of all, subjectification is associated with the freedom to

think and act. At the same time, freedom of thought and action is impossible without responsibility (Biesta, 2020). Learning and teaching to think and act “like an adult” is the ultimate goal of futurization as an educational strategy.

The practice of futurization of education refers to first-order changes in education, according to the classification of D. Mireille and Dr. Hubers, since it has not yet received state support and has not been implemented in specific educational institutions (Hubers, 2020). The future is interesting for students (stages of the experiment clearly demonstrated this). However, the prevailing “prescriptive” education system does not always allow satisfying students' interest. Futurization is ideologically connected with the transformative concept of education, focused on the integrity of a person, on the personality of the student (Biesta, Miedema, 2002). In particular, futurization is aimed at adapting youth to developing social trends, which is necessary for optimal existence in society. At the implementation of futurization (Stage 2), critical thinking should be formed as one of the key meta-competencies of education for the future (in particular, the futurological game is directed towards the formation of critical thinking) (Rieckmann, 2012).

For education to rise to a qualitatively new level, a culture of forecasting is included, or, in terms of P. Hayward et al., “Generic Foresight Process” (Hayward et al., 2012), where futures literacy is required. Futurization serves to form this primary literacy and therefore includes, for example, intellectual games, systematic appeals to science fiction as forms of culture familiar from childhood.

The fundamental importance of the experiment can be expressed in terms of the relational concept (Ahlqvist, Uotila, 2020), or the concept of “weak signals”. At the beginning of the experiment, we were faced with the fact that the presence of an observer and an object does not guarantee the formation of meaning, the vision of the development prospects of the object, the ability to measure a specific phenomenon and understand its context.

2.2. Methods

The methodology of the study corresponds to the general logic of the educational quasi-experiment, taking into account a number of limitations of the study: we used convenience sampling; there is no control group and an assessment of the statistical reliability of the effects obtained in the study.

Stage 1 took place in the first half of 2022 (March-May), stage 2 – in the first half of 2023 (January-February). The main goal of Stage 1 was to establish the level of readiness of Russian students to speak competently about the future (in particular, awareness of technical and technological trends); Stage 2 includes pedagogical forms that are non-traditional for Russian education, attuning students to the problems of the future, film seminars and intellectual games. Film seminars involved the analysis of audiovisual materials. Students had to correlate the content of the film with real-life trends, assess the degree of realism of science fiction movies. The second form involved a futurological game. Students had to imagine that a certain fantastic “artifact” became part of everyday life; students had to describe the possible economic, political, cultural level of society that has this “artifact”.

Stage 1 included two sub-stages. In Stage 1.1 we used a survey, in Stage 1.2 we conducted interviews. The respondents were 1-4 year students (bachelor's degree) of South Ural State University (Chelyabinsk, Russia). In total, students from 9 educational programs (medicine, biology, computer sciences, mechanics, robotics, linguistics, history, psychology, etc.) took part in the survey.

The total number of survey participants is 1,000. We used convenience sampling.

The survey questionnaire included 4 open-ended questions. The questions were aimed at identifying the level of awareness of students about hi-hume – technologies that affect human nature (body, cognitive abilities, psycho-emotional state, etc.):

I. What modern technologies (including those that are being developed, not yet applied in practice) associated with interference in human nature are known to you?

II. What are some examples of the progressive impact of hi-hume technology on human nature? Justify your position.

III. What are some examples of the regressive impact of hi-hume technology on human nature?

Justify your position.

In the last question, two quotes were presented. The respondent's task was to choose the one that corresponds to their own worldview position and to justify their choice. Students were offered statements that were opposite in content:

IV. Read two quotes. Do you agree with the content of the abstracts? Try to express your own opinion on the topic to which these statements are devoted. The first quote: “Human is the peak of the evolution of the universe” (G. Andronov). The second quote: “... the human species is not the end of our evolution, but rather its beginning ... We can use not only reasonable ways to improve the position of human and the world around him; we can also use them to improve ourselves, the human body” (N. Bostrom).

In the process of modeling the research, we put forward a hypothesis: the receiving education, its specialization (direction of study), directly affects the respondents' ideas about the future (Tables 1, 2).

Table 1. Educational specialties

Specialty of respondents	Number of respondents
Automation of technological processes	93
Design of Architectural Environment	68
Journalism	86
Communication systems	100
Computer engineering	96
History	74
Clinical psychology	66
Design and technological support of machine-building industries	108
Linguistics	80
Materials Science	94
Mechatronics and Robotics	84
Teacher Education	51

Table 2. Distribution of respondents by year of study

Number of respondents	Year of Study
189	1
278	2
297	3
236	4

For the second substage, interviewing, two people from each specialization were chosen (in total – 24 students). The choosing of respondents was based on the results of a survey. In each group (the groups were formed in accordance with specialties of students), 1 respondent was selected who did not substantively answer any question and 1 respondent who detailed the content of the answer to each question of the questionnaire. The interview consisted of 3 questions, following the logic from a concrete subject to a large-scale and abstract, from simple to complex:

- I. What will you do tomorrow?
- II. What will be your usual day in 2049?
- III. How do you represent our country in 2049?

The interviews were conducted in public, with participating observers (students studying in the same specialty). After the participants gave answers to 3 questions, it was a public discussion of those answers.

As part of Stage 2, pedagogical forms that are non-traditional for Russian education were introduced into the educational process, attuning students to the problems of the future, film seminars, and intellectual games. The main goal of this stage was to assess how students comprehend the problems of the future on the example of a specific topic. The participants in Stage 2 of the experiment were divided into 12 groups according to the number of specialties. At Stage 1 students relied exclusively on existing knowledge; at Stage 2 students were offered material for thought. Each of the 12 groups was divided into 3 working subgroups. Students were to watch 3 films: “A visitor to a Museum” (1989, Konstantin Lopushansky), “Dead Man's Letters” (1986, Konstantin Lopushansky), and “The Road” (2009, John Hillcoat). All films are united by the topic of ecological disaster. After viewing, the task of the students was to identify and record a list of

factors that contributed to the environmental disaster. The list was not limited to a given framework. Participants could freely capture both natural and anthropogenic factors if they took place in a particular film. As authors of the experiment, we evaluated the number of these factors, the correctness of the wording, as well as the correspondence of each specified factor to the content of the film.

The futurological game was carried out in the form of a thought experiment. The work was also with the same 12 groups. The participants were asked to imagine how the social conditions and life of each individual would change with the introduction of a hypothetical technical innovation, to assess the likely progressive and regressive consequences of the spread of a fantastic invention. The “teleport” was taken as a fantastic artifact. The participants were shown a visual series with images of the teleport. The preliminary stage of the experiment: the participants had to name and identify the artifact, focusing on the visual series. Each group had to identify and fix the options for the influence of the hypothetical artifact on various spheres of society (politics, economy, social sphere, culture). The correctness of the wording was assessed, as well as the range of the indicated options of influence.

3. Results and Discussion

3.1. Stage 1. Diagnosing students' futures literacy

3.1.1. Survey

As a result of the survey we received a wide range of technologies related to the interference in human nature. The list included prosthetics, human microchip implant, creation of augmented and virtual reality, synthesis of software with the brain, laser surgery, brain stimulation, organ transplantation, artificial insemination, incubation of premature infants, interference with the genome, use of pharmaceuticals, use of emotion detectors, neuro-linguistic programming, cloning of organs, cryonics, reading of brain, treatment of mental disorders, destruction of viruses, biorobotics, management of climatic terms. Along with the list of technologies related to interference with human nature, an alternative list was drawn up. Students did not always answer the question posed and replaced the concept of technology with the concepts of instrument hardware (technical artifact), science, or knowledge. According to the students, technologies include cybernetics, surgery, and neuromathematics (fields of knowledge and discipline), as well as artificial intelligence, smart houses, armament, sinusoidal harmonic oscillators, televisions, computer games, tablet computers, headphones, Oculus Rift, Google Glass, 3D printers, electrocardiographs, antibiotics, anesthesia breathing apparatus, drugs, exoskeletons and truth serum (artifacts).

None of the students named more than four technologies related to the interference in human nature. Some students identified more than four positions; however, they made mistakes and pointed out artifacts and areas of knowledge instead of technologies. Less than a quarter of the total number of students was able to name three or four technologies. The relative majority of students could name one or two technologies. Almost a third of the total number of students could not name any technology. These included those who identified artifacts or areas of knowledge (Oculus Rift, cybernetics, etc.) (Table 3).

The results of the first part of the research show relatively low awareness of young people about new human-oriented technologies. We assume that the reasons for this situation are related to the cognitive activity of the individual and the functioning of the education system. Specialization can impede the formation of general scientific literacy. In the Russian education system, there are practically no disciplines devoted to the problems of the future and suggesting the study of “megatrends” (John Naisbitt) and “microtrends” (Mark Penn). It turns out that students themselves must study actual technical, technological, humanitarian, and other tendencies.

Table 3. Results of the survey. Number of trends indicated

Number of named trends	5 and more	3-4	1-2	0
Percentage of the total number of respondents	–	22,4	44,8	32,8

The overwhelming majority of students were able to name one or two technologies and briefly substantiate the choice. Among the interviewed students were those who could name more

than two technologies, but did not want (or could not) think over the possible consequences of their implementation. About a third of respondents could not indicate any progressive consequences of the introduction of any new technology. Obviously, the consequences of introducing human-oriented technologies do not lie on the surface. Few are ready to express their own opinion, suggesting a preliminary critical assessment of the subject (Table 4).

Table 4. Results of the survey. Assessment of progressive and regressive consequences of technology introduction

Consequences of the introduction of new technologies	Progressive			Regressive		
	3 and more	1-2	0	3 and more	1-2	0
Percentage of the total number of respondents	6,9	60,3	32,8	–	51,7	48,3

The final question of the questionnaire implied agreement with one of the opposing judgments and a brief justification of the opinion. It is noteworthy that most students agreed with the second judgment (Table 5):

Table 5. Results of the survey. Agreement with one of the opposing judgments and a brief justification of the opinion

Position of the respondent	Percentage of the total number of respondents
Agree with the first judgment (without justification)	1,7
Agree with the second judgment (without justification)	5,2
Agree with the first judgment (with justification)	6,9
Agree with the second judgment (with justification)	74,1
Agree with both judgments (with justification)	1,7
Agree with both judgments (without justification)	–
Disagree with any judgment (with justification)	3,4
Disagree with any judgment (without justification)	1,7
Missed the question	3,4

The list of arguments in defense of the second position, in general, is quite wide: mankind will fight against diseases and aging; the world is constantly changing and the evolution of human is inevitable; new technologies that can change a person will develop; a person needs adaptation to environmental conditions; technologies cause a change in human life; a person has always aspired and will strive for a better life; evolution will never end; a person must overcome the flaws of his nature and, in particular, the animal's beginning (instincts); a person has not yet fully understood the world around him; only death can stop the development of the species; science is constantly evolving and creating something new.

All arguments can be divided into two groups: "subject-centered" and "logo-centered". According to the judgments of the first group, a person is a source of changes in the world around him. This group includes statements about the fight against diseases and aging, adaptation to new conditions of life, the desire for knowledge, and the struggle with the animal origin. According to the judgments of the second group, certain conditions (laws of nature, evolution, science, and technology, etc.) force a person to change. The second group included judgments about the irreversibility of evolution, the progressive development of science and technology. In substantiating their position, respondents did not use dialectical logic, which could allow them to see the contradictory nature of the development of a particular thing.

The statement about the inevitability of evolutionary processes belonged to a Swedish-born philosopher, transhumanist Nick Bostrom. Transhumanists call for victory over the “blind” evolution and the construction of human nature. A person can and must change. New technologies (including hypothetical ones) will be assistants in the matter of revolutionizing the nature of Homo Sapiens. The popularity of Bostrom’s idea, of course, is not the key to the popularity of H+ in the student environment. Many students interpreted this idea in the context of logo-centrism. In other words, they do not believe that evolution is an objective planetary process. Nature is not interested in the desires and aspirations of the individual. The individual, in his turn, cannot change anything. Fatalistic ideas are strong in the student environment. Often we had to answer “rhetorical” questions like: “Why talk about the future if it does not exist?”; “Don’t you think that the future will not ask us anything?”; “Do you think that we will be able to change something?”

3.1.2. Interviewing

The second substage was interviewing. In 12 groups 2 participants were asked 3 questions about their day in the present (1st question), their day in the future, 30 years from now (2nd question), a situation in the state in the future (3rd question).

The answers to the first question were detailed, the students described in particularities their “tomorrow”. The audience learned about the daily routine, work, study, personal preferences of the interviewee, etc. The answer to the second question required reflection. The students tried to imagine themselves as elderly people. They assumed that they already have grandchildren. They said that they would work less and devote more time to everyday life. In general, the daily routine in 2049 was not fundamentally different from the daily routine in 2019. For example, one of the respondents suggested that the technique would greatly facilitate his housework.

The third question puzzled the respondents. In particular, this is due to the scale of the subject. Not every expert can describe even the current situation in Russia, without talking of the future. To facilitate the situation of the respondents, we suggested that they reflect on the future state of various spheres of society. Students were attracted especially by the social sphere, art, and culture.

There were a lot of comments on the third question and no comments on the first and second questions. This is due, firstly, to the comparative completeness of the information. The interviewees described in detail the schedule of their tomorrow. Secondly, personal life is not interesting in comparison to the public sphere (Bernstein, 2015). The future of the state, on the contrary, directly or indirectly affects the entire audience.

The answers expressed the presentism of the interviewees' thinking. For example, respondents suggested that the political situation in Russia would not actually change. Against the backdrop of presentism judgments, at first glance, judgments about artificial intelligence were distinguished: a machine capable of solving all the most complicated problems will control humanity. In practice, this statement does not go beyond the limits of collective experience. In science fiction, the topic of artificial intelligence was popular in the '60s and '70s of the last century. Over the past two decades, interest in this topic has been fueled by cinematography (Matrix, I, Robot, Her, Electric Dreams, etc.). As a rule, the films show the circumstances of the catastrophe caused by the loss of control over artificial intelligence. Fantastic literature and sci-fi cinema can be assessed as a response to civilizational challenges and technological megatrends. Culture responds to the pathos of rationalism, preoccupied with the structure of the world on a reasonable basis.

Students argued about the future state of Russia and easily expressed categorical judgments. For example, it was claimed that culture would degrade. The opposite view was based on the belief in cultural pluralism. Along with new and unknown forms of culture, traditional genres (opera, operetta, etc.) would be also preserved. The interviewing showed that the formation of the so-called “Time Perspective” and, in particular, long-term thinking is in question. Meanwhile, for “future consciousness”, it is hardly enough to roughly imagine how tomorrow will turn out (Ahvenharju, 2018: 9). In addition, in an interview with 24 students, 18 expressed identical judgments: it makes no sense to think about the future in the long term, because the future is not definable. To the clarifying question, why is it “not definable”, 15 out of 18 students answered: “Because it is not we who do it, but those who have the power”. Three respondents did not substantiate their claim. In this case, it is appropriate to recall that future consciousness includes a sense of how the future will unfold and how it can be influenced (a sense of being able to influence how the future will unfold). This is described in more detail in S. Ahvenharju’s paper (Ahvenharju, 2018: 9).

The comparatively large number of comments on the third question is a significant indicator. A person can freely talk about the future of the state and make the boldest assumptions about it. First, it was about the state as a whole. Secondly, the answer to the third question had an indeterminate number of voids. The observers unsuccessfully tried to fill these voids with their comments. One of the fundamentally important results of the application of this method was to exchange views. Obviously, in the situation of the polylogue, it is difficult to come to strictly defined conclusions. However, pluralism of points of view is directly related to the space for thought, promotes a multifaceted study of the subject, and stimulates critical thinking.

3.2. Stage 2. Non-traditional pedagogical forms

Film seminars

The practice of film seminars proved its worth. One of the series of film seminars was devoted to environmental issues. We especially wanted to avoid the repetition of ideas expressed by environmentalists, participants of the Club of Rome, etc. We also refrained from the slogans of environmental organizations and political parties. We tried to approach the solution of environmental problems with the help of cinematography (the so-called post-apocalyptic anti-utopias) because of its distinctively cinematic interest and the philosophy of existentialism.

After watching the films and reading the fragments of the philosophical book related to the topic, the overwhelming majority of the participants were able to name 1 or 2 factors of an ecological disaster. 96 % of the responses contain indications of the same factors: nuclear war and depletion of natural resources. In the remaining 4 % of answers, these factors are clarified and meaningfully disclosed: depletion of the ozone layer, “nuclear winter”, gas pollution, pollution of water sources, irrational organization of industrial enterprises. Only six answers indicated an indirect factor, the specificity of a person's thinking, consumer orientation. Apparently, this is due to the study of the course of general philosophy and, in particular, the texts of M. Heidegger. All participants who named 1 or 2 factors did not reveal them meaningfully (Table 6). This is probably due to the fact that students are not informed about “nuclear winter” and other factors associated with a nuclear catastrophe. In any case, this requires additional research in the future.

Table 6. Factors of ecological catastrophe identified by students after watching films

Film	The number of recorded factors of environmental disaster	Percentage of total students
“A visitor to a Museum”	0	34
	1-2	57
	3 or more	9
“Dead Man's Letters”	0	12
	1-2	76
	3 or more	12
“The Road”	0	15
	1-2	74
	3 or more	11

Ultimately, the seminars were aimed at introducing students to one of the most important means of changing the ecological situation, that is, to reflect on their own life project. This is closely related to the “subjectification” of G. Biesta. Based on the results of this part of the experiment, several assumptions can be made that require future verification: 1. It is possible that students have poorly formed ability to analyze. 2. Students are not informed about the advances in forecasting (in particular, about modeling “nuclear winter”). 3. Finally, the lack of awareness about ecology can be a significant obstacle for students to form their own worldview position.

Futurological game

Unlike many other educational forms, the intellectual game allows us to draw the attention of youth to discussions about the future and to cause their genuine interest to serious questions. The use of games in forecasting and education is a topic of numerous serious scientific researches. The game can be part of prognostic procedures (Cesa-Bianchi, 2006: 301-310), an element of data mining (Koedinger et al., 2015), teach the basics of the scientific picture of the world (Clark,

Martinez-Garza, 2012), motivate learning and improve academic performance (Hwang et al., 2015; Yang, 2012). An integral part of game-based learning can also be learning the basics of forecasting using the game. In the game, we presented the basics of modeling, a systematic approach, and extrapolation in forecasting. These methods have been reproduced exclusively at the training level.

The progress of the groups was determined by the rules of the futurological game “Archeology of Time” (Segal, 2017: 785). The meaning of the heuristic game is reduced to constructing the image of a society of the future, using (or not using) the artifact from the future. The archaeologist deals with an artifact lying in a certain cultural layer. Based on the data on the find, the scientist tries to reconstruct the past. The “archaeologist of the future” deals with the image of a hypothetical object (tool or technology) and imagines how society will develop.

The task of one group of participants was to justify the high importance of the artifact from the future and, consequently, to prove that the object will necessarily appear. The task of the other group was the opposite. As part of this research, the subject of the future was a teleport. Participants had to name and identify the object (footages from *The Fly*, *Jumper*, *Contact*, etc.). Defining the artifact of the future, the students had to formulate arguments. The search for arguments was the most difficult task and required at least some logical tools, abilities for analysis and generalization. The content of the next stage was to formulate questions for opponents. At this stage, it was necessary to find lacunae in the arguments of rivals and correctly formulate a question that allows achieving the predicament of opponents.

Pluralism of opinions arose already in the first stage of group work. The participants gave five variants to name the artifact: television camera, Tardis (machine from the series “*Doctor Who*”), time machine, teleport, and portal. Supporters of teleport were divided into two “camps”. Some have defined a teleport as “a device and (or) an object that instantly moves an object in time and (or) in space, contributing to the entry of this object into alternative worlds”. Others have defined the teleport as “a device and (or) an object that instantly moves an object of reality in time and (or) space”. These definitions are comparable and have many similarities. However, most participants decided not to focus on the near-scientific theme of travel to parallel worlds. The participants did not pay attention to the fact that they contrast the concepts of the device and the object. As the “obvious” was the statement about the instantaneous displacement. Supporters of the portal defined it as “a gap in space and (or) the time through which you can move”. The statement about the instantaneous displacement was discarded.

Supporters of teleport won with a relatively small margin. It is noteworthy that the invention was conceived as an unconditionally significant scientific discovery and breakthrough in the field of scientific knowledge. Supporters argued that the teleport poses no danger to the environment. On the contrary, the players decided that with the help of this device it will be possible to get rid of waste (including radioactive waste). Unfortunately, the issue of the final point of the “garbage journey” remained unanswered. A special group of judgments concerned the universal consequences of the appearance of teleport (portal). The optimism of the argumentation was reduced to the embodiment of the dream of cosmic thinkers, that is, to the possibility of free travel around the galaxy and going beyond it. Pessimists argued that the device will give rise to chaos and cause the destruction of the universe.

Reasoning about the importance of the artifact for the economy has been reduced to several statements. Some arguments can be presented as opposites: the device will save resources and significantly reduce transportation costs/operation of the device will require a large expenditure of energy; positive transformations of the social environment (for example, the development of the education system)/negative transformations of the social environment (the growth of crime). The same was for the arguments about the impact of teleportation on a person: safety for health/danger to health; personal growth/degradation of a person's spiritual culture.

The study of opposites made it possible to understand better the purpose of the task, to evaluate the potential innovation in a multifaceted manner, and to recognize that the introduction of any significant innovation has both positive features and pitfalls. A couple of arguments illustrate this trivial thesis. Supporters of innovation argued that teleportation in time will correct mistakes of the past. Opponents, in turn, focused on the importance of self-development and learning from their own mistakes. In other words, it is important not only to correct mistakes but also to learn to live with them. The problematic place of the game is the application of a systematic approach by students. It requires taking into account numerous factors, relationships of the object with simulated conditions. As a rule, students need to learn to see the

context of technological innovation and to assess the complex of relations of the object with the spheres of society (politics, economy, culture).

4. Conclusion

In our study, we focused on identifying, firstly, the level of awareness of students about technical and technological trends, secondly, the degree of correctness of reasoning about the future outside the individual life (personal plans) of students, thirdly, the formation of the ability to analysis, fourthly, the ability to take into account the positive and negative aspects of certain trends, tendencies, processes. For this, as we assumed, it is necessary to overcome the one-dimensional thinking about the future.

At the same time, the one-dimensional thinking about the future is constituted by the factors identified in both stages of experimental work: 1. Lack of awareness of trends. The reasons for this situation can be both the student's disinterest (subjective factor) and the orientation of Russian education towards narrow specializations, profile (objective factor). Another factor may be the transmission of outdated information in the educational environment. In any case, these assumptions require argumentation and further research. The results of the survey showed that students are relatively poorly aware of hi-hume technologies 2. Unwillingness to go beyond the boundaries of personal experience. The interviews showed that it is difficult for students to talk about things that directly lie outside the boundaries of their personal experience. The Russian futurist I.V. Bestuzhev-Lada wrote about psychological barriers preventing the imagination of a qualitatively different, in comparison with the present, future. He called this phenomenon "presentism" (Bestuzhev-Lada, 1990: 74). "Presentism" is expressed in the fact that people think of the future as an extended present. 3. Lack of analytical skills. The film seminars revealed difficulties in analytical work. It was probably difficult for the students to see the "details" of the subject of analysis. This is confirmed by the small number of identified factors that were contributed to the environmental disaster. 4. Difficulties in determining and evaluating the various aspects of the subject, the possible positive and negative impact of the subject, phenomenon, process on a person, social relations, culture, etc.

The problem that the students are not yet ready to speak about the future is hampered by the habitual way of life of a person, the "presentism" of thinking, and the standardization of the content of academic disciplines. As a result, a person feels "impotence" before the future (Yakovenko, 2016). A person cares little about what does not enter his personal space. Nothing is surprising in that the student is concerned about his own needs and personal future. The futurization of the current education system in Russia is still limited to a few economic disciplines ("Organization and Production Planning", "Forecasting and Planning in Service", etc.) and technical disciplines ("Basics of designing electronic devices", "Computer-aided design systems", etc.). The results of the research turned out to be contradictory: on the one hand, it became clear that serious talk about the future in the classroom could not yet take place; on the other hand, without the use of specific techniques, it cannot take place.

Within the framework of Russian education, it is possible to assess the willingness of students to abstract from personal needs and thinking about things that lay outside of individual experience with the help of competently used educational strategies. These educational strategies ultimately boil down to encourage individual and collective work on the identified problems.

Nowadays a serious attitude to the political, economic, social, spiritual, environmental, and other problems that directly affect the existence and development of the social whole is required from a person. One of the objective reasons hindering this attitude is the dominance of futuroplurality, that is, the set of projects and models of the future. It is not easy to find your bearings in the "labyrinth of prophecies". This requires critical thinking, a comprehensive assessment of the subject, and, ultimately, a person's desire to go beyond personal needs and an individual life project.

To overcome the gap between objective conditions (technical and technological progress) and the lack of awareness of students about high technologies, Russian education needs a comprehensive strategy, the futurization of education. The practice of futurization is not limited by the framework of any special course. The subject of such a course would be extremely broad and blurred. The effective application of the strategy of futurization is to study the different facets of the future. Consequently, lectures of all profiles, natural science, technical, social, and humanitarian disciplines should contribute

to the practice of futurization. Only in this state of affairs, a comprehensive examination of the subject and the rejection of a narrow-profile orientation are possible.

Today there are no futurization mechanisms in Russian education. Meanwhile, it is necessary to transfer futurization from theory to practice, a real initiative of researchers and educators. Futurization can be effective only by taking into account the accumulated experience in the fields of futures studies, social forecasting, the initiatives of international organizations, as well as scholars who have developed original educational methods for integrating future issues into the education system.

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