

METHODOLOGY FOR IMPROVING STUDENTS' DELPHI CRITICAL TECHNOLOGIES AND CREATIVE COMPETENCIES

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ABSTRACT

This article is intended for students studying at the bachelor's degree program of the Pedagogical Higher Education Institution. Pedagogical conditions and quality indicators of using innovative organizational and didactic forms of education in methodically equipping students with knowledge of creative pedagogical competence, information and didactic support are described. The method of improvement of students' creative competences based on Forsayt technologies, innovative approach is covered.

INTRODUCTION

In the world, improvement of creative competences of students and mastering of new forms of independent professional development based on foresight technologies are emphasized as promising directions of education, science and innovation. In particular, in the concept of universal education adopted until 2030, the idea of "creating an opportunity to receive quality education throughout life" focuses on continuous professional development of specialists and development of creative thinking. Finland in particular: Finland is known for its centers of foresight and strategic planning. For example, the Finnish Innovation Fund Company (Sitra) conducts long-term forecasting based on various scenarios of economic and social development. There are several foresight centers in Germany, such as the Federal Ministry of Research and Education (BMBF) active in foresight, trend analysis and development in research and education. The British Technology Strategy Board has launched a Foresight and Innovation Center. The center is engaged in forecasting technological trends and developing strategies for the development of various sectors of the economy. There are various government and industry foresight centers in the US. The National Intelligence Council (NIC) forecasts global trends based on various scenarios of the development of world politics. Big companies like IBM and Microsoft also have their own foresight centers to plan future technology research and development. Singularity University in Singapore is engaged in foresight and research in the field of technological innovation.

Training of students' creative competences based on foresight technologies, application of interactive educational strategies to the educational process to create problem situations, selection of

appropriate ones from problematic issues, creation of educational resources for performing virtual laboratory work, and training of practical implementation Systematic works are being carried out to improve methodological support.

Research methodology. Decree of the President of the Republic of Uzbekistan dated June 30, 2017 "On measures to fundamentally improve the conditions for the development of the field of information technologies in the Republic" No. PF-5099, dated October 8, 2019 "The Higher Education System of the Republic of Uzbekistan On approval of the development concept until 2030" No. PF-5847, dated January 28, 2022 Decree No. PF-60 "On the Development Strategy of New Uzbekistan for 2022-2026", Decree No. PF-60 of April 20, 2017 "On Measures for the Further Development of the Higher Education System" No. 2909 of July 27, 2017 "Measures to further expand the participation of economic sectors and sectors in improving the quality of training of highly educated specialists on" Resolution No. PQ-3151, Resolution of the President of the Republic of Uzbekistan No. PF-60 of January 28, 2022 "On the Development Strategy of New Uzbekistan for 2022-2026" and other regulations related to this activity This dissertation research serves to a certain extent to fulfill the tasks specified in the documents.

In the "Concept of the Development of the Higher Education System of the Republic of Uzbekistan until 2030", the following tasks were defined in terms of increasing the efficiency of scientific and research work and creating an innovative infrastructure of science in HEIs: gradual implementation of the "University 3.0" concept; Special attention has been paid to the urgency of establishing and developing foresight centers, technoparks, innovative technology transfer centers,

accelerators, startups, and business incubators in higher education institutions.

Analysis of literature on the subject. In the continuous education system developing in our republic, the higher education system, which is developing in accordance with social requirements, has a special place. In order to find a solution to the problems arising in this regard, first of all, it is necessary to create the necessary information infrastructure for the introduction of modern technologies in educational processes.

The theoretical and methodological issues of the development of the educational system in higher education and the problems of creating an information environment in education were discussed by the scientists of our country R.Kh. Djurayev, A.A. Abdukadirov. Begimkulov U.S., Makhmudov S.Yu, Mirsoliyeva M.T. Muslimov N.A., Tailakov N.I., Abdullaeva B.S., M.A. Yuldashev and Sharipov Sh.S. and researched by others.

Theoretical and practical issues of using foresight technologies in higher education, didactic and methodical bases, studies related to education, science and innovation perspectives D.N.Mamatov, Tolipov O'.Q., Khimmataliev D.O. It is covered in the works of Ernazarova G.O., Ko'ysinov O.A., Hamidov J.A. and others. Scientific research on foresight technologies Khurramov A.J., Makhkamova M.U., Yusupov A.I., Foresight as a factor of expansion of innovative activity. Rakhimov O.D., Berdiyev Sh.J., Rakhmatov M.I., Nikboev A.T. in the scientific research of . found in works related to scientific research. Rakhimova D.O. The need to use "foresight methods" in the development of foresight competence in future managers. The need to use "foresight methods" in the development of foresight competence in future managers was discussed.

Research on introduction of information and communication technologies in higher education in foreign countries Andersen A.D., Bengston. D., Bas E., Burt G., Van der Heijden K., Durance P., Effie A. Guy E.K., Goxberg L.M., Georghiou L., Graves T., James P. Gavigan, Fabiana Scapolo, Michael Keenan, Ian Miles, François Farhi, Denis Lecoq, Michele Capriati, Teresa Di Bartolomeo., Johnston. Conducted by R., Kinen M., Loveridge D. Analysis and results.

Delphi critical technologies. It has gained the greatest popularity in recent years. The method is based on conducting a survey of a large number of 2-3 thousand experts and organizing opinions (through the second stage of the survey). The Delphi method is used in Japan, Germany, the first Foresight of Great Britain and a number of other countries. The method involves the selection of highly qualified specialists, the creation of expert panels in certain fields of science and technology; developing a list of topics - potential scientific and technological achievements expected in the long term, 25-30 years, including fundamental and applied research, innovative goods and services created on the basis of new technologies. Experts assess the relevance of each topic for the development of the economy and society, the availability of resources, and possible obstacles to practical implementation. Research result- It includes summary assessments of each topic, as well as analytical reviews of the most important areas of science and technology.

Critical technologies. This method of Foresight is used in USA, France, Czech Republic, Russia and other countries. The list of

important technologies is compiled based on the knowledge of experts with the highest qualifications in the relevant fields. Usually no more than 200 specialists are involved in the project and the forecast horizon is 5 to 10 years. The initial list of important technologies is formed on the basis of expert surveys and interviews. It is then discussed in special panels and focus groups, during which the final selection and list of essential technologies are agreed upon. Sometimes "benchmarking" is used, that is, comparison with other countries or regions, which allows not only to determine the level of development of technology in a country, region or industry, but also to compare it with the level of world leaders, as well as to determine the level of development in this field. It is to determine the degree of delay and develop a strategy to accelerate technological development in sectors with the greatest innovation potential. Usually, increasing the competitiveness of the economy and solving the main social problems is a priority.

Expert panels. This method is fundamental and is used in almost all Foresight projects. Expert teams of 12-20 people are asked to spend several months thinking about possible futures on a given topic, using the latest analytical and information materials and developments. The expert panel approach ensures that the Foresight process is open to hundreds of people. Its main advantages are the presence of specialists in the entire work process, the interaction of representatives of various scientific disciplines and fields of activity, which is difficult to organize in other conditions. The method can complement other approaches used in Foresight technologies. In addition, in some cases, the creation of panels is necessary to develop preliminary data, to interpret the obtained results, or to apply the method in general. The most active members of the panels are Foresight "leaders".

Technological road map. The technology roadmap method was developed by Motorola in the late 1970s. It is used to develop long-term technology development strategies for an industry or large company. For example, in the second British Foresight, it was applied to the transport sector. The essence of the method is to organize strategic planning involving specialists representing the main components of business - marketing, finance, production infrastructure, technology, research and development. The "Roadmap" shows the stages of transition from the current state to long-term development stages through the simultaneous development of technologies, products, services, business and market. The main advantage of the **Info-Tech Insight**. Technology cannot protect us. We have learned that guaranteed security is impossible and that even good security is very expensive. Most people do risk and reward assessments for all investments.

Value factors. Institutional growth and stability. Many institutions continue to use many different technologies and vendor solutions, leaving them with a wide attack surface. This is the zero trust strategy heterojen is the only viable solution for the environment. A strong future zero-trust framework will enable secure cloud migration, as well as better implementation of campus technology such as IoT devices for energy efficiency.

method is to develop a consistent view of the long-term development goals of the industry or company.

Foresight's implementation processes

Thematic lighting	Methods	Results
Thematic panels (groups)	Expert surveys, expert panels	List of important technologies
Expert panels	Delphi surveys, bibliometric analyses, expert panels, scenarios	Lectures, a list of recommendations for the development of thematic areas, recommendations for scientific policy
16 industrial panels i	Delphi, expert panels	360 recommendations for actions
11 industry and 3 thematic panels	Seminars, open discussions, panels, Knowledge Bank (Internet platform)	Creation of Foresight training centers, support of the national innovation system
Ongoing program (3-4 parallel projects)	Expert panels, scenarios, technology scans	Concentration of resources for practical use of scientific results
Thematic panels, selection of key technologies for national competitiveness	Expert assessment based on the criterion of strengthening the country's competitive position	A list of 119 key technologies
More than 1400 promising directions of scientific and technical development and fields of practical application of technologies	Workshops, open discussions, expert panels, scenarios, online surveys	Strategic directions of development. Development of priorities for research programs
Thematic panels	Diagnostic studies, Delphi surveys, macro-scenarios, seminars	Creating and strengthening horizontal relations: science - education - business

Risk and resilience. There is more at stake than money. Organizations have a long backlog of security improvements and don't have enough money or resources to make all the necessary changes. IT organizations must work with senior executives to develop prioritization criteria, then prioritize security investments against those criteria and implement changes as a portfolio of security projects.

Operational excellence and accountability. APIs themselves are a key component of automation; they are often a simple solution to reduce the manual aspects of administrative workflows. The problem is that in a federated model, IT administrators at different educational institutions may decide to allow API gateways before centralization. The main principles of forecasting:

- the future depends on the efforts made, it can be created;
- the future is variable - it does not come from the past, but depends on the decisions of participants and stakeholders;
- There are areas we can predict, but in general the future cannot be reliably predicted, we can prepare or create the future as we wish.

The range of approaches used in foresight projects is constantly expanding and today includes dozens of methods - qualitative (interviews, literature reviews, morphological analysis, scenarios, role-playing games, etc.) and quantitative (interviews), impact (interaction analysis), extrapolation, modeling, method performance analysis and forecasting, etc.). A number of methods are synthetic in nature, including the aforementioned Delphi, roadmapping, critical technologies, as well as multicriteria analysis, patent analysis, game modeling, and others. The set of methods used in a particular project can be selected taking into account many factors: time and resource limitations, availability of a sufficient number of highly qualified specialists, access to information sources, etc. Nevertheless, it became clear that the main condition for the success of the project is the use of methods that ensure the effective work of the involved specialists, and new approaches that provide an objective assessment based on the quantitative analysis of others. from the point of view, it has undergone changes and the idea of "Forsyth's triangle". In the works of I. Miles and R. Popper, it was proposed to add one more peak - "proof, thereby turning the triangle into a rhombus (in the original - Foresight Diamond). One of the variants of such a rhombus is shown in the picture. In recent years, all projects that have been successfully implemented to one degree or another were based on complex approaches. In addition, the tendency to constantly complicate the system of used methods is clear. Thus, if the seventh Japanese Foresight used the Delphi method, expert panels and literature reviews, in the eighth year, in addition to them, several new works were carried out: a serious bibliometric study, during which the fastest growing technological areas were identified and analyzed; expert survey and student group to determine the most important socio-economic goals of

technological development; creating long-term scenarios for a range of technology areas. Similar trends are described for recurring national technological Foresights, such as Germany's FUTUR program and the third phase of Britain's Foresight. Thinking about the future: types, approaches, features. Prediction is one way of working with the future, but not the only one. In general, five such approaches can be distinguished. Today, all the above approaches exist, develop and are used in parallel. In addition, the results of using some tools (for example, extrapolation) are actively used when working with other tools (for example, in predictions or futuristic forecasts). Currently, many forecasting tools have been developed and are used: -delphi, -scenario, -SWOT, - brainstorming, - science fiction and futurology, - reverse (or retro) forecasting, - panel discussions, essays, about literature sources general information, literature review, patent analysis, game simulations, structural, multicriteria, cluster and other types of analysis, critical technology method, industrial and technological forecast (CSR) "Inevitable Future"

Ways to imagine the future

Today, the Rapid Foresight methodology is internationally recognized - through the International Labor Organization, sessions were held in Vietnam, Armenia, Tanzania, and the Global Education Future project (<http://edu2035.org>) attracted leading experts in the field of education from around the world. did Forecast projects that are currently fully operational in Russia: Global Education Future - global discussion of future education formats; The National Technology Initiative is an effort to create forward-looking networks; Foresight Education 2030; Atlas of New Professions (Foresight Competencies); Russia's participation in the WorldSkills movement and the initiative to create the FutureSkills system.

In 2016 alone, more than 100 forecasting sessions were held in Russia, including industry sessions (NAKS Foresight, Childhood Foresight), sessions for large companies (R-Pharm, Lanit), sessions on the development of professional fields (HR Foresight, SRO, VI International Forum), regional development sessions (Obninsk, Yamal-Nenets Autonomous District), communities (Youth entrepreneurship, Far East Forum "Amur"), universities (FEFU, Moscow Polytechnic University). The method is constantly updated and expanded ladi There are two main directions of development:

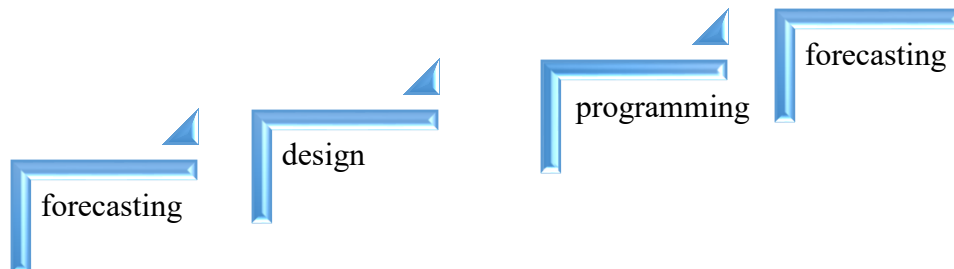
- development of interfaces for introducing the results of the session to the external environment, including combining the method with other tools for working with the future (for example, road maps), sociological research, comparison with other countries.
- the technology of the work elements of the session itself (for example, the development of templates for setting up the session for the moderator, templates for describing the initiative, templates for transforming change projects into a roadmap). The history of technological progress provides evidence that change is

often exponential rather than linear. Dynamics are increasingly driven by the convergence of technologies.

Rapid Foresight has four main functions at once:

- forecasting - forming a quick collective point of view about the possible options for the development of the research subject;
- design - choosing the optimal methods of development of the subject, including the means of its modification;
- programming - formation of project flash groups ready to move towards the specified results;
- projection - forming a collective language and options for understanding the topic under discussion.

Rapid Foresight features



What sets Rapid Foresight apart from other forecasting methods is the willingness of the participants in the forecasting sessions to continue the dialogue and work together towards the desired future, where the analysts are separated from the actors.

The result of a forecasting session using the RF method is a map of the future - a visually rich space that contains the entire subject, the image of its future, as well as various methods and means of achieving certain goals, implementing one or another version of the development of desirable and undesirable situations and events. It allows you to see the factors affecting the probability. A future map can easily be turned into a goal-oriented roadmap by participants - it is not easy and is not only a visual representation of the joint future, including key trends, technology development forecasts, events, strategies, but also decision-points and specific social, technological action or project launch, legislative action plan.

Typically, each Foresight project uses a combination of different methods, including expert panels, Delphi-method (two-stage expert surveys), SWOT-analysis, brainstorming, scenario building, technology roadmaps, interaction impact analysis etc. In order to take into account all possible options and get a complete picture, usually many experts are involved. When choosing technologies, the learning process can be used as a criterion for achieving growth, and when creating a technological road map for the industry. – it is possible to identify potential market niches and select technologies that allow for the fastest possible production of competitive products for developing markets: The choice of a development strategy is based on a series of extensive expert advice, which predicts a wide range of unexpected ways of development of events and possible "traps" allows to do. It allows to understand the essence of the changes taking place, to determine the stages of development of future processes; the higher education institution ensures its main efficiency in the formation of horizontal networks and platforms for professors and teachers to systematically discuss common problems in the field; Foresight is a systematic process that must be planned and organized and is carried out as a set of interrelated tasks and a sequence of cross-projects in the generation of ideas.

CONCLUSION

So, as a conclusion, it should be said that the preparation of the Forgnoz session is an important part of obtaining a quality result, the search for international experience, the search for scientific and research publications); - statistical data collection and analysis (including extrapolation, correlation and regression analysis); - analysis of the statements of well-known opinion leaders in this field (leading scientists, evangelists, entrepreneurs); - analysis of public opinion (forums, social networks, surveys in search engines); - information published by expert institutes and think tanks (for example, Gartner reviews).

Formation of the group of participants (selection of the group)
Preparation of the Foresight session necessarily includes determining the composition of expert groups, during which the most competent participants are selected, representing different positions of the topic in the context of the topic of the foresight session. Methodical approaches can be used: - the client's experience, his assumptions about people with the necessary experience; - compilation of lists, rankings and ratings on a given topic (largest, fastest, most effective, etc.); - search for authors of publications on the topic (including social networks and blogs); - bibliometrics and patent analysis (in rare cases).

Experienced foresight session moderators can suggest potential candidates to participate in this work, as they may have participated in foresight sessions before and may have been involved in some change projects. Generation is a real forecasting session that includes the most effective group work tools, such as: - brainstorming; development of scenarios (when working with a map); method of free associations; expert panels (actually working in partial groups); science fiction (when creating cards, participants often rely on science fiction pictures, discuss the possibilities and conditions for the realization of these "predictions"); requests (only within the group of moderators); checking the results (maps) of previous foresight sessions; voting by session participants.

Actions. The bulk format of conducting a predictive session is a natural fit for the RF approach. The most common outcome of a predictive session is that it can be presented in the form of roadmaps gan set of initiatives (change projects). In addition, the participants, as a rule, agree on the next (quick) actions for the implementation of the initiatives during the session and the start of the change projects agreed upon during the joint work. Monitoring this activity, supporting it with IT tools, conducting the work of moderators, providing a platform for communication - this is an important component of prediction, in fact, the only guarantee that the results of the session will not be forgotten. Also, the result of predictive training is the emergence of leaders who are ready to develop a specific topic (initiative, change project, project package).

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